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DIVISION 1 - GENERAL REQUIREMENTS

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SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work under separate contracts.
5. Owner-furnished products.
6. Access to Project Site.
7. Coordination with occupants.
8. Work restrictions.
9. Specification and drawing conventions.

B. Related Section:

1. Division 01 – Section 015000 "Construction Facilities and Temporary Controls" for limitations and procedures governing temporary use of Owner’s facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Monroe TK-5 Modular School Phase 2 , Receive, set and connect modular buildings. Perform site work and complete the scope outlined in the DSA approved plans that are a part of these contract documents.

B. , DSA Project Number #03-119490

C. Project Location: Monroe MS, 401 S. Inglewood Avenue, Inglewood, CA 90301..

D. Project Teams:

1. Identity of Project Teams listed below are consistent for all Contract Document Specifications.

Project Team	Project Team Information	
Owner	Name: Address: Phone: Fax:	Inglewood Unified School District 401 S. Inglewood Avenue, Inglewood, CA 90301 (310) 419-2700 (310) 680-5138
Owner's Representative	Name: Representative: Representative's Title: Address: Phone:	Cordoba Corporation, Bond Management Team Steve Ross Program Director 401 S. Inglewood Avenue, Inglewood, CA 90301 (310) 419-2766
Architect	Name: Representative: Representative's Title: Address: Phone: Fax:	XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. All references to work in Division 01 reference the Work of the Project as defined by the Contract Documents.

B. Scope of Work: Provide FAA approved sound mitigation upgrades at all existing permanent buildings. Demo existing structures as specified on the contract documents. Create new parking lot. Improve existing courtyard and make ADA compliant changes to the site.

C. Type of Contract

1. Project will be constructed under a Single Prime Contract with the CONTRACTOR.

1.5 PHASED CONSTRUCTION

A. The Work will be required to be completed in multiple phases as outlined in the General Conditions – Article 8.3.2.9-1.

1. PHASE 1 - Building B will be completed and ready for occupancy no later than 4-3-20.

2. PHASE 2 – Portions of Building A, Classrooms # 4, 6-9, library and both restrooms adjacent to room 7 and 9 will be completed and ready for occupancy no later than 6-5-20.

3. PHASE 3A – Parking lot, Building C, Building A corridors, Courtyard and stage, ADA access at the main entrance to the school, portions of building A (administration and room 13), demolition of bungalow 22, 23 and portable restroom. All exterior and miscellaneous exterior site utilities and paving improvements will be completed and ready for occupancy no later than 8-17-20.
4. PHASE 3B - Portions of building A rooms 1, 2, 3 and 5 will be completed and ready for occupancy no later than 12-31-20

1.6 WORK UNDER SEPARATE CONTRACTS

A. General: Cooperate fully with separate Contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

1.7 OWNER-FURNISHED, CONTRACTOR-INSTALLED PRODUCTS

A. Equipment and fixtures noted in the drawings as OFCI (Owner-Furnished, Contractor-Installed).

B. For existing OFCI equipment: CONTRACTOR is responsible for the relocation of the existing equipment from its original location, including the work to uninstall the equipment, remove anchorage, etc. When relocating the existing equipment in its new location, the CONTRACTOR shall install/attach the equipment to match how it was placed or attached in its previous condition to achieve the District's intended use for the equipment.

1.8 ACCESS TO SITE

A. Use of Site: Limit use of Project Site to areas within the Contract Limits indicated. Do not disturb portions of Project Site beyond areas in which the Work is indicated. CONTRACTOR to coordinate with the OWNER'S REPRESENTATIVE on Project Site access.
   1. Contract Limits: Confine construction operations to areas indicated on Drawings.
   2. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to OWNER, OWNER'S employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
      a. Schedule deliveries to minimize use of driveways and entrances by construction operations and prevent disruption to the District, especially during exam times.
      b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment onsite.
      c. All deliveries through public spaces, including parking lots, should be escorted to and from the Project Site by **two (2)** flag men at the front and rear of the vehicle.

B. Condition of Existing Site: CONTRACTOR is responsible to maintain condition of existing Project Site affected by construction operations. CONTRACTOR to repair damage to Project Site caused by construction operations.

C. Condition of Existing Building: CONTRACTOR is responsible to maintain condition of existing building(s) on Project Site affected by construction operations. CONTRACTOR will ensure existing building(s) are weather tight throughout construction period. CONTRACTOR to repair damage to building(s) caused by construction operations.

D. Existing Construction Fence. Currently, a portion of the project site is enclosed with a construction fence and green-screens, which are leased from National Construction Rentals. Within 10 Calendar Days after the effective date of the NTP, the Contractor shall contact National Construction Rentals to transfer the lease agreement to the Contractor. The Contractor shall pay for and maintain the fence in good order and provide additional fencing as required for the longevity of the project as stated above.

1.9 COORDINATION WITH OCCUPANTS

A. Full OWNER Occupancy: OWNER shall have access to the Project Site and adjacent building(s) during the entire construction period. Cooperate with OWNER during construction operations to minimize conflicts and facilitate OWNER usage. Perform the Work so as not to interfere with OWNER'S day-to-day operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from OWNER and approval of authorities having jurisdiction.

2. Notify the OWNER not less than **seventy-two (72)** hours in advance of activities that will affect OWNER'S operations. Refer to the General Conditions for a list of notification time-frames.

B. Owner Limited Occupancy of Completed Areas of Construction: OWNER reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to OWNER acceptance of the completed Work.

2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited OWNER occupancy.

3. Before limited OWNER occupancy, mechanical and electrical systems shall be fully operational and required tests, inspections and commissioning shall be successfully completed. On occupancy, OWNER will operate and maintain mechanical and electrical systems serving occupied portions of Work.

4. On occupancy, OWNER will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.10 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and other requirements of authorities having jurisdiction. CONTRACTOR to be especially aware of the District's academic calendar and ensure no disruption to exam times or any other special events by the District, times and dates for which have not yet been identified.

B. On-Site Work Hours: Limit work in the existing building(s) to normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, except as otherwise indicated.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by OWNER or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify OWNER'S REPRESENTATIVE no less than a minimum two (2) weeks before proposed utility interruptions.
2. Obtain 's written permission before proceeding with utility interruptions.
3. All utilities cutovers should be performed after-hours or during weekends, unless otherwise indicated.

D. Noise, Vibration, and Odors: CONTRACTOR to coordinate operations with OWNER that may result in high levels of noise and vibration, odors, or other disruption during OWNER occupancy.

1. Notify OWNER'S REPRESENTATIVE no less than a minimum **one (1)** week in advance of proposed disruptive operations.
2. Obtain OWNER'S REPRESENTATIVE'S written permission before proceeding with disruptive operations.

E. Nonsmoking Building: Smoking is not permitted within the construction Project Site building(s) or on campus except for designated smoking areas.

F. Controlled Substances: Use of tobacco products and other controlled substances on the District's Property is not permitted.

G. Employee Identification: Provide identification tags for CONTRACTOR personnel working on the Project Site. Require personnel to utilize identification tags at all times.

H. Employee Screening: Comply with OWNER'S requirements regarding drugs and Background screening of GENERAL CONTRACTOR personnel working on the Project Site.

1. Provide and maintain list of approved screened personnel with OWNER'S REPRESENTATIVE.

1.11 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

2. Specification requirements are to be performed by CONTRACTOR unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on the Drawings are described in detail in the Specifications. One or more of the following are used on the Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.

3. Keynoting: Materials and products are identified by keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 011000 - SUMMARY

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing Allowances.

1. An Allowance has been established for conditions that may be encountered during the course of Construction.

B. Related Sections:

1. Divisions 02 through 33 Sections for items of Work covered by Allowances.

1.3 SUBMITTALS

A. Submit proposed changes designated as Allowances, in the format specified for Change Orders.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the Project Site for use in fulfillment of each Allowance.

C. Coordinate and process submittals for Allowance items in same manner as for other portions of the Work.

1.4 COORDINATION

A. Coordinate Allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.5 ALLOWANCE COST PROPOSALS

A. Allowance Cost Proposals shall include cost to CONTRACTOR of specific products and materials ordered by OWNER or selected by Architect under Allowance and shall include taxes, freight, and delivery to Project Site.

B. Unless otherwise indicated, Contractor’s Cost Proposals shall be inclusive of all material and labor, overhead and profit, and other costs, as included in the General Conditions for Change Orders.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an Allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each Allowance with related materials and installations to ensure that each Allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Unforeseen Conditions - $150,000

B. Abatement - $50,000

C. Move Management - $50,000

D. Utilities - $50,000

E. Structural repair - $75,000

END OF SECTION 012100 - ALLOWANCES

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1. Drawings and general provisions of the Subcontract apply to this Section.
2. Review these documents for coordination with additional requirements and information that apply to work under this Section.

1.2 SUMMARY

A. Section Includes:

1. This section identifies each Alternate and describes basic changes to Work only when that Alternate is made a part of the Work by specific provision in the Subcontract
2. Base Bid and Alternates include costs of all supporting elements required, so that the combination of Base Bid and any Alternates are complete.
3. The scope of work for Alternates shall be in accordance with applicable Drawings and Specifications.

B. Related Sections:

1. Division 01 - Section 019113 "General Commissioning Requirements"

C. Except as otherwise indicated, complete work described in Alternates with no increase in Subcontract Time.

D. This section includes non-technical descriptions of Alternates. Refer to specific sections of the Specifications and to Drawings for technical descriptions of Alternates.

E. Coordinate related work and modify surrounding work as required to integrate Alternates into the Work.

F. Base Bid includes all work indicated, except work described as Alternates.

G. District reserves the right to award none, any one, or more in any order, or all Alternates in combination with work covered by Base Bid.

H. Alternates will not be awarded without awarding Base Bid.

I. District reserves the right to determine low bid as Base Bid alone or sum of Base Bid and any combination of Alternates.

J. Each Alternate is intended to cover all work required for a complete finished job.

K. Alternates are [additive] [deductive] to the Base Bid. Provide costs in appropriate spaces provided on Bid Form.

L. Submit bids for Base Bid and all Alternates listed on Bid Form. Failure to quote an amount, or insertion of the words "no bid," "none" or words of similar meaning, will be considered as not completing the proposal and may constitute disqualification of entire bid, at District's discretion. When there is no change in base bid due to using the Alternate, use the words "No Change". The words "No Change" will be interpreted to mean that work described in the Alternate shall be completed at no adjustment or change in cost of Base Bid.

M. Base Bid and Alternates are exclusive in their scope of work. There is no overlap between or among Base Bid and Alternates. The cost of any item of work shall be included only once, in Base Bid or in Alternates.

1.3 DESCRIPTION OF [ADDITIVE] [DEDUCTIVE] ALTERNATES

A. Fill in Additive and Deductive Alternates (Not Applicable)

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION NOT USED

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1. General Conditions – Article 1.1.47 for definition of substitutions.
2. General Conditions – Article 3.10 for more information on substitutions.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Sections:

1. Division 01 – Section 012100 "Allowances" for products selected under an Allowance.
2. Division 01 – Section 012300 "Alternates" for products selected under an alternate.
3. Division 01 – Section 016010 "Materials and Equipment" for requirements for submitting comparable product submittals for products by listed manufacturers.
4. Divisions 02 through 33 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by CONTRACTOR as defined by General Conditions Article 1.1.47.

1. Substitutions for Cause: Changes proposed by CONTRACTOR that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by CONTRACTOR or OWNER that are not required in order to meet other Project requirements but may offer advantage to CONTRACTOR or OWNER.

1.4 SUBMITTALS

A. Request for consideration of each product to be substituted. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Submittal Form: Use CSI Form 13.1A or Contractor’s comparable form.

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    a. Statement indicating why specified product, fabrication, or installation cannot be provided, if applicable.
    b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by OWNER and separate Contractors, that will be necessary to accommodate proposed substitution.
    c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    e. Samples, where applicable or requested.
    f. Certificates and qualification data, where applicable or requested.
    g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and Owners.
    h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
    i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES or another model code organization acceptable to authorities having jurisdiction.
    j. Detailed comparison of Contractor’s Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
    k. Cost information, including a proposal of change, if any, in the Contract Sum.
    l. Contractor’s certification that proposed substitution complies with requirements in the Contract Documents, is compatible with related materials, and is appropriate for applications indicated.
    m. Contractor’s waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within **seven (7)** days of receipt of a product substitution submittal. Architect will notify CONTRACTOR of acceptance or rejection of proposed

substitution within **fifteen (15)** days of receipt of submittal, or **seven (7)** days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.

b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

1. Contractor is responsible for providing products and construction methods compatible with products and construction methods previously selected.

2. If a dispute arises over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PROCEDURES

A. Coordination: Modify or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit product substitution submittal immediately upon discovery of need for change, but not later than **thirty-five (35)** days following the date of the OWNER'S Award of Contract to the CONTRACTOR by action of the Board of Education.

1. Conditions: Architect will consider Contractor's product substitution submittal when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Substitute product offers OWNER a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities OWNER must assume. OWNER'S additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by OWNER, and similar considerations.

b. Substitute product is consistent with the Contract Documents and will produce indicated results.

1) Use of proposed product does not require revisions to the Contract Documents.

c. Product substitution submittal is fully documented and properly submitted.

1) Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

2) List of similar installations for completed projects with project names and addresses and names and addresses of architects and Owners, if requested.

3) Samples, if requested.

d. Use of proposed product will not adversely affect Contractor's Construction Schedule.

e. Substitute product has received necessary approvals of authorities having jurisdiction.

f. Substitute product is compatible with other portions of the Work.

g. Use of proposed product has been coordinated with other portions of the Work.

h. Substitute product provides specified warranty.

i. If use of proposed product involves more than one CONTRACTOR, use of proposed product has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all Contractors involved.

B. Substitutions for Convenience: Architect will consider product substitution submittals if received within **thirty-five (35)** days after the Notice of Award unless otherwise indicated. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's product substitution submittal when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Substitute product offers OWNER a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities OWNER must assume. OWNER'S additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by OWNER, and similar considerations.

b. Substitute product is consistent with the Contract Documents and will produce indicated results.

1) Use of proposed product does not require revisions to the Contract Documents.

c. Product substitution submittal is fully documented and properly submitted.

1) Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such

as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

2) List of similar installations for completed projects with project names and addresses and names and addresses of architects and Owners, if requested.

3) Samples, if requested.

d. Use of proposed product will not adversely affect Contractor's Construction Schedule.

e. Substitute product has received necessary approvals of authorities having jurisdiction.

f. Substitute product is compatible with other portions of the Work.

g. Use of proposed product has been coordinated with other portions of the Work.

h. Substitute product provides specified warranty.

i. If use of proposed product involves more than one CONTRACTOR, use of proposed product has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all Contractors involved.

PART 3 - EXECUTION (NOT USED)

END OF SECTION 012500 - SUBSTITUTION PROCEDURES

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SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1. General Conditions – Article 7 for more information on Contract Modification Procedures.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract Modifications.

B. Related Sections:

1. Division 01 – Section 012500 “Substitution Procedures" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 ADDENDA

A. Addenda shall be signed by Architect and approved by DSA.

1.4 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.5 REQUESTS FOR PROPOSAL

A. Owner-Initiated Requests For Proposal: OWNER’S REPRESENTATIVE will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Requests For Proposal issued by OWNER’S REPRESENTATIVE are not instructions either to stop work in progress or to execute the proposed change.

2. Within **ten (10)** days, unless indicated otherwise, after receipt of Request For Proposal (RFP), CONTRACTOR to submit a Change Order Request with a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change. Refer to the General Conditions for additional requirements.

a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

c. Include costs of labor and supervision directly attributable to the change.

d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

e. Quotation Form: Use CSI Form 13.6B "Proposal Worksheet Summary" and 13.6C "Proposal Worksheet Detail" or Contractor's comparable forms.

B. Contractor Initiated Requests For Proposal: If latent or changed conditions require modifications to the Contract, CONTRACTOR may initiate a claim by submitting a Change Order Request to the OWNER'S REPRESENTATIVE and Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

4. Include costs of labor and supervision directly attributable to the change.

5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

6. Comply with requirements in Division 01 - Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

7. Change Order Request Form: Use CSI Form 13.6A "Change Order Request (Proposal)" with attachments CSI Form 13.6B "Proposal Worksheet Summary" and 13.6C "Proposal Worksheet Detail" or Contractor's comparable forms.

1.6 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: Refer to Division 01 - Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of Allowances.

1.7 CHANGE ORDER PROCEDURES

A. On OWNER'S approval of a Change Order Request, the OWNER'S REPRESENTATIVE will issue a Change Order for signatures of OWNER, Architect, and CONTRACTOR.

1. Change Orders shall be signed by the Architect, CONTRACTOR, OWNER and the OWNER'S REPRESENTATIVE.

2. General Conditions – Article 7.7.3 for more information on formatting Change Order

1.8 CONSTRUCTION DIRECTIVE

A. Construction Directive: The OWNER'S REPRESENTATIVE may issue a Construction Directive, to instruct the CONTRACTOR to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Directive.

1. After completion of change, CONTRACTOR must submit Change Order Request with itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

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SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1. General Conditions – Article 9 for more information on Schedule of Values and Payment Information.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections:

1. Division 01 – Section 012100 "Allowances" for procedural requirements governing the handling and processing of Allowances.
2. Division 01 – Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
3. Division 01 – Section 013210 "Construction Schedule" for administrative requirements governing the preparation and submittal of Contractor’s Schedule.
4. Division 01 – Section 013300 "Submittal Procedures" for administrative requirements governing the preparation and submittal of submittal schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by CONTRACTOR allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor’s Schedule.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
    a. Application for Payment forms with continuation sheets.
    b. Submittal Schedule.

c. Items required to be indicated as separate activities in Baseline Schedule.

2. Submit to OWNER'S REPRESENTATIVE within thirty **(30)** days after the Notice to Proceed, **one (1)** copy of an accurate and realistic Schedule of Values allocated to the various portions of the work

3. Sub-schedules for Phased Work: If at any time the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values correlated with each phase of payment.

4. Sub-schedules for Separate Elements of Work: Where the CONTRACTOR Schedule of Values defines separate elements of the Work; CONTRACTOR must provide sub-schedules showing values correlated with each element.

B. Format and Content: Breakdown the Master Schedule into Sub-schedule sections for Phased Work and Separate Elements of Work. Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values under the Master Schedule and sub-schedules as required. Provide at least one line item for each Specification Section with Labor and Materials separated.

1. Identification: Include the following Project identification on the Schedule of Values:

a. Project title and location.

b. Project number

c. Specification number.

d. Name and address of Contractor.

e. Name of the Architect of Record.

f. Name and address of the Inspector of Record.

g. Name and address of the Owner's Representative.

h. Date of submission.

2. Arrange Schedule of Values consistent with format of AIA Document G703.

3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

a. Related Specification Section or Division.

b. Description of the Work.

c. Name of Subcontractor.

d. Name of manufacturer or fabricator.

e. Name of supplier.

f. Change Orders that affect value.

g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

1) Labor.

2) Materials.

3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of Contract Sum.

   a. Include separate line items under CONTRACTOR and principal subcontracts for project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.

5. Round amounts to nearest whole dollar wherever possible; total shall equal the Contract Sum.

6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

   a. Differentiate between items stored onsite and items stored offsite. If required, include evidence of insurance.

7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

8. Allowances: Provide a separate line item in the Schedule of Values for each Allowance. Show line-item value of unit-cost Allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.

9. Purchase Contracts: Provide a separate line item in the Schedule of Values for each purchase contract. Show line-item value of purchase contract. Indicate OWNER payments or deposits, if any, and balance to be paid by Contractor.

10. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

11. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by OWNER.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between OWNER and CONTRACTOR. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

1. Contractor shall provide a draft of the Payment Application on the **twenty-fifth (25)** of the month proceeding the end of the period for review by OWNER'S REPRESENTATIVE, the Inspector of Record and the Architect.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of CONTRACTOR. OWNER'S REPRESENTATIVE and Architect will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.

2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.

3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored onsite and items stored offsite.

1. Provide certificate of insurance, evidence of transfer of title to OWNER, and consent of surety to payment, for stored materials.

2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.

3. Provide summary documentation for stored materials indicating the following:

a. Materials previously stored and included in previous Applications for Payment.

b. Work completed for this Application utilizing previously stored materials.

c. Additional materials stored with this Application.

d. Total materials remaining stored, including materials with this Application.

F. Transmittal: Submit four signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from Subcontractors, sub-Subcontractors, and suppliers for construction period covered by the previous application.

1. Submit required waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to OWNER.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of principal suppliers, fabricators, and Subcontractors.
2. Certified Schedule of Values.
3. Contractor’s Schedule (preliminary if not final).
4. Products list (preliminary if not final).
5. Copies of building permits.
6. Certificates of insurance and insurance policies.
7. Performance and payment bonds.
8. Data needed to acquire OWNER’S insurance.
9. Construction Schedule
10. Submittal Schedule (Design Schedule)
11. Certified Payroll
12. Storm Water Pollution Prevention Plan (SWPPP)

I. Second Application for Payment: All submittals have been accepted for review by the Architect.

J. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

2. This application shall reflect Certificates of Partial Substantial Completion issued previously for OWNER occupancy of designated portions of the Work.

K. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Occupancy permits and similar approvals by authorities having jurisdiction over Work.
3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
4. Updated final statement, accounting for final changes to the Contract Sum.
5. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
6. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
7. AIA Document G707, "Consent of Surety to Final Payment."
8. Evidence that claims have been settled.
9. Removal of temporary facilities and services.
10. Testing, adjusting and balance records.
11. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when OWNER took possession of and assumed responsibility for corresponding elements of the Work.
12. Start-up performance reports.
13. District training and orientations.
14. Operating and maintenance instruction manuals.
15. Preliminary Warranties guarantees and maintenance agreements
16. Delivery of extra materials, products and/or stock.
17. Final liquidated damages settlement statement.
18. Retention Escrow Deposit Request Form (if applicable)
19. Consent of Surety to Final Payment
20. Conditional Waiver and Release Upon Final Payment (Contractor/Subcontractor)
21. Unconditional Waiver and Release Upon Final Payment (Contractor/Subcontractor)
22. Notice of Project Completion and Recommendation of Acceptance (w/required attachments)
23. Final Punch List
24. Certification Re Insurance
25. Certification Re Satisfaction of Indebtedness
26. Guarantee Form
27. Asbestos and Other Hazardous Materials Certification

28. SWPPP and NPDES District Requirements for Maintenance.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 012900 - PAYMENT PROCEDURES

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SECTION 012973 - SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1. General Conditions – Article 9 for more information on Schedule of Values.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and submit Schedule of Values.

B. Related Sections:

1. Division 01 –Section 013210 "Construction Schedule" for reference to format listing component items in Schedule of Values.
2. Division 01 – Section 012900 “Payment Procedures” for more information on Schedule of Values.

1.3 DESCRIPTION

A. Submit to Inglewood Unified School District within **ten (10)** days after the Notice to Proceed, **one (1)** copy of an accurate and realistic Schedule of Values allocated to the various portions of the work.

B. The Schedule of Values, unless objected to by Inglewood Unified School District, shall become the basis for the Contractor’s application for payment.

1. Upon request by the OWNER’S REPRESENTATIVE, support values given with data that will substantiate their correctness.
2. Payment for materials stored shall be limited to those materials approved by the OWNER’S REPRESENTATIVE and is only at the OWNER’S discretion.

1.4 FORM OF SUBMITTAL

A. Identification: Include the following Project identification on the Schedule of Values:

1. Project title and location.
2. Project number
3. Specification number.

4. Name and address of Contractor.
5. Name of the Architect of Record.
6. Name and address of the Inspector of Record.
7. Name and address of the Owner's Representative.
8. Date of submission.
9. Arrange Schedule of Values consistent with format of AIA Document G703.

B. Component Items:
1. Section 013210 "Construction Schedule" shall be used as a basis for listing components.
2. Schedule of Values shall list the value of the component items of work in sufficient detail to serve as a basis for computing values for progress payments during construction.

C. List sub-values of major products or operations for each line item. Additional sub-values may be requested by the OWNER'S REPRESENTATIVE.

D. Costs for the various portions of the work:
1. Each item shall include a directly proportion amount of the Contractor's overhead and profit.
2. For items on which progress payments will be requested for stored products, list the total installed value, including Contractor's overhead and profit.

E. Round amounts to nearest whole dollar wherever possible; total shall equal the Contract Sum.

F. A similar, detailed Schedule of Values, itemizing costs and/or credits in a form satisfactory to the OWNER'S REPRESENTATIVE shall accompany all quotations for changes in the work or for extra work.

G. The sum of all values listed in the Schedule of Values shall equal the total Contract Sum.

1.5 REVIEW AND RESUBMITTAL

A. After review by the OWNER'S REPRESENTATIVE, revise and resubmit Schedule of Values as required if the OWNER'S REPRESENTATIVE determines that the costs are frontloaded, and/or the distribution of the costs is unreasonable. Resubmit revised Schedule in same manner within **five (5)** days for review.

B. Progress payments will not be made until Schedule of Values has been approved.

END OF SECTION 012973 - SCHEDULE OF VALUES

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General project coordination procedures.
2. Administrative and supervisory personnel.
3. Coordination drawings.
4. Requests for Information (RFIs).
5. Project meetings.

B. Related Sections:

1. Division 01 – Section 012900 “Payment Procedures”
2. Division 01 – Section 012973 “Schedule of Values” for preparing and submitting Schedule of Values.
3. Division 01 – Section 013210 “Construction Schedule” for preparing and submitting Contractor’s Construction Schedule.
4. Division 01 – Section 017000 "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
5. Division 01 – Section 017700 “Closeout Procedures” for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from OWNER, OWNER’S REPRESENTATIVE, Architect, or CONTRACTOR seeking information from each other during construction.

1.4 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate

construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for OWNER and separate Contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Pre-installation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as OWNER'S property.

1.5 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is

required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Execution: The Mechanical Subcontractor shall prepare ductwork fabrication drawings and BIM model for review and coordination with the architect and other design consultants, the electrical, plumbing, sprinkler and other relative Subcontractors. Drawings shall be in sufficient detail to show overall ductwork dimensions, clearances, and relative locations of work in allotted spaces. Ductwork routing and sectional elevations shall be provided for congested areas. The Mechanical Subcontractor will disseminate the ductwork drawings and will direct and expedite review by the various trades. Each trade shall indicate where conflicts or clearance problems exist for their work and subsequently seek resolution from the Architect/Engineer via GENERAL CONTRACTOR. Final coordinated drawings shall be produced by the Mechanical Subcontractor, who shall obtain approval for any changes to duct or pipe sizes and significant changes in routing. Electrical, sprinkler, and other relative Subcontractors are required to participate in and cooperate fully with the coordination process.
    a. The Mechanical Subcontractor to include the GENERAL CONTRACTOR, OWNER and Architect in BIM coordination meetings.
2. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
    a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
    b. Coordinate the addition of trade-specific information to the coordination drawings by multiple Contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
    c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
    e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
    f. Indicate required installation sequences.
    g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to OWNER'S REPRESENTATIVE and the Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire protection, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate sub-framing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:
    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    c. Fire-rated enclosures around ductwork.
7. Electrical Work: Show the following:
    a. Runs of vertical and horizontal conduit 1-1/4 inch diameter and larger.
    b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire alarm locations.
    c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
    d. Location of pull boxes and junction boxes dimensioned from column center lines.
8. Fire Protection System: Show the following:
    a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
9. Review:
    a. OWNER’S REPRESENTATIVE and Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor’s responsibility. If the OWNER’S REPRESENTATIVE and Architect determines that the coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the

OWNER'S REPRESENTATIVE and Architect will so inform the CONTRACTOR, who shall make changes as directed and resubmit.

10. Coordination Drawing Prints: Prepare coordination drawing prints in accordance with requirements of Division 01 - Section 013300 "Submittal Procedures."

1.6 KEY PERSONNEL

A. Key Personnel Names: Within **fifteen (15)** days of starting construction operations, submit a list of key personnel assignments, resumes, including superintendent and other personnel in attendance at Project Site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.7 REQUESTS FOR INFORMATION OR INTERPRETATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, CONTRACTOR shall prepare and submit an RFI in the form specified.

1. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of Subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of OWNER'S REPRESENTATIVE
6. Name of Architect.
7. RFI number, numbered sequentially.
8. RFI subject.
9. Specification Section number and title and related paragraphs, as appropriate.
10. Drawing number and detail references, as appropriate.
11. Field dimensions and conditions, as appropriate.
12. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, CONTRACTOR shall state impact in the RFI.
13. Contractor's signature.

14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: AIA Document G716, CSI Form 13.2A, or Contractor's comparable form.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow **seven (7)** working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
    1. The following RFIs will be returned without action:
        a. Requests for approval of submittals.
        b. Requests for approval of substitutions.
        c. Requests for coordination information already indicated in the Contract Documents.
        d. Requests for adjustments in the Contract Time or the Contract Sum.
        e. Requests for interpretation of Architect's actions on submittals.
        f. Incomplete RFIs or inaccurately prepared RFIs.
    2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
    3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for CONTRACTOR to submit Change Proposal according to Division 01 - Section 012600 "Contract Modification Procedures."
        a. If CONTRACTOR believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify the OWNER'S REPRESENTATIVE and Architect within **seven (7)** days if CONTRACTOR disagrees with response.

F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly. Use CSI Log Form 13.2B or Contractor's comparable form. Include the following:
    1. Project name.
    2. Name and address of Contractor.
    3. Name and address of Architect.
    4. RFI number including RFIs that were dropped and not submitted.
    5. RFI description.

6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Field Order, minor change in work, CCD, CD and proposal request.

1.8 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project Site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify the OWNER'S REPRESENTATIVE and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: The OWNER'S REPRESENTATIVE will record significant conference discussions, agreements, and disagreements, including required corrective measures and actions. Distribute the meeting minutes to each party present, to parties who should have been present, and to other parties requiring information within **three (3)** days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to OWNER, OWNER'S REPRESENTATIVE and Architect.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of OWNER, OWNER'S REPRESENTATIVE, Architect, and their consultants; CONTRACTOR and its superintendent; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:
    a. Tentative construction schedule.
    b. Phasing.
    c. Critical work sequencing and long-lead items.
    d. Designation of key personnel and their duties.
    e. Lines of communications.
    f. Procedures for processing field decisions and Change Orders.
    g. Procedures for RFIs.
    h. Procedures for testing and inspecting.
    i. Procedures for processing Applications for Payment.
    j. Distribution of the Contract Documents.
    k. Submittal procedures.
    l. Preparation of record documents.

m. Use of the premises and existing building(s).

n. Work restrictions.

o. Working hours.

p. Owner's occupancy requirements.

q. Responsibility for temporary facilities and controls.

r. Procedures for moisture and mold control.

s. Procedures for disruptions and shutdowns.

t. Construction waste management and recycling.

u. Parking availability.

v. Office, work, and storage areas.

w. Equipment deliveries and priorities.

x. First aid.

y. Security.

z. Progress cleaning.

4. Minutes: The OWNER'S REPRESENTATIVE will record significant conference discussions, agreements, and disagreements, including required corrective measures and actions. Distribute the meeting minutes to each party present, to parties who should have been present, and to other parties requiring information of the meeting.

C. Pre-installation Conferences: The CONTRACTOR shall conduct a pre-installation conference at Project Site before each construction activity that requires coordination with other construction, or prior to a new Subcontractor is about to start onsite, so their scope can be understood by all parties.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.

b. Options.

c. Related RFIs.

d. Related Change Orders.

e. Purchases.

f. Deliveries.

g. Submittals.

h. Review of mockups.

i. Possible conflicts.

j. Compatibility problems.

k. Time schedules.

l. Weather limitations.

m. Manufacturer's written recommendations.

n. Warranty requirements.

o. Compatibility of materials.

p. Acceptability of substrates.

q. Temporary facilities and controls.

r. Space and access limitations.

s. Regulations of authorities having jurisdiction.

t. Testing and inspecting requirements.

u. Installation procedures.

v. Coordination with other work.

w. Required performance results.

x. Protection of adjacent work.

y. Protection of construction and personnel.

3. Minutes: The CONTRACTOR is responsible for conducting meeting will record significant conference discussions, agreements, and disagreements, including required corrective measures and actions. Distribute the meeting minutes to each party present, to parties who should have been present, and to other parties requiring information within **three (3)** days of the meeting.

4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Schedule and conduct a Project closeout conference, at a time convenient to OWNER, OWNER'S REPRESENTATIVE, Inspector of Record and Architect, but no later than **ninety (90)** days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.

2. Attendees: Authorized representatives of OWNER, Architect, and their consultants; CONTRACTOR and its superintendent; major Subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

a. Preparation of record documents.

b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.

c. Submittal of written warranties.

d. Requirements for preparing operations and maintenance data.

e. Requirements for demonstration and training.

f. Preparation of Contractor's punch list.

g. Procedures for processing Applications for Payment at Substantial Completion and for final payment.

h. Submittal procedures.

i. Owner's partial occupancy requirements.

j. Installation of OWNER'S furniture, fixtures, and equipment.

k. Responsibility for removing temporary facilities and controls.

4. Minutes: The OWNER'S REPRESENTATIVE will record significant conference discussions, agreements, and disagreements, including required corrective measures and actions. Distribute the meeting minutes to each party present, to parties who should have been present, and to other parties requiring information.

E. Progress Meetings: The OWNER'S REPRESENTATIVE will conduct progress meetings at weekly intervals or at intervals approved by OWNER.

1. Contractor shall coordinate dates of meetings with preparation of payment requests.

2. Attendees: In addition to representatives of OWNER, OWNER'S REPRESENTATIVE, Project Inspector and Architect, each CONTRACTOR, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor'sConstruction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.

2) Sequence of operations.

3) Status of submittals.

4) Deliveries.

5) Off-site fabrication.

6) Access.

7) Site utilization.

8) Temporary facilities and controls.

9) Progress cleaning.

10) Quality and work standards.

11) Status of correction of deficient items.

12) Field observations.

13) Status of RFIs.

14) Status of proposal requests.

15) Pending changes.

16) Status of Change Orders.

17) Pending claims and disputes.

18) Documentation of information for payment requests.

4. Minutes: The OWNER'S REPRESENTATIVE will record significant conference discussions, agreements, and disagreements, including required corrective measures and actions. Distribute the meeting minutes to each party present, to parties who should have been present, and to other parties requiring information of the meeting.

   a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting. If special meetings such as site mobilization conferences or special inspections conferences are required, insert articles here specifying meeting requirements.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

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SECTION 013119 - PROGRESS MEETINGS

PART 1 - PART 1 - GENERAL

1.1 DESCRIPTION

A. Scheduling and administration of progress meetings.

1.2 RELATED REQUIREMENTS

A. Instructions to Bidders

B. Project General Requirements

C. Construction Schedules

D. Shop Drawings, Product Data and Samples

E. Quality Control

F. Temporary Facilities

1.3 PROGRESS MEETINGS

A. The CONTRACTOR will schedule coordination meetings and re-installation conferences throughout the progress of work. The Contractor is responsible to minute and distribute all weekly Subcontractor coordination and pre installation meeting minutes.

B. Weekly Construction Progress Meetings (WCPM) will be coordinated by the OWNER'S REPRESENTATIVE. OWNER'S REPRESENTATIVE will set dates and times, make physical arrangements, prepare agenda and distribute notice of each meeting to CONTRACTOR, Architect, and Inspector of Record in advance of or at meetings.

C. The OWNER'S REPRESENTATIVE will preside at the weekly construction meeting with the Contractor; will be responsible for the administrating and distributing Project meeting minutes from the weekly meetings with the CONTRACTOR and participants.

D. Location of meetings: Project's field office, Project Site, or OWNER'S REPRESENTATIVE'S office.

E. Attendance: OWNER'S REPRESENTATIVE, Inspector of Record, CONTRACTOR or his authorized representative, and job superintendent, CONTRACTOR Architect. Subcontractors, suppliers and others shall attend as appropriate to agenda; Design Engineers and others shall attend when appropriate.

F. Minimum Agenda:

1. Approval of minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems and decisions.
4. Identification of problems which impede planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-Site fabrication and delivery schedules.
7. Review, maintenance, and adjustment of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to Work.
14. Site safety.

END OF SECTION 013119 - PROGRESS MEETINGS

SECTION 013210 - CONSTRUCTION SCHEDULE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. General and Special Conditions

B. Required procedures, preparation, submittals, reviews, updates, and revisions to the cost/schedule integrated Construction Schedule. The purpose of this section is to:

1. Ensure adequate planning and execution of the Work by Contractor.
2. Establish a standard against which satisfactory completion of the Project can be measured by OWNER.
3. Assist CONTRACTOR and the OWNER'S REPRESENTATIVE in monitoring progress.
4. Aid in assessing the impact of any changes to the Contract.
5. Provide justification for progress payments.

1.2 RELATED SECTIONS

A. General Conditions – Article 8 "Time and Schedule"

B. Division 01 – 012900 "Payment Procedures"

C. Division 01 – 013100 "Project Management and Coordination"

D. Division 01 – 013300 "Submittal Procedures"

E. Division 01 – 012973 "Schedule of Values"

F. Division 01 – 014523 "Testing and Inspection"

G. Division 01 – 015000 "Construction Facilities And Temporary Controls"

H. Division 01 – 017700 "Closeout Procedures"

PART 2 - PRODUCTS

2.1 SCHEDULING SOFTWARE

A. Contractor shall utilize Primavera Project Planner™ for Windows® (P6) software (latest version) by Primavera Systems, Inc., or equivalent scheduling software to employ the Critical Path Method (CPM) in the development and maintenance of the construction schedule network using

the Precedence Diagram Mode (PDM). The scheduling software shall be capable of being resource loaded with manpower, costs and materials. It shall also be capable of generating time-scaled logic diagrams, resource histograms and profiles, bar charts, layouts and reports with any and/or all activity detail.

B. All schedule calculation rules, auto cost rules and resource calculation rules shall be in a format acceptable to OWNER'S REPRESENTATIVE. When schedule calculations are performed, the "Retained Logic" setting shall be used. CONTRACTOR shall use the zero (0) "Decimal Places" setting.

PART 3 - EXECUTION

3.1 SUBMITTALS

A. Contractor shall retain a Construction Scheduler to work in enough capacity to perform all of the requirements outlined in this Section. CONTRACTOR shall submit a resume of the proposed Scheduler for review and acceptance prior to the preparation of any Schedule. The resume shall demonstrate the proposed scheduler's capability to plan, coordinate, execute, and monitor a cost/resource loaded CPM schedule as required for this Project and have a minimum of **five (5)** years direct experience using Primavera Project Planner. Scheduler will cooperate with OWNER'S REPRESENTATIVE and shall be available onsite for monitoring, maintaining and updating schedules in a timely manner. OWNER'S REPRESENTATIVE has the right to refuse to accept the Scheduler based upon a lack of experience as required by this or based on lack of performance and timeliness of schedule submittals/fragments on past projects. If the OWNER'S REPRESENTATIVE does not accept the proposed Scheduler, CONTRACTOR shall within **one (1)** week of disapproval, propose another scheduler who meets the experience requirements stated above.

B. Contractor shall submit the Preliminary Construction Schedule within ten **(10) days** after Notice to Proceed.

C. Contractor shall submit the Proposed Baseline Schedule as required by the date stipulated in Section 013210-3.04.

D. Contractor shall submit the Monthly Schedule Updates, Four-Week Rolling Schedules, and Recovery Schedules as required.

3.2 PRELIMINARY CONSTRUCTION SCHEDULE

A. The purpose of the cost-loaded Preliminary Construction Schedule is to provide a mechanism in which to measure performance on individual activities and to validate the Contractor's monthly Application for Payment on work performed (starting with month 1) during the first three months of the job until the complete Baseline Schedule is approved by the OWNER'S REPRESENTATIVE.

B. Contractor shall develop and submit a cost loaded Preliminary Construction Schedule as required by this Section. It shall be submitted in computer generated network format and shall be organized by Activity Codes representing the Contractor's intended sequencing of the Work. The Preliminary Construction Schedule shall include activities for the first **ninety (90)** calendar days following the Notice To Proceed such as mobilization, preparation of submittals, specified review periods, procurement items, fabrication items, milestones, and detailed construction activities.

C. Upon OWNER'S REPRESENTATIVE'S acceptance of the Preliminary Construction Schedule, CONTRACTOR shall update the accepted Preliminary Construction Schedule each month (beginning with month 1) and submit these updates until Contractor's Baseline Schedule is fully developed and accepted. Since updates to Preliminary Construction Schedule are the basis for payment to CONTRACTOR during the first three-month period, submittal and acceptance of such updates shall be a condition precedent to making of monthly payment, as referenced in General Conditions.

D. Provide a written narrative describing Contractor's approach to mobilization, procurement, and construction during the first **ninety (90)** calendar days including crew sizes, equipment and material delivery, Project Site access, submittals, and permits.

E. Submit Bar Charts, Tabular Reports, a Cost Flow Histogram, Electronic Data, and Plots in accordance with Division 01 – Section 013210 "Construction Schedule".

3.3 SCHEDULE OF VALUES

A. Contractor shall cost load activities in the Preliminary Construction Schedule and allocate costs to the cost accounts of all activities. The cost accounts shall match the CSI subsections listed in the Table of Contents of the Specifications. The format shall be coordinated with Article 8.3 (Progress Payment).

B. Submit a computer generated tabular report from the Preliminary Construction Schedule using the P6 scheduling software. The report shall contain the following data for each activity: Cost Account Number (by CSI subsection), Cost Account Description, Cost Account Budget, Cost to Date, Cost this Period, and Cost to complete. Total costs shall be organized and totaled by CSI subsection. This tabular report shall be the source of the data CONTRACTOR reports on the Schedule of Values.

C. The cost loading associated with the activities shall be based on CONTRACTOR estimates of costs that CONTRACTOR will incur performing the specific activities.

3.4 PROPOSED BASELINE SCHEDULE

A. Within sixty **(60)** days after of the Notice to Proceed, CONTRACTOR shall submit a detailed Proposed Baseline Schedule that covers the entire duration of the Project. This schedule shall convey Contractor's plan for organizing, managing, and executing the Work.

B. The Proposed Baseline Schedule shall include activity descriptions, sequencing, logic relationships, duration estimates, cost loading by CSI subsection, resource loading, and other information as set forth in this Section.

1. The Proposed Baseline Schedule shall include all Milestones stipulated in General Conditions, as well as all activities required to achieve timely completion of the Milestones.

2. The Proposed Baseline Schedule shall include activities for: all construction activities, the Notice To Proceed, Milestones, submittals, coordination drawings, re-submittals, procurement of materials and equipment, manufacturing, fabrication and delivery, OFCI (Owner-Furnished, Contractor-Installed) items, access restrictions, work restrictions, phased occupancy, testing, start-up, and contract closeout activities. The Proposed Baseline Schedule shall allow a period for OWNER'S REPRESENTATIVE and Architect to review each submittal, as required by General Conditions Article 7.3 and other sections which require additional time for OWNER reviews and deferred submittal reviews by Division of State Architects (DSA).

3. The Proposed Baseline Schedule shall include start and completion dates for: temporary facilities, construction of mock-ups, prototypes, samples, punch list, OWNER interfaces and furnishing of items, separate work contracts, regulatory agency approvals, and permits required for performance of the Work.

4. The Proposed Baseline Schedule shall allow for all foreseeable factors and risks which affect performance of the Work. Include Allowances for weather conditions, applicable laws, transportation, traffic, air quality, noise, or any other applicable regulatory requirements, regulations or collective bargaining agreements pertaining to labor.

5. Contractor shall not use any float suppression techniques such as preferential sequencing or logic, special lead/lag constraints or unjustifiable over-estimating of activity durations in preparing the Proposed Baseline Schedule except that Finish No Later Than constraints are permitted for Milestones. No "Zero Free Float" constraints, No "Early" Constraints, and No "Mandatory Finish" constraints shall be utilized.

6. The Proposed Baseline Schedule shall include activity durations based on the crew sizes and equipment utilization that CONTRACTOR will maintain during the Project. No activity durations shall exceed **twenty (20)** working days unless approved by the OWNER'S REPRESENTATIVE. Non-construction activities such as procurement, fabrication, delivery, or submittal activities are exempted.

7. Contractor shall include with the Proposed Baseline Schedule a written narrative report sufficiently comprehensive to explain the rationale behind Contractor's approach to the Work including but not limited to: activity durations, manpower flow, average crew sizes, equipment requirements, production rates, constraints, holidays and other non-work days, potential problem areas, permits, coordination with regulatory authorities, utilities, separate work contracts and other parties, and long lead delivery items requiring more than **thirty (30)** days from the date of order to delivery to the Project Site.

C. At the OWNER'S REPRESENTATIVE request, furnish a detailed written explanation of Contractor's basis for specific durations, logic, phasing, or other information. Such an explanation shall include Contractor's rationale for selecting the number of crews, crew

composition, number of shifts per day, number of hours in a shift, number of work days per week, construction equipment, and/or similar factors.

D. The Proposed Baseline Schedule activities shall contain the following data:

1. Activity ID numbers shall consist of no more than eight (8) alphanumeric characters. Following OWNER'S REPRESENTATIVE acceptance of the Baseline Schedule, Activity ID numbers shall not be changed.
2. Activity Descriptions shall provide adequate information that readily identifies each activity, work scope, and location.
3. Activity codes specified in Section 013210 "Construction Schedule" – 3.04G shall be applied to each activity.
4. Cost accounts (in CSI subsection format) and Resource accounts shall be applied to each activity. They shall include lump sum costs, and man-hours/man-days (where applicable).

E. At OWNER'S REPRESENTATIVE'S request, furnish a written explanation for each lead or lag relationship and each constrained date. Unjustifiable leads, lags, and constraints will result in OWNER'S REPRESENTATIVE rejection of the Proposed Baseline Schedule.

F. Calendar Identification: In the scheduling software, identify all activities that will require overtime shifts, double shifts, and work on weekends or holidays. Identify non-work days and holidays in the schedule calendar. All milestones stipulated in General Conditions shall be placed on a calendar with **seven (7)** days per week. No holiday or non-work day restrictions are permitted on this calendar.

G. Activity Codes: As a minimum, the Activity Codes shown in the Table 1 below shall be assigned to each activity.

Table 1

Name	Length	Description
TYPE	2	Type of activity (mobilization, submittals, procurement/fabrication, construction, milestones, etc.)
AREA	2	Area and/or building (General Conditions, Project Site, Bldg "A")
STAG	2	Stage (foundations, superstructure, exterior, interior, roof, floor #, etc.)
SBST	2	Sub-stage (a specific area within a stage such as main electrical room, #, etc.)
RESP	7	Responsible Party (Subcontractor and/or trade)
SPEC	5	CSI sub section number

1. The OWNER'S REPRESENTATIVE may require additional coding of activities. The mandatory activity code requirements listed in Table 1 are not to be construed as setting

limits on Contractor's management and coordination responsibilities but are intended to guide CONTRACTOR in the administration of its contractual responsibilities.

H. Milestones are designated dates as set forth in General Conditions in which Work, or portions thereof, are required to start and/or complete in accordance with the Contract Documents.

1. Where the term completion or similar terms are used in regard to a Milestone, it shall be construed to mean all portions of the Work in the indicated phase, area, and/or zone are complete and acceptable to OWNER'S REPRESENTATIVE. Where the terms start, or similar terms are used in the designation of a Milestone, it shall be construed to mean a portion of the Work in the indicated phase, area, and/or zone is required to be commenced.

2. A Proposed Baseline Schedule extending beyond the Milestones and/or Contract Time will not be acceptable.

3. Finish Milestones shall be constrained with Late Finish (Finish No Later Than) type constraints in accordance with the dates stipulated in General Conditions.

4. In the scheduling software, in the "Project Overview" menu, assign the "Project Must Finish By" date to match the Substantial Completion and Contract Completion Milestone dates stipulated in General Conditions.

5. A Proposed Baseline Schedule indicating Work completed in less time than the Milestones and/or Contract Time will not be acceptable. Rather, CONTRACTOR shall show any unused contract time as float.

6. Milestones shall be placed on a calendar with **seven (7)** days per week No Holiday or non-workday restrictions are permitted on this calendar.

I. The Critical Path shall be clearly indicated on all schedules submitted. An activity is defined as critical when its Total Float is less than or equal to **zero (0)** days. The critical path is defined as the longest path.

J. Contractor shall allow for inclement weather in the Proposed Baseline Schedule by incorporating an activity titled "Rain Day Impact Allowance" and "Governmental Delay Impact Allowance" as the last activity prior to the Substantial Completion Milestone. No other activities may be concurrent with it. The duration of the Rain Day Impact Allowance activity will be based on the criteria below and will be calculated from the Notice to Proceed until the original date of Substantial Completion.

1. Cumulative Calendar Days "Rain Day Impact Allowance": This Project will have a total of twenty-three **(23)** Rain days for the duration of the Construction.

2. Governmental Delay Float "Governmental Delay Impact Allowance": This Project will have a total of thirteen **(13)** Governmental days for the duration of the Construction.

3. When inclement weather at the Project Site impacts Critical Path activities, CONTRACTOR may provide the OWNER'S REPRESENTATIVE with a written request for a weather impact day describing the inclement weather delay on the Critical Path activities. The inclement weather delay must be clearly indicated by a 70% decrease in the field labor workforce hours on Critical Path activities on the day in question as indicated by Contractor's Daily Reports from the day in question and the scheduled work days prior to

the day in question. Upon the OWNER'S REPRESENTATIVE'S independent confirmation of the amount of rainfall and impact, OWNER'S REPRESENTATIVE will authorize CONTRACTOR to reduce the duration of the Rain Day Impact Allowance by **one (1)** day.

4. Inclement weather on non-scheduled workdays shall not be granted as weather impact days. If CONTRACTOR asks to work a specific weekend or holiday and gives OWNER'S REPRESENTATIVE advanced, written notification of critical path work to be performed and a substantial amount of precipitation occurs that prevents the work from being performed, then that day can be claimed as a weather impact day. If the effects of inclement weather from a non-scheduled work day carry forward to a scheduled work day and impacts the Critical Path as noted above, then the scheduled work day will be considered impacted by weather. Any unused rain day Allowance at the end of the project will be shown as available float to the Substantial Completion Milestone. Excusable, non-compensable time extensions will be granted for inclement weather to Substantial Completion milestone only after the weather impact area affecting the critical path work has exhausted the allotted cumulative Rain Day Impact Allowance.

K. Cost loaded Activities:

1. Each activity included in the Proposed Baseline Schedule shall be assigned the cost CONTRACTOR estimates it will incur performing that activity. Each activity's assigned cost will be inclusive of overhead and profit, so Contractor's total overhead and profit is distributed over all activities on a pro rata basis. The sum of the costs assigned to activities shall equal the total contract value. No activity costs shall be assigned to manufacturing or delivery activities unless approved by OWNER'S REPRESENTATIVE. If the OWNER'S REPRESENTATIVE finds that the costs are frontloaded, and the distribution of costs is unreasonable, CONTRACTOR shall re-distribute the costs and resubmit the revised Schedule of Values within **five (5)** days for The OWNER'S REPRESENTATIVE back check.

2. Contractor shall cost load activities in the Proposed Baseline Schedule and allocate costs to related resource/cost accounts associated with each activity. The cost accounts shall match the CSI subsections listed in the Table of Contents of the Specifications. All cost-loaded activities shall roll-up to their designated CSI subsections and shall be the basis for the data reported in the Schedule of Values.

3. Submit computer generated tabular reports using the scheduling software which will be the basis for the approved Schedule of Values. The reports shall contain the following data for each activity: Cost/Resource Account Number (by CSI subsection), Cost/Resource Account Description, Cost/Resource Account Budget, Material Quantities and Unit Costs, Cumulative Quantities and Cost to Date, Material Quantities and Cost this Period, and Estimated Material Quantities and Cost at Completion. Total Material Quantities and Total Costs shall be organized and totaled by CSI subsection.

4. Submit a Cost Flow Histogram in accordance with specification Section 01321 "Construction Schedule – 3.04-L-3.

L. Contractor shall submit computer generated reports and plots with the Proposed Baseline Schedule submittal package. Format shall display the following columns: Activity ID, Activity

Description, Original Duration, Remaining Duration, Percent Complete, Early Start, Early Finish, Late Start, Late Finish, and Total Float.

1. Bar charts shall be generated separately for:
    a. Milestones only.
    b. All activities sorted by Early Start date and organized by Project, Area, Stage, and Sub-stage. (The network shall show continuous flow of all activities from left to right).
    c. All activities sorted by Responsibility.
    d. Summary level of all activities sorted by craft/trade and area.
2. Tabular Reports:
    a. Total Float sorted low to high
    b. Predecessors and Successors sorted by Activity ID.
3. Cost Flow Histogram
    a. Using the costs assigned to each activity, develop a Histogram that projects the estimated invoice amounts by month for the Project duration. The histogram shall be produced from the scheduling software on 11x17 size paper (landscape mode). It shall contain both a monthly bar histogram and a cumulative cost curve on the same graph. The Total Costs shall be based on the Early Dates option.
4. Manpower Histogram
    a. Submit a planned manpower graphic bar histogram produced from the scheduling software on 11x17 size paper (landscape mode) that displays total man-hours based on Early Dates. Show both a weekly bar histogram and a cumulative curve on same graph. Upon the Construction Manger request, provide manpower broken down by trade.
5. Provide a written narrative as required by Section 013210 “Construction Schedule” – 3.04-B-7.
6. Electronic data: Provide two compact discs that contain a back-up of the Proposed Baseline Schedule data on it. Flash drives may be submitted in lieu of compact discs if approved by the OWNER’S REPRESENTATIVE. The electronic P6 files shall be saved in “.XER” type format.

M. OWNER’S REPRESENTATIVE will notify CONTRACTOR of any adjustments that are required for the Proposed Baseline Schedule to be accepted. CONTRACTOR shall perform any required adjustments to the Proposed Baseline Schedule and resubmit it for acceptance certifying in writing that all information contained therein complies with the Contract Documents. The OWNER’S REPRESENTATIVE will review the Proposed Baseline Schedule for accuracy, reasonableness, and conformance with the Contract Documents and shall provide comments within **ten (10)** days of receipt. Within **five (5)** days after receiving OWNER’S REPRESENTATIVE comments, CONTRACTOR shall both incorporate changes to address OWNER’S REPRESENTATIVE concerns and resubmit the Proposed Baseline Schedule for

OWNER'S REPRESENTATIVE back-check. This process will continue until the Proposed Baseline Schedule is accepted as the Baseline Schedule. Once accepted by OWNER'S REPRESENTATIVE, the Baseline Schedule will be the basis upon which CONTRACTOR shall prepare updates that record and report actual performance and progress. The accepted Baseline Schedule and subsequent Monthly Updates (reference Section 013210 "Construction Schedule" – 3.04 and 3.05 respectively) shall be the basis for consideration and analysis of requests for time extensions and CONTRACTOR progress payments.

N. OWNER'S REPRESENTATIVE acceptance of the Baseline Schedule or Contractor's failure to identify and/or include any element of the Contract, shall not release Contractor's obligation to complete all required Work in accordance with the Contract Documents.

3.5 REQUIREMENTS FOR MONTHLY/WEEKLY SCHEDULE UPDATING

A. Once the Baseline Schedule is accepted by OWNER'S REPRESENTATIVE, CONTRACTOR shall submit Monthly Schedule Updates beginning with month No. 1. The current month's schedule update cannot be accepted until the previous Monthly Schedule Update has been accepted by OWNER'S REPRESENTATIVE.

B. Monthly Schedule Update Format

1. Initially, the CONTRACTOR shall status a current Monthly Schedule Update with actual Work progress only. No logic ties shall be modified. Status all Actual Start and Finish dates, adjust Remaining Durations where needed, and update Percent Completion of cost and resource loaded activities. No activity Original Durations or Logic shall be changed unless authorized by OWNER'S REPRESENTATIVE. No new activities shall be added unless authorized by the OWNER'S REPRESENTATIVE.

2. Once the schedule is status in accordance with Section 013210 "Construction Schedule" – 3.05-B1, CONTRACTOR shall print (and submit with Monthly Schedule Update) a report of "out-of-sequence" logic that results from the updating process. CONTRACTOR shall then correct all "out-of-sequence" logic to reflect Contractor's actual Work sequence. If CONTRACTOR chooses to modify logic or add activities (other than out-of-sequence corrections), it shall be done in accordance with Section 013210 "Construction Schedule" – 3.07 (Fragnets and Time Extensions Request).

3. During construction, CONTRACTOR may desire to break down specific activities into greater detail. If greater detail is necessary, then CONTRACTOR shall identify expanded activities such that the Baseline Schedule activities that the expanded activities originated from are readily apparent. CONTRACTOR shall not allow the aggregate duration of the expanded activities to exceed the duration assigned to the Baseline Schedule activity unless permitted by OWNER'S REPRESENTATIVE in writing.

4. Autocost rules shall link Remaining Duration and Percent Complete.

5. The Data Date for the Monthly Schedule Updates shall be the last day of the month. At a minimum, **three (3)** days prior to the submission of the Monthly Schedule Update, CONTRACTOR shall meet in person with OWNER'S REPRESENTATIVE to present the proposed Percentages of Completion and Actual Start and Actual Finish dates. Once

percentages of completion and actual dates have been agreed to, they shall be the basis of the Monthly Schedule Update.

6. Contractor shall submit a Manpower Histogram that overlays a planned curve from the Baseline Schedule and a planned curve from the current Monthly Schedule Update.

7. Written Narrative Report: CONTRACTOR shall include a written report to explain the Monthly Schedule Update. The narrative shall, at a minimum include the following headings with appropriate discussions of each topic:

   a. Introduction

   b. A Summary of Work which was on-going This Pay Period

   c. Problem Areas and Proposed Solutions

   d. Critical Path

   e. Current and Anticipated Delays

   f. Coordination of Work with Others

   g. Milestone Status

8. In updating the Schedule, CONTRACTOR shall not modify Activity ID numbers, schedule calculation rules/criteria, or the Activity Coding Structure required.

9. Submit bar charts, tabular reports, a cost flow histogram, man-power histogram, written narrative, electronic data, and plots in accordance with Specification Section 013210 “Construction Schedule” – 3.04L.

10. Submit a cost-loaded report (progressed monthly) produced from the scheduling software that displays all of the activities organized by the CSI subsection cost/resource accounts. This report shall be in compliance with Section 013210 “Construction Schedule” – 3.04K, Section 012973 “Schedule of Values” and Section 012900 “Payment Procedures”.

C. Three-Week Look Ahead Schedule: At each Weekly Progress Meeting, CONTRACTOR shall present a Three-Week Schedule in Bar Chart format. It shall show **one (1)** week of actual and **two (2)** weeks of forecasted progress. The Three-Week Rolling Schedule shall be used as a basis for discussing progress and work planned during the **three (3)** weeks.

   1. The Three-Week Look Ahead Schedule shall be based on the most recent OWNER’S REPRESENTATIVE Accepted Monthly Schedule Update. It shall include weekly updates to all construction, submittal, fabrication/procurement, and separate work contract activities. CONTRACTOR shall ensure that it accurately reflects the current progress of the Work.

   2. Contractor shall discuss actual dates and any variances to critical or near critical activities.

   3. Upon request by OWNER’S REPRESENTATIVE, CONTRACTOR shall provide the Three-Week Look Ahead Schedule in electronic format.

   4. If the Three-Week Look Ahead Schedule indicates activities are behind schedule, CONTRACTOR shall provide a Recovery Schedule in accordance with Section 013210 “Construction Schedule” – 3.06.

3.6 RECOVERY SCHEDULES

A. If a Monthly Schedule Update indicates negative float greater than **ten (10)** days on a critical path as result of events not predicated by Articles 17.3 and 17.4 of the General Conditions CONTRACTOR shall prepare a Proposed Recovery Schedule demonstrating Contractor's plan to regain the time lost. The Recovery Schedule shall be submitted either in advance of or concurrent with the Monthly Schedule Update and CONTRACTOR progress request. Both the Monthly Schedule Update and the Proposed Recovery Schedule shall be based on the same percentages of completion and actual dates accepted by OWNER'S REPRESENTATIVE under Section 013210 "Construction Schedule: – 3.05B (Monthly Schedule Update Format).

B. The Proposed Recovery Schedule shall be based on a copy of the Monthly Schedule Update for the calendar month during which the negative float first appears.

C. The Proposed Recovery Schedule shall include a narrative that identifies the causes of the negative float on the critical path and provides Contractor's proposed corrective action to ensure timely completion of all Milestones and the Substantial Completion Date. Contractor's corrective actions shall include but are not limited to increasing concurrent operations, increasing labor, adding multiple shifts in a 24-hour period, and adding overtime.

D. During any period of time when CONTRACTOR is found to be behind schedule by OWNER'S REPRESENTATIVE, the Monthly Schedule Update described in Section 013210 "Construction Schedule – 3.05 shall become a weekly requirement to provide a greater degree of focus on the timely completion of the Work. These Monthly Schedule Updates shall be submitted to OWNER'S REPRESENTATIVE every Monday morning. When CONTRACTOR is deemed by the OWNER'S REPRESENTATIVE to be back on schedule, CONTRACTOR may revert to submitting the Schedule monthly.

E. Contractor's progress payment may not be processed until the OWNER'S REPRESENTATIVE accepts the Proposed Recovery Schedule. Following such an acceptance, the Proposed Recovery Schedule will be known as the Recovery Schedule and future Work will be performed by CONTRACTOR in accordance with it.

3.7 FRAGNETS AND TIME EXTENSION REQUESTS

A. Float is not for exclusive use or benefit of either OWNER or CONTRACTOR but is an expiring resource available to both parties on a non-discriminatory basis. If required to meet specified Milestones, either party may utilize float. Adjustments to Milestones and/or Contract Time will only be authorized by Change Order and only to the extent the claimed adjustments exceed total float along the most critical path of the current Monthly Schedule Update in effect at the time of the claimed adjustments. The claimed adjustments to the Milestones and/or Contract Time must also cause the Substantial Completion Date to exceed that currently indicated in the Monthly Schedule Update. CONTRACTOR claimed adjustments to an existing negative float path will not receive consideration until the activity with the highest negative float is driven even further negative.

1. Claimed adjustments to the Milestones and/or Contract Time will be administered in conjunction with those set forth in the General Conditions.

B. Pursuant to the float sharing requirements of this Section, the use of float suppression techniques such as preferential sequencing or logic, special lead / lag logic restraints, and extended activity times or durations are prohibited. The use of float time disclosed or implied by the use of alternate float suppression techniques shall be proportionally shared to benefit OWNER and CONTRACTOR.The use of any technique solely for the purpose of suppressing float will result in OWNER rejection of the submitted Monthly Schedule Update.

C. In the event CONTRACTOR believes the Project has suffered an adverse impact arising from events predicated by Articles 17.3 and 17.4 of the General Conditions, CONTRACTOR may prepare a Time Extension Request by submitting a Schedule Fragnet and a written narrative outlining the detail of the impact. A Schedule Fragnet must demonstrate a critical path delay. Such a delay must adversely impact the Substantial Completion Date for CONTRACTOR to receive a time extension. To demonstrate such an impact successfully, CONTRACTOR shall prepare a Schedule Fragnet based on a copy of OWNER accepted Monthly Schedule Update for the calendar month during which the adverse impact occurred. This “copy” of the OWNER accepted Monthly Schedule Update shall however first be updated (by OWNER and CONTRACTOR jointly) with both Percentages of Completion and Actual Dates up to the day the delay commenced. This process will provide the “pre-delay” project status. Once OWNER and CONTRACTOR have agreed to the “pre-delay” project status, CONTRACTOR should make a copy of this “pre-delay” schedule and this copy is to be the starting point for Contractor’s Schedule Fragnet development. OWNER will evaluate the activities, logic, durations, etc.… in the Schedule Fragnet and will evaluate if the adverse impact arose from events described by Articles 17.3 and 17.4 of the General Conditions. The Fragnet shall also include Contractor-caused delays that affect the critical or near critical path in the network and should be accounted for in the Time Impact Analysis if overlapped at any point in time with Owner-caused delay. If rain impact days were granted between the Start and Finish of Owner-caused delay period, they should be accounted for in the Time Impact Analysis as well. Provided OWNER determines such an impact occurred, CONTRACTOR may be due a time extension equal to the number of proportioned days of variance/delay that resulted to the Substantial Completion Date.

D. All activities added into a Schedule Fragnet to demonstrate the impact of adverse event shall be assigned a unique activity code. The Schedule shall be organized by this unique activity code.

E. The Schedule Fragnet shall incorporate logic that accurately ties reflective of the adverse event to pre-event predecessor activities and post event successor activities.

F. The format and components of a Schedule Fragnet submittal shall be in accordance with Section 013210 “Construction Schedule” and the General Conditions. It is crucial for the Fragnet to be submitted within the same month of discovery so it can be resolved during the monthly schedule update review. The notice shall be transmitted to OWNER’S REPRESENTATIVE within the stipulations outlined in Article 9 of the General Conditions.

G. If OWNER accepts Contractor's Schedule Fragnet and an extension is granted, a Change Order will be prepared. OWNER will advise what Change Order number the time extension will become. When CONTRACTOR receives this Change Order number, all the activities added to the Schedule Fragnet shall be given Activity Identification Numbers that corresponds with the Change Order number. CONTRACTOR shall cost load and resource-load the activities if required by OWNER. If resource loading is required, the resource loading shall include a breakdown of labor, material, and equipment quantities.

H. If OWNER rejects Contractor's Schedule Fragnet in part based on improper forecast logic or activity tasks, then it shall be revised accordingly to conform to the OWNER'S review comments and resubmitted. If the forecast logic and activity tasks cannot be agreed to then the pre-delay schedule outlined in Section 013210 "Construction Schedule" – 3.07C shall be compared to the actual as-built data in the succeeding month of the encountering issue, event, condition, circumstance, and/or cause. The variance to the project between the pre-delay and post delay schedules shall be discussed in Contractor's written narrative and proportioned between the different parties involved in the delay.

I. If OWNER rejects Contractor's Schedule Fragnet in whole, then CONTRACTOR may follow the procedures set forth in the General Conditions.

3.8 PAYMENT FOR SCHEDULING

A. The Work in Section 013210 "Construction Schedule" will be included as part of the bid price.

B. Preparation, revising, maintenance, and compliance with Section 013210 "Construction Schedule" is an integral part of the Contract Documents and is specified to have a minimum value equal to 2% of the original Contract Amount or $150,000, whichever is less. This amount shall be cost loaded into an activity titled "Construction Schedule" in both the Proposed Baseline Schedule and the Schedule of Values described in Section 012973 "Schedule of Values".

1. Contractor may bill twenty percent (20%) of the amount cost- loaded in the "Construction Schedule" activity when the OWNER'S REPRESENTATIVE accepts the Proposed Baseline Schedule as the Baseline Schedule.

2. The remaining eighty percent (80%) may be billed in equal monthly increments. The amount of those increments is determined by dividing the remainder of the amount cost-loaded in the "Construction Schedule" activity divided by the total number of months in the Contract Time. Payment of these incremental amounts is contingent upon OWNER'S REPRESENTATIVE acceptance of CONTRACTOR Monthly Schedule Updates, Recovery Schedules, Three-Week Look Ahead Schedule and the updated Log of Required Submittals.

3.9 FAILURE TO COMPLY WITH REQUIREMENTS

A. At any time during the project if CONTRACTOR fails to comply with the specified requirements, OWNER reserves the right to engage independent estimating and/or scheduling consultants to

fulfill these requirements. Upon notice to CONTRACTOR, OWNER shall assess against CONTRACTOR, all incurred costs for these additional services.

B. In such an event, OWNER will require, and CONTRACTOR shall participate and provide all requested and/or required information to ensure the resulting Milestones Schedule accurately reflects CONTRACTOR plan to execute the Work in compliance with the Contract Documents. If it becomes necessary for OWNER to recommend logic and/or duration revisions as a result of CONTRACTOR failure to furnish acceptable data, and if CONTRACTOR has objections to the recommendations, CONTRACTOR shall provide notice to OWNER within **three (3)** days and CONTRACTOR shall provide an acceptable alternate plan. If CONTRACTOR fails to so note any objections and provide an acceptable alternate plan, or if CONTRACTOR implements the recommendations of OWNER without so noting any objections, CONTRACTOR will be deemed to have waived all objections and concurred with the recommended logic/duration revisions provided by Architect and/or OWNER.

C. Submittal of any Monthly Schedule Updates is subject to review and acceptance by OWNER. OWNER retains the right, including, but not limited to Article 8 of the General Conditions, to withhold progress payments in whole or part until CONTRACTOR submits a Monthly Schedule Update acceptable to OWNER.

3.10 CONTRACTOR RESPONSIBILITY

A. Nothing in this Section shall be construed to be a usurpation of CONTRACTOR authority, responsibility, and obligation to plan and schedule Work as CONTRACTOR deems necessary, subject to all other requirements of the Contract Documents.

B. Contractor shall involve the Subcontractors, manufacturers, and suppliers in the development and periodic updating of the schedule.

3.11 RECORD DOCUMENTS

A. Prior to Contract Completion of the Work, CONTRACTOR shall submit an as-built time-scaled network diagram reflecting the actual dates of all activities.

END OF SECTION 013210 - CONSTRUCTION SCHEDULE

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Periodic construction photographs.
3. Preconstruction videos.
4. Periodic construction videos.

B. Related Sections include the following:

1. Division 01 - Section 013300 "Submittal Procedures" for submitting photographic documentation.
2. Division XX Section XXXXXX "Selective Demolition" for photographic documentation before selective demolition operations commence.
3. Division 01 - Section 017900 "Demonstration and Training" for submitting videos of demonstration of equipment and training of OWNER'S personnel.

1.3 SUBMITTALS

A. Construction Photographs: Submit prints of each photographic view within **seven (7)** days of taking photographs.

1. Format: Submit a complete set of digital image electronic files with each submittal of prints on USB. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as the sensor, un-cropped. Pictures within the USB should have reference to the following information.
    a. Name of Project.
    b. Name of OWNER'S REPRESENTATIVE.
    c. Name of Architect.
    d. Name of Contractor.
    e. Date photograph was taken if not date stamped by camera.

f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

g. Unique sequential identifier.

B. Digital Video: Submit videos within **seven (7)** days of recording.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.

b. Name of OWNER'S REPRESENTATIVE.

c. Name of Architect.

d. Name of Contractor.

e. Date video was recorded.

f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

g. Weather conditions at time of recording.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in uncompressed TIFF format, produced by a digital camera with minimum sensor size of 4.0 megapixels, and at an image resolution of not less than 1024 by 768 pixels.

B. Digital Video Format: Provide high-quality, high definition color digital video at an image resolution of not less than 1920 x 1080 pixels.

1. Video quality shall be adequate to create photographic prints to be made from individual frames.

PART 3 - EXECUTION

3.1 GENERAL

A. Contractor shall document preconstruction conditions using photographs or video, including condition of underground utilities, as required.

B. Contractor may use photographs or video.

3.2 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in filename for each image.

2. Field Office Images: Maintain set of images in the field office at Project Site, available at all times for reference.

C. Preconstruction Photographs: Before commencement of excavation, commencement of demolition, and starting construction, take digital photographs of Project Site and surrounding properties, including existing items to remain during construction, from different vantage points, as necessary to document existing conditions.

1. Flag excavation areas and construction limits before taking construction photographs.

2. Take photographs to show existing conditions adjacent to property before starting the Work.

3. Take photographs of existing building(s) either on or adjoining property to accurately record physical conditions at start of Work.

4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

5. Show protection efforts by Contractor.

D. Monthly Construction Photographs: Take digital photographs to show existing conditions uncovered as work progresses. Select vantage points to show status of construction and progress since last photographs were taken.

3.3 CONSTRUCTION VIDEOS

A. Narration: Describe scenes on video by audio narration by microphone while video is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.

1. Confirm date and time at beginning and end of recording.

2. Begin each video with name of Project, Contractor’s name, videographer's name, and Project location.

B. Preconstruction Video: Before commencement of excavation, commencement of demolition, and starting construction, record video of Project Site and surrounding properties, including existing items to remain during construction, from different vantage points, as necessary to document existing conditions.

1. Flag excavation areas and construction limits before recording construction videos.

2. Show existing conditions adjacent to Project Site before starting the Work.

3. Show existing building(s) either on or adjoining Project Site to accurately record physical conditions at the start of Work.

4. Record additional video as required to record settlement or cracking of adjacent structures, pavements, and improvements.
5. Show protection efforts by Contractor.

C. Monthly Construction Videos: Record video to show existing conditions uncovered as work progresses. Select vantage points to show existing construction or condition, status of construction and progress since last video was taken.

END OF SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1. General Conditions: Article 3 for more information on submittals

1.2 RELATED SECTIONS

A. Other Division 01 Specification Sections.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require District's Project Manager's responsive action.

B. Informational Submittals: Written and graphic information and physical samples that do not require OWNER'S REPRESENTATIVE'S responsive action. Submittals may be rejected for not complying with requirements.

1.4 QUALITY ASSURANCE

A. Perform no portion of Work requiring an Action Submittal and review of Shop Drawings, Product Data, Samples, or similar submittals until respective Action Submittal has been approved by Architect/Engineers of Record and reviewed by OWNER'S REPRESENTATIVE. All Work shall be in accordance with Accepted/Accepted As Noted Submittals.

B. Contractor shall not be relieved of its sole responsibility for deviations from requirements of Contract Documents by review or acceptance by OWNER'S REPRESENTATIVE of Shop Drawings, Product Data, Samples or similar Submittals.

C. Contractor shall not be relieved of its sole responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar Submittals by OWNER'S REPRESENTATIVE'S review thereof.

D. Direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar Submittals, to revisions (other than those requested by OWNER'S REPRESENTATIVE on previous Submittals).

E. Informational Submittals upon which OWNER'S REPRESENTATIVE is not expected to take responsible action may be so identified in Contract Documents.

F. When professional calculations or certification of performance criteria of materials, systems or equipment is required by Contract Documents, District and OWNER'S REPRESENTATIVE shall be entitled to rely upon accuracy and completeness of such calculations and certifications.

G. Submittals may be rejected for not complying with requirements of Contract Documents.

1.5 SUBMITTAL SCHEDULE

A. Submittal Schedule. **Ten (10)** days prior to starting construction at the Project Site, the CONTRACTOR shall prepare and submit, in accordance with the Contract Documents, a Submittal Schedule. The Submittal Schedule shall be coordinated with the Contractor's Construction Schedule and allow the OWNER'S REPRESENTATIVE such time for review of Submittals as may be required by the Contract Documents, or if none is required, an average time of **twenty-one (21)** days for such review. The CONTRACTOR shall keep the Submittal Schedule current and updated in accordance with the requirements of the Contract Documents.

1. Coordinate Submittal Schedule with Work of Sub-Contractors, Schedule of Values and list of products, as well as Contractors Construction Schedule.

B. Include scheduled activities for all Fabrication, BIM Models, Shop Drawings, Product Data, Samples and similar Submittals, including without limitation, coordination drawings, and certificates of compliance, manufacturer's certificates, warranties, operations and maintenance manuals, attic stock (extra Material), demonstration and training (including video documentation), as-built plans, transfer of keys, and all other types of documents that are required to be submitted by CONTRACTOR under the Contract Documents.

C. Coordinate preparation of Submittal Schedule with OWNER'S REPRESENTATIVE, allowing more than **twenty-one (21)** days of review time for complicated or lengthy Submittals and less time than **twenty-one (21)** days for those less complicated and less lengthy Submittals. Allow time for separate review by Architect/Engineer of Record prior to submittal to review by OWNER'S REPRESENTATIVE.

D. Schedule Submittals to avoid concurrent Submittals to maximum extent possible.

E. Where Submittal is concurrent with or overlaps Submittals currently being reviewed, indicate priority of each outstanding Submittals.

F. Prepare schedule in chronological order. Provide following information:

1. Schedule date for first Submittal.
2. Related Section number.
3. Submittal category.
4. Name of Sub-Contractor.
5. Description of part of Work covered.
6. Scheduled date for re-submittal.

7. Number of Contractor's shop drawings, coordination drawings or other drawings anticipated within each submittal.

8. Review time by Contractor's team, prior to submission to OWNER'S REPRESENTATIVE.

G. Distribution of Submittal Schedule: Following comments resulting from OWNER'S REPRESENTATIVE'S response to initial submission, print and distribute copies to OWNER'S REPRESENTATIVE, Contractor's team, Sub-Contractors, and other parties required to comply with Submittal dates indicated.

1. Post copies in Project meeting room and temporary field office.

2. When additional revisions are made, distribute to same parties and post in same locations. Delete parties from distribution when they have completed their assigned part of Work and are no longer involved in construction activities.

3. Adhere to accepted schedule except when specifically otherwise permitted.

H. Schedule Updating: Revise Submittal Schedule every month and after each meeting or other activity where revisions have been recognized or made. Issue updated Submittal Schedule concurrently with report of each meeting.

1.6 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Digital Data Files: Electronic copies of digital files of the Contract Drawings will be provided and/or produced by CONTRACTOR and Sub-Contractors for use as background only in preparing submittals.

1. Contractor shall use Digital CAD files and drawings for submission of shop drawings.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. OWNER's REPRESENTATIVE reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for reviews by OWNER'S REPRESENTATIVE and applicable receipt of submittal. No extension of the Contract time will be authorized because of failure to transmit submittals enough in advance of the Work to permit reasonable processing, including re-submittals.

1. Initial Review: Allow an average review time of **twenty-one (21)** days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. OWNER'S REPRESENTATIVE will advise CONTRACTOR when a submittal is being processed must be delayed for coordination.

2. Intermediate Review: If intermediate review is necessary, process it in the same manner as initial submittal.

3. Re-submittal Review: allow an average review time of **fourteen (14)** days for review of each re-submittal.

D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.

2. Provide a space approximately 6 by 8 inches (150) by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect/Engineers of Record, and by OWNER'S REPRESENTATIVE.

3. Include the following information for processing and recording action taken:

   a. Project name.

   b. DSA Approval Number.

   c. Date.

   d. Name of Architect/Engineers of Record.

   e. Name of OWNER'S REPRESENTATIVE.

   f. Name of Contractor.

   g. Name of Sub-Contractor.

   h. Name of supplier.

   i. Name of manufacturer.

   j. Submittal number or other unique identifier, including revision identifier.

   k. Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g. 06100.01). Re-submittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01A).

   l. Number and title of appropriate Specification Section.

   m. Drawing number and detail references, as appropriate.

   n. Location(s) where product is to be installed, as appropriate.

   o. Other necessary identification.

4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless OWNER'S REPRESENTATIVE observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

   a. a.If, in addition to review by OWNER'S REPRESENTATIVE, the Submittal is being reviewed concurrently by other District Consultants, submit one copy of submittal to each concurrent reviewer in addition to specified number of copies to OWNER'S REPRESENTATIVE.

5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. OWNER'S

REPRESENTATIVE will return without review submittals from sources other than Contractor.

a. On attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by OWNER'S REPRESENTATIVE on previous Submittals, and deviations from requirements of Contract Documents, including minor variations and limitations. Include same label information as related Submittal.

b. Include Contractor's certification stating that information submitted complies with requirements of Contract Documents.

c. Transmittal Form: Use sample form provided by OWNER'S REPRESENTATIVE.

d. Transmittal form for Paper Submittals: Provide locations on form for the following information:

1) Project name.

2) DSA Approval Number.

3) Date.

4) Destination (To:).

5) Source (From:).

6) Name and address of Architect/Engineers of Record.

7) Name of OWNER'S REPRESENTATIVE.

8) Name of Contractor.

9) Name of firm or entity that prepared submittal.

10) Names of Sub-CONTRACTOR, manufacturer, and supplier.

11) Category and type of submittal.

12) Submittal purpose and description.

13) Specification Section number and title.

14) Specification paragraph number or drawing designation and generic name for each of multiple items.

15) Drawing number and detail references, as appropriate.

16) Indication of full or partial submittal.

17) Transmittal number numbered consecutively.

18) Submittal and transmittal distribution record.

19) Remarks.

20) Signature of transmitter.

E. Electronic Submittals: Where required per paragraph 1.6.A above. Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
    a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Re-submittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01A).
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect/Engineers of Record, and by OWNER'S REPRESENTATIVE.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to OWNER'S REPRESENTATIVE, containing the following information:
    a. Project name.
    b. DSA Approval Number.
    c. Date.
    d. Name and address of Architect/Engineers of Record.
    e. Name of OWNER'S REPRESENTATIVE.
    f. Name of Contractor.
    g. Name of firm or entity that prepared submittal.
    h. Names of Sub-CONTRACTOR, manufacturer, and supplier.
    i. Category and type of submittal.
    j. Submittal purpose and description.
    k. Specification Section number and title.
    l. Specification paragraph number or drawing designation and generic name for each of multiple items.
    m. Drawing number and detail references, as appropriate.
    n. Location(s) where product is to be installed, as appropriate.
    o. Related physical samples submitted directly.
    p. Indication of full or partial submittal.
    q. Transmittal number numbered consecutively.
    r. Submittal and transmittal distribution record.
    s. Other necessary identification.
    t. Remarks.
5. Metadata: Include the following information as keywords in the electronic submittal file metadata:

a. Project name.

b. Number and title of appropriate Specification Section.

c. Manufacturer name.

d. Product name.

F. Deviations: Highlight, encircle, or otherwise identify deviations from Contract Documents on Submittals clearly designating those portions as deviating from the Contract Documents and include separate written notification.

G. Re-submittals: Make re-submittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.

2. Note date and content of revision in label or title block and clearly indicate extent of revision.

3. Resubmissions are subject to same terms and conditions as original Submittal.

4. Should more than 1 resubmission be required, CONTRACTOR may, at the sole discretion of the District, reimburse District for time spent by OWNER'S REPRESENTATIVE, District Consultants or other reviewers in processing additional resubmissions at either the agreed rates as established by contract, or if none is established, at the rate of 2.5 times the reviewer's Direct Personnel Expense (DPE). For purposes of this Paragraph, "Direct Personnel Expense: is defined as direct salaries of the reviewer's personnel engaged on Project and portion of costs of mandatory, and customary contributions and benefits related thereto, including employment taxes and other statutory employee benefits, insurance, sick leave, holidays, vacations, pensions and similar contributions and benefits.

5. Resubmit submittals until they are marked with approval notation from Architect/Engineers of Record's and OWNER'S REPRESENTATIVE'S action stamp.

H. Distribution: Furnish copies of final submittals to manufacturers, Sub-Contractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Retain complete copies of submittals on Project Site. Use only final action submittals that are marked with approval notation from Architect/Engineers of Record's and "Accepted or Accepted As Noted" from OWNER'S REPRESENTATIVE.

1. Fabrication Models shall be visually presented to OWNER'S REPRESENTATIVE demonstrating full coordination with other systems prior to use for fabrication and installation.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements:

1. GENERAL CONTRACTOR to submit all submittals electronically and store all submittals in a cloud based storage system for the duration of the project.
2. OWNER'S REPRESENTATIVE will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
3. Markups and screen captures shall be included within the provided fabrication models, where appropriate.

B. Action Submittals: For Product Data, Shop Drawings and Samples, and other actions requiring review by the OWNER'S REPRESENTATIVE. Submit seven copies of each submittal unless otherwise indicated.
1. If additional copies are needed for distribution to District Consultants or others not listed below, they shall be provided as required by the Contract Documents or as requested by OWNER'S REPRESENTATIVE.
2. OWNER'S REPRESENTATIVE will, upon initial receipt of a submission or resubmission of a Submittal, retain 5 copies and forward 1 copy to the Program Manager.
3. OWNER'S REPRESENTATIVE will, following review and action by reviewers on a submission or resubmission of a Submittal, distribute signed and stamped copies as follows: 1 to CPM, 1 to Program Manager, 1 to Inspector of Record and 2 to Contractor.
4. Contractor shall retain returned copy as Record Document and using it prepare copies for distribution to Sub-Contractor.

C. Informational Submittals: for submittals not requiring responsive action by the OWNER'S REPRESENTATIVE and other action required by Specifications. Submit three paper copies of each submittal unless otherwise indicated. OWNER'S REPRESENTATIVE will not return copies.

D. Certificates and Certifications Submittals: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
1. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
2. Provide a notarized statement on original paper copy certificates and certifications where indicated.

E. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
    a. Manufacturer's catalog cuts.
    b. Manufacturer's product Specifications.

c. Manufacturer's installation instructions.

d. Mill reports.

e. Standard product operating and maintenance manuals.

f. Manufacturer's written recommendations.

g. Manufacturer's standard product warranty.

h. Standard color charts.

i. Statement of compliance with specified referenced standards, and recognized trade association standards.

j. Testing by recognized testing agency.

k. Application of testing agency labels and seals.

l. Approval numbers of organizations or agencies as required by Governmental authorities having jurisdiction.

m. Notation of dimensions verified by field measurement.

n. Notation of coordination requirements.

o. Availability and delivery time information.

p. Complete training demonstration video: Prepare electronic version in a format satisfactory to the District of all training demonstrations.

q. Inventory Listing: Inventory of tools, spare parts, extra material, keys, and similar items.

r. Manuals: Operations and Maintenance (O&M) manual, Warranties manual, Extended Warranties manual (if applicable), other demonstration and training documents including demonstration and training video documentation.

4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams showing factory-installed wiring.

b. Printed performance curves.

c. Operational range diagrams.

d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.

F. Shop Drawings: Prepare Project-specific information, drawn or modeled accurately to scale. Use reproductions of the contract Documents or standard printed data as background only for insertion of specific data and design required by each trade.

1. Preparation: Fully illustrate requirements in the Contract documents. Include the following information, as applicable:

a. Identification of Products.

b. Dimensions.

c. Fabrication and installation drawings.

d. Roughing-in and setting diagrams.

e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.

f. Shopwork manufacturing instructions.

g. Templates and patterns.

h. Design calculations.

i. Schedules.

j. Compliance with specified standards.

k. Notation of coordination requirements.

l. Notation of dimensions established by field measurement.

m. Notation of as-built conditions.

n. Relationship and attachment to adjoining construction clearly indicated.

o. Seal and signature of Professional Engineer if specified.

2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).

G. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

2. Identification: Attach label on unexposed side of Samples that include the following:

a. Generic description of Sample.

b. Product name and name of manufacturer.

c. Sample source.

d. Number and title of applicable Specification Section.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.

4. Disposition: Maintain sets of approved Samples at Project Site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.

b. Samples not incorporated into the work, or otherwise designated as OWNER'S property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

7. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect of Record's exemplar where so indicated. Attach label on unexposed side that includes the following:

   a. Generic description of Sample.

   b. Product name or name of manufacturer.

   c. Sample source.

8. Additional Information: On attached separate sheet, prepared on Contractor's letterhead, provide the following:

   a. Size limitations.

   b. Compliance with recognized standards.

   c. Availability.

   d. Compliance with Applicable Laws.

   e. Statement of acceptable uses or statement indicating suitability of product specified for proposed use.

   f. Delivery time.

9. Submit Samples for review of kind, color, pattern, and texture for final check of these characteristics with other elements and for comparison of these characteristics between final Submittal and actual component as delivered and installed.

   a. If variation in color, pattern, texture, or other characteristic is inherent in product represented by Sample, submit at least 3 sets of paired units that show approximate limits of variations.

   b. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

10. Disposition: Maintain sets of approved Samples at Project Site, available for quality-control comparisons throughout course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    a. Samples that may be incorporated into Work are indicated in individual Specification Sections. Such Samples must be in undamaged condition at time of use.
    b. Samples not incorporated into Work, or otherwise designated as District's property, are property of Contractor.

H. Product List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the work and their intended location. Include the following information in tabular form:
    1. Type of product. Include unique identifier for each product.
    2. Number and name of room or space.
    3. Location within room or space.

I. Coordination Drawings Submittals: Comply with requirements specified in General Conditions.

J. Contractor'sConstruction Schedule: Comply with requirements specified in General Conditions.

K. Application for Payment and Schedule of Values: Comply with requirements specified in General Conditions.

L. Subcontract List: Prepare written summary identifying individuals or firms proposed for each portion of work, including those who are to furnish products or equipment fabricated to special design. Use CSI Form 1.5A or other form acceptable to OWNER'S REPRESENTATIVE. Include following information in tabular form:
    1. Name, address, and telephone number of entities performing subcontract or supplying products.
    2. Number and title of related Specification Sections covered by subcontract.
    3. Drawing number and detail references, as appropriate, covered by subcontract.

M. Test and Inspection and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."

N. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."

O. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data".

P. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Design Consultants and Owners, and other information specified.

Q. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

R. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

S. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the contract documents. Include evidence of manufacturing experience where required.

T. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

U. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

V. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

W. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluations of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

X. Research/Evaluation Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

Y. Schedule of Tests and Inspections: Comply with requirements specified in Section 014000 "Quality Requirements."

Z. Preconstruction Test Reports: Submit reports written by a qualified agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

AA. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

BB. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

CC. Design Data: Prepare and submit written and graphic information, including, but not limited to performance and design criteria, list of applicable codes and regulations and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

DD. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Section 017823 "Operation and Maintenance Data".

EE. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating product or equipment. Include name of product and name, address, and telephone number of product manufacturer. Include following, as applicable:

1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

FF. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project Site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of CONTRACTOR by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to OWNER'S REPRESENTATIVE.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to CONTRACTOR to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR' REVIEW

A. Action and Informational Submittals: Review and approve each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Obtain Architect/Engineers of Record's approval and mark with approval stamp prior to submission to OWNER'S REPRESENTATIVE.

1. Submittals that do not bear Contractor's approval stamp and Architect/Engineers of Record's approval stamp as required herein will be returned without actions.

B. Architect/Engineers of Record's Action: Approval is for purpose of checking for conformance with the Contract Documents.

1. Where action and return of Submittals is required, Architect of Record will review each Submittal, mark to indicate action taken, and return.
2. Compliance with Contract Documents is Contractor's responsibility.
3. Review of separate item shall not indicate acceptance of assembly of which item is part.

C. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

D. Approval Stamp: Stamp each submittal with a uniform, approval stamp that has been reviewed and approved by CONTRACTOR. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval.

3.2 DISTRICT PROJECT MANAGER'S ACTION

A. General: OWNER'S REPRESENTATIVE nor Architect/Engineer of Record will not review submittals that do not bear Contractor's approval stamp will return them without action.

B. OWNER'S REPRESENTATIVE review is for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

1. Purpose of Submittal is to demonstrate for those portions of Work for which submittals are required, manner in which CONTRACTOR proposes to conform to information given and design concept expressed on Contract Documents.

2. Review is not conducted for purpose of determining accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain responsibility of Contractor.

C. Except for Submittals for record or for information, where action and return of Submittals is not required, District Project manager will review each Submittal, mark to indicate action taken, and return.

1. Compliance with specified characteristics is Contractor's responsibility and is not considered part of OWNER'S REPRESENTATIVE'S review.

2. Acceptance of Submittals with deviations from the Contract Documents that have been noted in the manner required by the Contract Documents shall not relieve CONTRACTOR from its sole responsibility for additional costs and delays associated with changes required to accommodate such deviations. Deviations included in Submittals, including those that have been noted as such by CONTRACTOR, are deemed rejected and exempt from any review of Submittal by OWNER'S REPRESENTATIVE.

3. Review of separate item shall not indicate acceptance of assembly of which item is part.

4. Make those revisions required by OWNER'S REPRESENTATIVE.

5. Notations by OWNER'S REPRESENTATIVE which, if implemented, would require CONTRACTOR to perform extra work and cause delay shall be brought to OWNER'S REPRESENTATIVE'S attention, in writing in the manner required by the General Conditions, before proceeding with Work.

6. When professional certification of performance criteria of materials, systems or equipment is required by Contract Documents, OWNER'S REPRESENTATIVE shall be entitled to rely upon accuracy and completeness of such calculations and certifications.

D. Action Submittals: Architect or Engineer of Record will review each submittal, make marks to indicate acceptance, corrections or revisions required, and return it. OWNER'S REPRESENTATIVE will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action as follows:

1. Accepted: Means fabrication, manufacturer, or construction may proceed provided that the Submittal complies with Contract Documents.

2. Accepted as Noted: Means fabrication, manufacture, or construction may proceed provided that Submittal complies with the Contract Documents and incorporates reviewer's

notations. If CONTRACTOR cannot comply with such notations, CONTRACTOR shall make revisions and resubmit.

3. Revise and Resubmit: Means fabrication, manufacture, or construction may NOT proceed. In resubmitting, CONTRACTOR shall limit corrections to items marked.

4. Rejected: Means Submittal does not comply with expressed design intent of Contract Documents. Do not reuse Submittals stamped “Rejected.”. Prepare Submittal again and resubmit.

E. Informational Submittals: OWNER’S REPRESENTATIVE will review each submittal and will not return unless it does not comply with requirements. OWNER’S REPRESENTATIVE will forward each submittal to appropriate party.

F. Incomplete submittals are unacceptable, will be considered non responsive, and will be returned for re-submittal without review.

G. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300 - SUBMITTAL PROCEDURES

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SECTION 013527 - SITE SAFETY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements for compliance with OSHA, Cal-OSHA, and other safety requirements.

1.2 JOBSITE SAFETY

A. The CONTRACTOR shall be solely responsible for ensuring that all work performed under the Contract is performed in strict compliance with all applicable Federal, State and Local occupational safety regulations. The CONTRACTOR shall provide at its expense all safeguards, safety devices and protective equipment, and shall take any and all actions appropriate to providing a safe jobsite.

B. A multi-employment worksite, as defined by Cal-OSHA, is one in which many employers occupy the same site. The Inglewood Unified School District (IUSD) considers the CONTRACTOR to be the “controlling authority” for all work site safety and health of the sub-Contractors.

1.3 PROJECT SAFETY OFFICIAL (PSO)

A. The CONTRACTOR shall designate in writing a Project Safety Official (PSO). The PSO must be a competent person capable of identifying existing and predictable hazards in the surroundings of working conditions which are unsanitary, hazardous, or dangerous to employees and must have previous experience on similar types of projects. The PSO shall be thoroughly familiar with the Contractor’s Injury and Illness Prevention Program (IIPP). The PSO shall be available at the work site at all times work is in progress to promptly abate any potential safety hazards and shall have the authority and responsibility to shut down an operation, if necessary. Failure by the CONTRACTOR to provide the required PSO or grant the PSO due authority are grounds upon which the OWNER’S REPRESENTATIVE may direct the cessation of all work activities and operations at no cost to IUSD until such time as the CONTRACTOR supplies the required PSO.

B. The CONTRACTOR through the PSO shall oversee and be responsible for the provision and maintenance of, including but not limited to the following:

1. A log of safety inspections performed.
2. A proper and adequate First Aid kit shall be maintained onsite for one time treatment of minor cuts, scratches, burns, splinters and the like.
3. All applicable Material Safety Data Sheets shall be onsite prior to the use of said materials.

4. Display in clear view of the onsite personnel all applicable Federal, State and local regulations dealing with safety including a map denoting the route to the nearest emergency care facility with emergency phone numbers.
5. Maintain an adequate Fire Protection and Prevention plan.
    a. Firefighting equipment must be well maintained and freely accessible onsite in conspicuous locations at all times.
    b. Fire extinguishers must comply with all applicable Cal - OSHA specification.
    c. Work shall be carried out complying with the California Fire Code, latest edition as applicable to construction work.
6. Employee Safety Training including but not limited to:
    a. All equipment operators must be trained and certified as per Contractors Injury and Illness Prevention Program (IIPP):
    b. Training in the use of fire extinguishers.
    c. Flaggers must be trained.
    d. Safe Scaffolding usage.
7. Lock-out and block-out procedures for machinery, equipment, electrical and tool related hazards.
8. Heavy equipment procedures and standards.
9. Excavation and trenching hazards.
10. Project Site must be fenced adequately (see Section 015000 “Construction Facilities and Temporary Controls”) to protect Public, including gates to be kept secured at all times. In the rare cases when fences must be temporarily opened to public areas to facilitate construction or the work area cannot be effectively fenced, Flaggers must be provided. Project Site must be fully secured by the end of the workday with no remaining hazards or obstacles in the public areas.
    a. Flaggers must be placed in locations so as to give effective warning.
    b. Flaggers must wear orange or strong yellow-green warning garments, such as vests, jackets, shirts, or rainwear.
11. 11. Electrical hazards and safe procedures.
12. Musculoskeletal hazards.
13. Hazards causing chronic illness, such as exposure to lead, asbestos, and other cancer-causing products.
14. A severe weather plan including ceasing or modifying onsite operations during high temperature, lightning, or high wind velocities, etc.
15. No damaged or hazardous tools will be tolerated onsite including but not limited to frayed or damaged electric cords, any tools with missing or altered original safety devices or switches, ladders without proper slip-resistant feet, etc.

16. Any work done using ladders must conform to original proper use of said ladders and all OSHA guidelines. (i.e. including but not limited to top rung of a step ladder is not to be used as a step, extension ladders must extend three rungs above the proposed use height, etc.)

17. All employees must wear proper Personal Protective Equipment (PPE) and abide by safety work ethics included but not limited to hard hat, proper shoes, long pants, and clothing including gloves, protective eyewear and respirators, no loose clothing, long hair must be restrained, etc.

C. Provide a site specific written review of potential or predictable Fall Protection Hazards from heights of six (6) feet or greater. The review should address the need for Fall Protection Systems to mitigate hazards and include equipment and methods employed, responsibilities, training requirements, and monitoring methods. The erection and dismantling operations of scaffolds as well as the fall zones around scaffolds must be included as well.

1. All Fall Protection systems must be properly implemented and maintained.

2. Fall Protection Plan must be implemented when a Fall Protection System is required but cannot be used. A Fall Protection Plan must be written by a qualified person identified in the plan and actively responsible for the implementation.

D. Job site safety practices found by County representatives to be in violation of any of Contractors Injury and Illness Prevention Program (IIPP) or applicable Federal, State and local occupational safety regulations including any Cal-OSHA issued materials shall be grounds for IUSD to direct the cessation of all work activities and operations affected by this violation at no cost to IUSD until such time as the CONTRACTOR notifies IUSD in writing that the CONTRACTOR complies with all violated regulations.

END OF SECTION 013527 - SITE SAFETY

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SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve CONTRACTOR of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for CONTRACTOR to provide quality-assurance and quality-control services required by Architect, OWNER, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections:

1. Division 01 - Section 013210 "Construction Schedule" for developing a schedule of required tests and inspections.
2. Division 01 – Section 014523 "Testing and Inspection" for required tests and inspections and testing and inspection criteria.
3. Divisions 02 through 33 for specific test and inspection requirements.

1.3 DEFINITIONS

A. DSA: State of California, Division of the State Architect.

B. AOR: Architect of Record

C. IOR: Inspector of Record.

D. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

E. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

F. Mockups: Full size physical assemblies that are constructed onsite. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size, physical assemblies constructed at testing facility to verify performance characteristics.
2. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building(s) but on the Project Site, consisting of multiple products, assemblies and subassemblies.
3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.

G. Preconstruction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

H. Product Testing: Tests and inspections that are performed by a Nationally Recognized Testing Laboratory, a National Voluntary Laboratory Accreditation Program, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

I. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

J. Field Quality-Control Testing: Tests and inspections that are performed onsite for installation of the Work and for completed Work.

K. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

L. Installer/Applicator/Erector: CONTRACTOR or another entity engaged by CONTRACTOR as an employee, Subcontractor, or sub-Subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.

M. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

1.5 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A Professional Engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according

to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:
    a. Provide test specimens representative of proposed products and construction.
    b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
    d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
    e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to DSA, OWNER, OWNER’S REPRESENTATIVE, Architect, Inspector of Record, Structural Engineer and CONTRACTOR. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.

2. Notify Architect **seven (7)** days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at the Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
    a. Allow **seven (7)** days for initial review and each re-review of each mockup.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed, unless otherwise indicated.

1.6 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as OWNER'S responsibility, OWNER will engage a qualified testing agency to perform these services.
    1. Owner will furnish CONTRACTOR with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
    2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to OWNER are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
    1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of CONTRACTOR by authorities having jurisdiction, whether specified or not.
    2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
        a. Contractor shall not employ same entity engaged by OWNER, unless agreed to in writing by OWNER.
    3. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or inspecting will be performed.
    4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report of each quality-control service to DSA, OWNER, OWNER'S REPRESENTATIVE, Architect, Inspector of Record, Structural Engineer, and Contractor.
    5. Testing and inspecting requested by CONTRACTOR and not required by the Contract Documents are Contractor's responsibility.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including

service connections. Report results in writing as specified in Section 012500 "Submittal Procedures."

1. Submit written report to OWNER, OWNER'S REPRESENTATIVE, and Architect.

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in pre-installation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

1. Submit written report to OWNER, OWNER'S REPRESENTATIVE, Architect, and Contractor.

E. Retesting/Reinspection: Regardless of whether original tests or inspections were OWNER'S or Contractor's responsibility; CONTRACTOR shall provide quality-control services, including retesting and reinspection, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect, Inspector of Record, and CONTRACTOR in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify the OWNER'S REPRESENTATIVE, Architect, Inspector of Record, and CONTRACTOR promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report of each test, inspection, and similar quality-control service to DSA, OWNER, OWNER'S REPRESENTATIVE, Architect, Inspector of Record, Structural Engineer, and Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.

4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project Site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's Construction Schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to OWNER, OWNER'S REPRESENTATIVE, Architect, Inspector of Record, Structural Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.7 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: OWNER will engage a qualified testing agency and special inspectors to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of OWNER, and as follows:

1. Verify that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notify Architect, Inspector of Record, and CONTRACTOR promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submit a certified written report of each test, inspection, and similar quality-control service to DSA, OWNER, OWNER'S REPRESENTATIVE, Architect, Inspector of Record, Structural Engineer, and Contractor.
4. Submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpret tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retest and re-inspect corrected work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Contractor to prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project Site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's and Inspector of Record's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017000 "Execution Requirements."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor’s responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000 - QUALITY REQUIREMENTS

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. Approved: When used to convey Contractor’s submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. Directed: A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. Indicated: Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. Regulations: Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. Furnish: Supply and deliver to Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. Install: Operations at Project Site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. Provide: Furnish and install, complete and ready for the intended use.

I. Project Site: Space available for performing construction activities. The extent of Project Site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied

directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Websites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

1. For additional information refer to Thomson Gale's "Encyclopedia of Associations" and Columbia Books' "National Trade and Professional Associations of the U.S."

AA	Aluminum Association, Inc. (The) www.aluminum.org	(703) 358-2960
AAADM	American Association of Automatic Door Manufacturers www.aaadm.com	(216) 241-7333
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists www.aatcc.org	(919) 549-8141
ABAA	Air Barrier Association of America www.airbarrier.org	(866) 956-5888
ABMA	American Bearing Manufacturers Association www.abma-dc.org	(202) 367-1155
ACI	American Concrete Institute www.concrete.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216

AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205) 257-2530
AF&PA	American Forest and Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association www.aga.org	(202) 824-7000
AGC	Associated General Contractors of America (The) www.agc.org	(703) 548-3118
AHA	American Hardboard Association (Now part of CPA)	
AHAM	Association of Home Appliance Manufacturers www.aham.org	(202) 872-5955
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559
ALCA	Associated Landscape Contractors of America (Now PLANET - Professional Land care Network)	
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
AOSA	Association of Official Seed Analysts, Inc. www.aosaseed.com	(405) 780-7372
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600

APA EWS	APA - The Engineered Wood Association; Engineered Wood Systems (See APA - The Engineered Wood Association)	
API	American Petroleum Institute www.api.org	(202) 682-8000
ARI	Air-Conditioning and Refrigeration Institute www.ari.org	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Association www.asphaltroofing.org	(202) 207-0917
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)	
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400
ASME	ASME International (American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (973) 882-1170
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9500
AWCI	Association of the Wall and Ceiling Industry www.awci.org	(703) 534-8300
AWCMA	American Window Covering Manufacturers Association (Now WCMA)	
AWI	Architectural Woodwork Institute www.awinet.org	(571) 323-3636
AWPA	American Wood Protection Association (Formerly: American Wood Preservers' Association) www.awpa.com	(205) 733-4077
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122

BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010
BICSI	BICSI, Inc. www.bicsi.org	(800) 242-7405 (813) 979-1991
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International) www.bifma.com	(616) 285-3963
BISSC	Baking Industry Sanitation Standards Committee www.bissc.org	(866) 342-4772
CCC	Carpet Cushion Council www.carpetcushion.org	(610) 527-3880
CDA	Copper Development Association www.copper.org	(800) 232-3282 (212) 251-7200
CEA	Canadian Electricity Association www.canelect.ca	(613) 230-9263
CEA	Consumer Electronics Association www.ce.org	(866) 858-1555 (703) 907-7600
CFFA	Chemical Fabrics and Film Association, Inc. www.chemicalfabricsandfilm.com	(216) 241-7333
CGA	Compressed Gas Association www.cganet.com	(703) 788-2700
CIMA	Cellulose Insulation Manufacturers Association www.cellulose.org	(888) 881-2462 (937) 222-2462
CISCA	Ceilings and Interior Systems Construction Association www.cisca.org	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583
CRRC	Cool Roof Rating Council www.coolroofs.org	(866) 465-2523 (510) 485-7175
CPA	Composite Panel Association www.pbmdf.com	(301) 670-0604
CPPA	Corrugated Polyethylene Pipe Association www.cppa-info.org	(800) 510-2772 (202) 462-9607
CRI	Carpet and Rug Institute (The) www.carpet-rug.com	(800) 882-8846 (706) 278-3176

CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200
CSA	Canadian Standards Association	(800) 463-6727 (416) 747-4000
CSA	CSA International (Formerly: IAS - International Approval Services) www.csa-international.org	(866) 797-4272 (416) 747-4000
CSI	Cast Stone Institute www.caststone.org	(717) 272-3744
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
CSSB	Cedar Shake and Shingle Bureau www.cedarbureau.org	(604) 820-7700
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute) www.cti.org	(281) 583-4087
DBIA	Design Build Institute of America www.dbia.org	(866) 692-0110
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
EIA	Electronic Industries Alliance www.eia.org	(703) 907-7500
EIMA	EIFS Industry Members Association www.eima.com	(800) 294-3462 (770) 968-7945
EJCDC	Engineers Joint Contract Documents Committee www.ejdc.org	(703) 295-5000
EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040
ESD	ESD Association (Electrostatic Discharge Association) www.esda.org	(315) 339-6937
ETL SEMCO	Intertek ETL SEMCO (Formerly: ITS - Intertek Testing Service NA) www.intertek.com	(800) 967-5352
FMA	FM Approvals LLC www.fmglobal.com	(781) 762-4300
FMG	FM Global (Formerly: FMG - FM Global) www.fmglobal.com	(401) 275-3000

FMRC	Factory Mutual Research (Now FM Global)	
FSA	Fluid Sealing Association www.fluidsealing.com	(610) 971-4850
FSC	Forest Stewardship Council www.fsc.org	49 228 367 66 0
GA	Gypsum Association www.gypsum.org	(202) 289-5440
GANA	Glass Association of North America www.glasswebsite.com	(785) 271-0208
GRI	(Part of GSI)	
GS	Green Seal www.greenseal.org	(202) 872-6400
GSI	Geosynthetic Institute www.geosynthetic-institute.org	(610) 522-8440
HI	Hydraulic Institute www.pumps.org	(973) 267-9700
HI	Hydronics Institute www.gamanet.org	(908) 464-8200
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)	
HPVA	Hardwood Plywood and Veneer Association www.hpva.org	(703) 435-2900
HPW	H. P. White Laboratory, Inc. www.hpwhite.com	(410) 838-6550
IAS	International Approval Services (Now CSA International)	
ICEA	Insulated Cable Engineers Association, Inc. www.icea.net	(770) 830-0369
ICRI	International Concrete Repair Institute, Inc. www.icri.org	(847) 827-0830
IEC	International Electrotechnical Commission www.iec.ch	41 22 919 02 11
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000

IEST	Institute of Environmental Sciences and Technology www.iest.org	(847) 255-1561
IGCC	Insulating Glass Certification Council www.igcc.org	(315) 646-2234
IGMA	Insulating Glass Manufacturers Alliance www.igmaonline.org	(613) 233-1510
ILI	Indiana Limestone Institute of America, Inc. www.iliai.com	(812) 275-4426
ISO	International Organization for Standardization www.iso.ch	41 22 749 01 11
ISSFA	International Solid Surface Fabricators Association www.issfa.net	(877) 464-7732 (702) 567-8150
ITS	Intertek Testing Service NA (Now ETL SEMCO)	
ITU	International Telecommunication Union www.itu.int/home	41 22 730 51 11
KCMA	Kitchen Cabinet Manufacturers Association www.kcma.org	(703) 264-1690
LMA	Laminating Materials Association (Now part of CPA)	
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864
MBMA	Metal Building Manufacturers Association www.mbma.com	(216) 241-7333
MFMA	Maple Flooring Manufacturers Association, Inc. www.maplefloor.org	(888) 480-9138
MFMA	Metal Framing Manufacturers Association, Inc. www.metalframingmfg.org	(312) 644-6610
MH	Material Handling (Now MHIA)	
MHIA	Material Handling Industry of America www.mhia.org	(800) 345-1815 (704) 676-1190
MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222
MPI	Master Painters Institute www.paintinfo.com	(888) 674-8937 (604) 298-7578

MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.com	(703) 281-6613
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(630) 942-6591
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(800) 797-6623 (281) 228-6200
NADCA	National Air Duct Cleaners Association www.nadca.com	(202) 737-2926
NAIMA	North American Insulation Manufacturers Association www.naima.org	(703) 684-0084
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NCPI	National Clay Pipe Institute www.ncpi.org	(262) 248-9094
NCTA	National Cable and Telecommunications Association www.ncta.com	(202) 775-2300
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(888) 300-6382 (269) 488-6382
NFHS	National Federation of State High School Associations www.nfhs.org	(317) 972-6900
NFPA	National Fire Protection Association www.nfpa.org	(800) 344-3555 (607) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-1776

NGA	National Glass Association www.glass.org	(866) 342-5642 (703) 442-4890
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933-0318 (901) 377-1818
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NOFMA	The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association) www.nofma.com	(901) 526-5016
NOMMA	National Ornamental and Miscellaneous Metals Association www.nomma.org	(888) 516-8585
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010
NSSGA	National Stone, Sand and Gravel Association www.nssga.org	(800) 342-1415 (703) 525-8788
NTMA	National Terrazzo and Mosaic Association, Inc. (The) www.ntma.com	(800) 323-9736 (540) 751-0930
NTRMA	National Tile Roofing Manufacturers Association (Now TRI)	(206) 209-5300
NWWDA	Window and Door Manufacturers Association www.wdma.com	(312) 321-6802
OPL	Omega Point Laboratories, Inc. (Now ITS)	
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDCA	Painting and Decorating Contractors of America www.pdca.com	(800) 332-7322 (314) 514-7322
PDI	Plumbing and Drainage Institute www.pdionline.org	(800) 589-8956 (978) 557-0720
PGI	PVC Geomembrane Institute http://pgi-tp.ce.uiuc.edu	(217) 333-3929

PLANET	Professional Landcare Network (Formerly: ACLA - Associated Landscape Contractors of America) www.landcarenetwork.org	(800) 395-2522 (703) 736-9666
PTI	Post-Tensioning Institute www.post-tensioning.org	(602) 870-7540
RCSC	Research Council on Structural Connections www.boltcouncil.org	
RFCI	Resilient Floor Covering Institute www.rfci.com	(301) 340-8580
RIS	Redwood Inspection Service www.redwoodinspection.com	(888) 225-7339 (415) 382-0662
SAE	SAE International www.sae.org	(877) 606-7323 (724) 776-4841
SDI	Steel Deck Institute www.sdi.org	(847) 458-4647
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SEFA	Scientific Equipment and Furniture Association www.sefalabs.com	(877) 294-5424 (516) 294-5424
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)	
SGCC	Safety Glazing Certification Council www.sgcc.org	(315) 646-2234
SIA	Security Industry Association www.siaonline.org	(866) 817-8888 (703) 683-2075
SIGMA	Sealed Insulating Glass Manufacturers Association (Now IGMA)	
SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995
SMA	Screen Manufacturers Association www.smacentral.org	(561) 533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SMPTE	Society of Motion Picture and Television Engineers www.smpte.org	(914) 761-1100

SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division) www.sprayfoam.org	(800) 523-6154
SPIB	Southern Pine Inspection Bureau (The) www.spib.org	(850) 434-2611
SPRI	Single Ply Roofing Industry www.spri.org	(781) 647-7026
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331
STI	Steel Tank Institute www.steeltank.com	(847) 438-8265
SWI	Steel Window Institute www.steelwindows.com	(216) 241-7333
SWRI	Sealant, Waterproofing, and Restoration Institute www.swrionline.org	(816) 472-7974
TCA	Tile Council of America, Inc. (Now TCNA)	
TCNA	Tile Council of North America, Inc. www.tileusa.com	(864) 646-8453
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance www.tiaonline.org	(703) 907-7700
TMS	The Masonry Society www.masonrysociety.org	(303) 939-9700
TPI	Truss Plate Institute, Inc. www.tpinst.org	(703) 683-1010
TPI	Turfgrass Producers International www.turfgrasssod.org	(800) 405-8873 (847) 649-5555
TRI	Tile Roofing Institute www.tileroofing.org	(312) 670-4177
UL	Underwriters Laboratories Inc. www.ul.com	(877) 854-3577 (847) 272-8800
UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902
USGBC	U.S. Green Building Council www.usgbc.org	(800) 795-1747

USITT	United States Institute for Theatre Technology, Inc. www.usitt.org	(800) 938-7488 (315) 463-6463
WASTEC	Waste Equipment Technology Association www.wastec.org	(800) 424-2869 (202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association www.wcmanet.org	(212) 297-2122
WCSC	Window Covering Safety Council (Formerly: WCMA - Window Covering Manufacturers Association) www.windowcoverings.org	(800) 506-4636 (212) 297-2109
WDMA	Window and Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com	(800) 223-2301 (847) 299-5200
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California) www.wicnet.org	(916) 372-9943
WIC	Woodwork Institute of California (Now WI)	
WMMPA	Wood Moulding and Millwork Producers Association www.wmmpa.com	(800) 550-7889 (530) 661-9591
WSRCA	Western States Roofing Contractors Association www.wsrca.com	(800) 725-0333 (650) 570-5441
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Websites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	(909) 472-4100
ICC	International Code Council www.iccsafe.org	(888) 422-7233
ICC-ES	ICC Evaluation Service, Inc. www.icc-es.org	(800) 423-6587 (562) 699-0543
UBC	Uniform Building Code (See ICC)	

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Websites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CE	Army Corps of Engineers www.usace.army.mil	(202) 761-0011
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-7923
DOC	Department of Commerce www.commerce.gov	(202) 482-2000
DOD	Department of Defense http://.dodssp.daps.dla.mil	(215) 697-6257
DOE	Department of Energy www.energy.gov	(202) 586-9220
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
FAA	Federal Aviation Administration www.faa.gov	(866) 835-5322
FCC	Federal Communications Commission www.fcc.gov	(888) 225-5322
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(800) 488-3111
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
LBL	Lawrence Berkeley National Laboratory www.lbl.gov	(510) 486-4000
NCHRP	National Cooperative Highway Research Program (See TRB)	
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety and Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999
PBS	Public Buildings Service (See GSA)	
PHS	Office of Public Health and Science www.osophs.dhhs.gov/ophs	(202) 690-7694

RUS	Rural Utilities Service (See USDA)	(202) 720-9540
SD	State Department www.state.gov	(202) 647-4000
TRB	Transportation Research Board http://gulliver.trb.org	(202) 334-2934
USDA	Department of Agriculture www.usda.gov	(202) 720-2791
USPS	Postal Service www.usps.com	(202) 268-2000

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Websites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from U.S. Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080
CFR	Code of Federal Regulations Available from Government Printing Office www.gpoaccess.gov/cfr/index.html	(866) 512-1800 (202) 512-1800
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
DSCC	Defense Supply Center Columbus (See FS)	
FED-STD	Federal Standard (See FS)	
FS	Federal Specification Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
	Available from Defense Standardization Program www.dps.dla.mil	
	Available from General Services Administration www.gsa.gov	(202) 619-8925
	Available from National Institute of Building Sciences www.wbdg.org/ccb	(202) 289-7800

FTMS	Federal Test Method Standard (See FS)	
MIL	(See MILSPEC)	
MIL-STD	(See MILSPEC)	
MILSPEC	Military Specification and Standards Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
UFAS	Uniform Federal Accessibility Standards Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Websites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CBHF	State of California, Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation www.dca.ca.gov/bhfti	(800) 952-5210 (916) 574-2041
CBSC	State of California, Building Standards Commission 2525 Natomas Park Drive, Suite 130 Sacramento, CA 95833 www.bsc.ca.gov	(916) 263-0916
CCR	California Code of Regulations www.calregs.com	(916) 323-6815
CPUC	California Public Utilities Commission www.cpuc.ca.gov	(415) 703-2782
DSA	State of California, Division of the State Architect DSA Headquarters Office Mr. David F. Thorman, AIA State Architect of California 1102 Q Street, Suite 5100 Sacramento, California 95811	(916) 445-8100
DSA	State of California, Division of the State Architect DSA San Francisco Bay Area Regional Office 1515 Clay Street, Suite 1201 Oakland, California 94612 www.dsa.dgs.ca.gov/default	(510) 622-3101
DSA	State of California, Division of the State Architect DSA Sacramento Regional Office 1102 Q Street, Suite 5200 Sacramento, California 95814 www.dsa.dgs.ca.gov/default	(916) 445-8730

DSA	State of California, Division of the State Architect DSA Los Angeles Basin Regional Office 700 N. Alameda Street, Suite 5-500 Los Angeles, California 90012 www.dsa.dgs.ca.gov/default	(213) 897-3995
DSA	State of California, Division of the State Architect DSA San Diego Regional Office 16680 West Bernardo Drive San Diego, California 92127 www.dsa.dgs.ca.gov/default	
TFS	Texas Forest Service Forest Resource Development http://txforestservice.tamu.edu	

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 014200 - REFERENCES

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SECTION 014213 - ABBREVIATIONS, SYMBOLS AND ACRONYMS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. List of abbreviations, units, symbols and acronyms used in these Specifications.

1.2 TITLE ABBREVIATIONS:

OAR	Owner's Authorized Representative, i.e., Owner's Representative, District Representative, Owner
AOR	Architect of Record
EOR	Engineer of Record
PM	Project Manager,
IOR	Inspector of Record, Owner's Inspector, Inspector

1.3 UNITS AND OTHER ABBREVIATIONS:

ac	Alternating current
BTU	British thermal unit
cfh	Cubic feet per hour
cfm	Cubic feet per minute
cm	Centimeter
Co.	Company
COP	Coefficient of performance
Corp.	Corporation
d	Penny
db.	Decibel
DB	Dry bulb
dc	Direct current
EER	Energy efficiency ratio
F	Degrees Fahrenheit
fpm	Feet per minute
gph	Gallons per hour
gpm	Gallons per minute
HP	Horsepower
HVAC	Heating, ventilating and air conditioning
Hz	Hertz
Inc.	Incorporated
KHz	Kilohertz
lb	Pound
LED	Light emitting dial
MBH	1000 BTUs per hour
mfr	Manufacturer
MHz	Mega hertz
mil	Thousandth of an inch
mm	Millimeter
mph	Miles per hour
oz.	Ounce

pH	Acidity-alkalinity balance
psf	Pounds per square foot
psi	Pounds per square inch
psig	Pounds per square inch, gage
RF	Radio frequency
rpm	Revolutions per minute
V	Volt
WB	Wet bulb

1.4 SYMBOLS

#	Number
'	Foot/Feet
"	Inch(es)
%	Percent

1.5 ACRONYMS

AE	Architect and engineer(s)
ABMA	American Boiler Manufacturers Association
ABMS	American Bureau of Metal Statistics
ABPA	American Board Products Association
ACI	American Concrete Institute
AGA	American Gas Association
AHAM	Association of Heating and Air Conditioning Manufacturers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association, Inc.
ANSI	American National Standards Institute
APA	American Plywood Association
AQMD	Air Quality Management District
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Institute of America
CCR	California Code of Regulations
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CQC	California Quality Control (CMA Standards)
CRA	California Redwood Association
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standards, U.S. Department of Commerce
CTI	Ceramic Tile Institute
CTI	Cooling Tower Institute

DHI	Door and Hardware Institute
DSA	Division of the State Architect, Office of Regulation Services
DBE	Design-Build Entity, Design-Builder
FCC	Federal Communication Commission
FGMA	Flat Glass Marketing Association
FM	Factory Mutual
FS	Federal Specifications
HPMA	Hardwood Plywood Manufacturers Association
IACS	International Annealed Copper Standards
IAMPO	International Association of Plumbing and Mechanical Officials
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronic Engineers, Inc.
IES	Illuminating Engineering Society
IMI	International Masonry Institute
IRI	Industrial Risk Insurers
MEP	Mechanical, electrical, and plumbing
MIA	Marble Institute of America
MIA	Masonry Institute of America
MLSFA	Metal Lath/Steel Framing Association
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry.
NAAMM	National Association of Architectural Metal Manufacturers
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NCMA	National Concrete Masonry Association
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NOFMA	National Oak Flooring Manufacturers Association
NPCA	National Paint and Coatings Association
NSF	National Sanitation Foundation
NTMA	National Terrazzo and Mosaic Association
NWMA	National Woodwork Manufacturers Association
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PDI	Plumbing and Drainage Institute
PEI	Porcelain Enamel Institute
PS	Product Standard, U.S. Department of Commerce
RIS	Redwood Inspection Service
RFCI	Resilient Floor Covering Institute
SCMA	Southern Cypress Manufacturers Association
SDI	Steel Deck Institute
SFPA	Southern Forest Products Association
SIGMA	Sealed Insulating Glass Manufacturers Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SPIB	Southern Pine Inspection Bureau

SSPC	Steel Structure Painting Council
SWI	Steel Window Institute
TCA	Tile Council of America
UBC	Uniform Building Code
UCI	Uniform Construction Index
UL	Underwriters' Laboratories, Inc.
UMC	Uniform Mechanical Code
UPC	Uniform Plumbing Code
WCLIB	West Coast Lumber Inspection Bureau
WI (WIC)	Woodwork Institute
WWPA	Western Wood Products Association

END OF SECTION 014213 - ABBREVIATIONS, SYMBOLS AND ACRONYMS

SECTION 014523 - TESTING AND INSPECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. This Section includes the following:

1. Testing and inspection services to meet requirements of the California Building Code (CBC), Title 24, Parts 1 and 2, as indicated in Contract Documents.

    a. One or more DSA certified inspectors employed by the OWNER in accordance with the requirements of California Building Standards Administrative Code will be assigned to the Work with their duties as specifically defined in Sections 4-333(b), 4-333(c), and 4-342.

2. Test of materials are required by a DSA certified testing agency as set forth in Section 4-335 of the California Building Standards Administrative Code.

B. Related Sections include the following:

1. Division 01 – Section 013210 "Construction Schedule".
2. Division 01 – Section 012500 "Submittal Procedures".
3. Division 01 – Section 018620 “Test and Balance”.
4. Division 01 – Section 015000 "Construction Facilities and Temporary Controls ".
5. Division 01 – Section 017000 "Execution Requirements".
6. Division 02 – Section XXXXXX "Selective Demolition".
7. Division 01 – Section 017700 "Closeout Procedures".

1.3 DEFINITIONS

A. CBC: California Building Code.

B. DSA: State of California, Division of the State Architect.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 TESTS

A. Owner will select and provide an independent testing agency to conduct tests, sampling, and testing of materials. Selection of material to be tested shall be by the agency or the OWNER'S REPRESENTATIVE and not by Contractor.

1. Procedural and acceptance criteria shall be as set forth in Section 4-335 of the California Building Standards Administrative Code.

2. As set forth in CBC Section 1705A.1.

B. Owner will directly reimburse testing agency all costs for all DSA required tests and inspections, but may be reimbursed by CONTRACTOR for such costs as noted in related sections of the Contract Documents.

1. Contractor will reimburse OWNER or directly reimburse testing agency all costs for retesting required by failed tests as set forth in Sections 4-333(c) and 4-335(c) of the California Building Standards Administrative Code.

C. Independent testing agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.

D. Independent testing agency shall not perform any duties of Contractor.

E. Contractor shall notify the OWNER'S REPRESENTATIVE a sufficient time in advance of the manufacture of material to be supplied by him under the Contract Documents, which must by terms of the Contract Documents be tested, in order that the OWNER may arrange for the testing of same at the source of supply.

F. Any material shipped by CONTRACTOR from source of supply prior to having satisfactorily passed such required testing and inspection or prior to receipt of notice from Inspector of Record such testing and inspection is not required shall not be incorporated into the Work.

G. Contractor shall provide an insulated curing box with capacity for not less than twenty (20) concrete cylinders and relocate said box and cylinders as rapidly as required in order to provide for progress of the Work.

3.2 TEST REPORTS

A. One copy of each test report shall be forwarded directly to DSA by the testing agency. Additional copies of each test report shall be forwarded directly to OWNER, Architect, CONTRACTOR, Project Inspector, OWNER'S REPRESENTATIVE, and Structural Engineer by the testing agency. Such reports shall include all tests made, regardless of whether such tests indicate that the material is satisfactory or unsatisfactory. Samples taken but not tested shall also be reported.

Records of special sampling operations as required shall also be reported. The reports shall show that the material or materials were sampled and tested in accordance with the requirements of CBC, Title 24, Parts 1 and 2, and with the approved Contract Documents. Test reports shall show the specified design strength. Test reports shall also definitely state whether or not material or materials tested comply with the specified requirements.

1. As set forth in Section 4-335(d) of the California Building Standards Administrative Code.

3.3 VERIFICATION OF TEST REPORTS

A. Testing agency shall submit to DSA a verified report, in duplicate, covering tests that were performed by that agency during the progress of the Work. Additional copies of each test report shall be forwarded directly to OWNER, Architect, CONTRACTOR, Project Inspector, OWNER'S REPRESENTATIVE, and Structural Engineer by the testing agency. Such report shall be furnished each time construction on the Work is suspended, covering tests up to that time, and prior to Final Completion of the Work, covering all tests.

1. As set forth in Sections 4-335(e) and 4-336 of the California Building Standards Administrative Code.

3.4 INSPECTION BY OWNER

A. Owner, and OWNER'S REPRESENTATIVE shall at all times have access, for purpose of inspection, to all parts of the Work and to all shops wherein the Work is in preparation. CONTRACTOR shall at all times maintain proper facilities and provide safe access for such inspection.

B. Owner, and OWNER'S REPRESENTATIVE shall have the right to reject materials and workmanship deemed defective Work, and to require their correction. Rejected workmanship shall be corrected in a satisfactory manner and rejected materials shall be removed from the premises and legally disposed of, all without charge to OWNER. If CONTRACTOR does not correct such rejected Work within a reasonable time, fixed by written notice and in accordance with the terms and conditions of the Contract Documents, OWNER may correct such rejected Work and proceed in accordance with related Articles of the Contract Documents.

C. Should it be considered necessary or advisable by the OWNER and OWNER'S REPRESENTATIVE at any time prior to Final Acceptance of the entire Work to make an examination of the Work already completed by removing or tearing out the same, the CONTRACTOR shall, on request, promptly furnish all necessary facilities, labor, and materials. If such work is found to be defective in any respect due to the fault of the CONTRACTOR or any of his Subcontractors, he shall defray all expenses of such examinations and of satisfactory reconstruction. If, however, such work is found to meet the requirements of Contract Documents, the additional cost of labor and material necessarily involved in the examination and replacement shall be allowed the Contractor.

D. Contractor is responsible for compliance with all applicable local, state, and federal codes, regulations, ordinances, restrictions, and requirements.

3.5 PROJECT INSPECTOR

A. Project inspector, employed by the OWNER in accordance with requirements of California Code of Regulations, Title 24, will be assigned to the work.

1. Project inspector shall be approved by Architect, Structural Engineer, and DSA.
2. As set forth in Section 4-333(b) of the California Building Standards Administrative Code.
3. Duties of Project Inspector are specifically defined in Section 4-342 of the California Building Standards Administrative Code.

B. The work of construction in all stages of progress shall be subject to the personal continuous observation of the Project Inspector. He shall have free access to any or all parts of the Work at any time. The CONTRACTOR shall furnish the Project Inspector reasonable facilities for obtaining such information as may be necessary to keep him fully informed respecting the progress and manner of the Work and the character of the materials.

C. Inspection of Work shall not relieve CONTRACTOR from any obligation to fulfill all of the terms and conditions of the Contract Documents.

D. Contractor shall be responsible for scheduling times of inspection, tests, sample taking, and similar activities of the Work.

1. Contractor shall perform quality control inspection of work prior to filling out an inspection request to the inspector of record.

3.6 SPECIAL INSPECTOR

A. Special Inspector:

1. As set forth in Section 4-333(c) of the California Building Standards Administrative Code.
2. As set forth in CBC Section 1701A.5, 1704A.1.

3.7 TESTS AND INSPECTIONS

A. The following tests and inspection requirements are based on the 2013 California Building Code, Part 2 of the California Code of Regulations, Title 24, California Building Standards Code, (latest version of the International Building Code (IBC) with California Amendments).

B. Required tests and inspections include but are not limited to the following.

1. All required inspections, as applicable, shown in the California Building Code.
2. All tests required per DSA 103 - Statement of Structural Tests and Special Inspections card.
3. Inspections listed within project Specifications located within divisions 1 through 48.

C. Excavations, Foundations and Retaining Walls: CBC, Chapter 18A.

1. Inspection:

a. Inspection of Piles and Piers Installation: 1705A.7.1, 1810A.

D. Concrete: CBC, Chapter 19A.

1. Materials:

a. Concrete Materials: 1705A.3, 1904A.2.

b. Shotcrete Materials: 1705A.18, 1910A.

c. Portland Cement: 1903A.1, 1913A.1.

d. Concrete Aggregate: 1903A.6.

e. Shotcrete Aggregate: 1910A.3

f. Reinforcing Bars: 1903A.

g. Shotcrete Reinforcing Bars: 1910A.4.

h. Prestressing Steel and Anchorage: 1913A.3.

i. Fly Ash: 1903A.5.

2. Quality:

a. Concrete Proportions: 1903A, 1904A.2.

b. Shotcrete Proportions: 1910A.

c. Concrete Testing: 1903A.

d. Shotcrete Testing: 1913A.5.

e. Mixing and Placing: 1903A.

f. Shotcrete Mixing and Placing: 1910A.

g. Curing: 1903A.

h. Shotcrete Curing: 1910A.9.

i. Cold Weather Requirements: ACI 318-11, SECTION 5.12.

j. Hot Weather Requirements: ACI 318-11, SECTION 5.13.

k. Composite Construction Cores: 1913A.4.

l. Gypsum Concrete Strength Tests: 1911A, 1913A.6.

m. Post-Installed Anchors in Concrete: 1913A.7.

3. Inspection:

a. Project Site Inspection: 1903A.

b. Batch Plant Inspection: 1705A.3.2.

c. Waiver of Material Testing: 1705A.3.3.

d. Pre-stressed Concrete Inspection: 1705A.3.4.

e. Shotcrete Inspection: 1705A.18.

f. Reinforcing Bar Welding Inspection: 1705A.2.2.1.2.

E. Lightweight Metal – CBC, Chapter 20A:

1. Materials

a. Alloys: 2001.1

b. Identification: 2002.1

2. Inspection

a. Welding: 2003.1

F. Aluminum: CBC, Chapter 20:

1. Materials:

a. Aluminum Materials: 2002.1.

2. Inspection:

a. Aluminum Inspection: 2003.1

G. Masonry: CBC, Chapter 21A.

1. Materials:

a. Masonry Units: 2103A.1, 2103A.2, 2103A.4, 2103A.5, 2103A.6.

b. Mortar: 2103A.9, 2103A.10.

c. Grout: 2103A.13.

d. Metal Reinforcement and Accessories: 2103A.14.

2. Quality:

a. Portland Cement Tests: 1913A.1.

b. Mortar and Grout Tests: 2105A.2.2.1.4.

c. Masonry Prism Tests: 2105A.2.2.2.

d. Masonry Core Tests: 2105A.5.

e. Combination of Units: 2105A.3.

3. Inspection:

a. Reinforced Masonry: 1705A.4.

b. Reinforcing Bar Welding Inspection: 1705A.2.2.1.2.

H. Steel: CBC, Chapter 22A.

1. Materials:

a. Structural Steel: 2205A.1

b. Material Identification: 2203A.1.

2. Inspection and Tests:

a. Test of Structural Steel: 1705A.2.

3. Quality:

a. Test of Structural and Cold Formed Steel: 1705A.2.

b. Tests of High Strength Bolts, Nuts, and Washers: 2213A.1.

c. Tests of End Welded Studs: 2213A.2.

d. Tests of Beam-to-Column Moment Connections: 1705A.2.

4. Inspection:

a. Steel Construction Inspection: 1705A.2.

b. Shop Fabrication Inspection: 1704A.2.5.

c. Steel Joist and Girder Inspection: 1705A.2.2.3.

d. Welding Inspection: 1705A.2.2.1.

e. High Strength Bolt Inspection: TABLE 1705A.2.1.

f. Post-Installed Anchors in Concrete: 1913A.7.

g. Spray applied fire resistance materials: 1705A.13.

I. Wood: CBC, Chapter 23.

1. Materials:

a. Sawn Lumber: 2303.1.1.

b. Prefabricated Wood I-Joists: 2303.1.2.

c. Structural Glued-Laminated Timbers: 2303.1.3.

d. Wood Structural Panels: 2303.1.4.

e. Preservative Treated Wood: 2303.1.8.

f. Moisture Content: 2303.1.8.2.

g. Fire-Retardant-Treated Wood: 2303.2.

h. Hardwood and Plywood: 2303.3.

i. Wood Trusses: 2303.4.

j. Joist Hangers and Connectors: 2303.5.

k. Nails and Staples: 2303.6.

2. Inspection:

a. Wood Construction: 1705A.5.

b. Glue-Laminated Fabrication: 1705A.5.4.

c. Timber Connectors: 1705A.5.6.

d. Manufactured Trusses: 1705A.5.2.

J. Exterior Wall Coverings: CBC, Chapter 14, 25.

1. Materials:

a. Adhered Masonry Veneer: 1405.10.

b. Portland Cement Plaster: 2507.1, 2507.2.

2. Inspection:

a. Adhered Masonry Veneer Inspection: 1705A.4.1.

b. Portland Cement Plaster Inspection: 2503.1, 2503.2.

c. Exterior Insulation and Finish System (EFIS): 1705A.15.

K. Clay or Concrete Roof Tile: CBC Chapter 15.

1. Materials:

a. Clay or concrete tile: 1711A.2.

END OF SECTION 014523 - TESTING AND INSPECTION

SECTION 015000 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1. General Conditions – Article 10.2.6 for more information on barricades.

1.2 SECTION INCLUDES

A. Temporary utilities, construction facilities and controls to be provided, maintained, relocated, and removed by CONTRACTOR

1.3 RELATED SECTIONS AND DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

B. Division 01 – Section 011000 “Summary”

C. Division 01 – Section 012973 “Schedule of Values”

D. Division 01 – Section 015723 “Storm Water Pollution Control Measures”

E. Division 01 – Section 01321 “Construction Schedule”

F. Division 01 – Section 014523 “Testing and Inspection”

G. Division 01 – Section 018620 “Test and Balance”

H. Division 01 – Section 017700 “Closeout Procedures”

1.4 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, OWNER’S construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Pay sewer service use charges for sewer usage by all entities for construction operations.

C. Water Service: Pay water service use charges for water used by all entities for construction operations.

D. Electric Power Service: Pay electric power service use charges for electricity used by all entities for construction operations. If needed, insert use-charge requirements for other utilities needed for construction operations.

1.5 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

1.6 QUALITY ASSURANCE

A. Contractor shall comply with applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:

1. Building Code requirements
2. Division of State Architect
3. Health and safety regulations
4. Utility company regulations
5. Police, fire department and rescue squad requirements
6. Environmental protection regulations

B. Contractor shall arrange for the inspection and testing of each temporary utility prior to use. Obtain required certifications and permits and transmit to OWNER’S REPRESENTATIVE.

C. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with California Electrical Code (CEC).

D. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

E. Accessible Temporary Egress: Comply with applicable provisions in the California Building Code (CBC), the U.S. Architectural and Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines, and ICC/ANSI A117.1.

1.7 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before OWNER’S acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 QUALITY ASSURANCE

A. Contractor provided facilities are to be in place and available for OWNER use and occupancy within **ten (10)** calendar days following the date of issue of the Notice to Proceed and shall remain in place and available for OWNER use and occupancy throughout the full term of the Contract.

B. Interior Air Quality (IAQ) During Construction:

1. Referenced Standards include:

   a. ASHRAE 62.1 – 2004.

   b. ASHRAE 52.2 – 1999.

   c. CHPS Best Practices Manual – Volume III (2006 Edition).

2. Interior Air Quality (IAQ) During Construction Plan: CONTRACTOR is required to develop and submit to the OWNER for review and approval a Construction Indoor Air Quality (IAQ) Plan using the blank form provided as Appendix A of this Specification. Plan shall be submitted within **one-hundred and twenty (120)** days of Notice To Proceed. Implementation of the approved (IAQ) Plan will be included in the project Construction Schedule.

3. Construction Photos Requirement: CONTRACTOR shall submit photographs that demonstrate the Construction Ventilation, Preconditioning, Sequencing, and Protection measures taken during the project for complying with the IAQ plan, applicable Specifications and referenced standards.

3.2 TEMPORARY UTILITIES

A. Contractor shall submit to OWNER'S REPRESENTATIVE reports of tests, inspections, meter readings and similar procedures performed on temporary utilities.

B. Contractor shall coordinate with the appropriate utility company to install temporary services. Where the utility company provides only partial service, CONTRACTOR shall provide and install the remainder with matching compatible materials and equipment.

C. Temporary Water:

1. Contractor shall furnish, install and pay for all necessary permits, inspections, move ins/out, temporary water lines, connections and fees, extensions and distribution, metering devices and use charges, deliveries/pick-ups, rentals, storage, transportation, taxes, labor, insurance, bonds, material, equipment and all other miscellaneous items for the temporary water system, and upon Substantial Completion of the Work, removal of all such temporary water system devices and appurtenances.

2. Contractor shall provide and maintain temporary water service, including water distribution piping and outlet devices of the size and required flow rates in order to provide service to all areas of the Project Site.

3. Contractor shall provide and pay for all potable water needed for construction and all other uses associated with the Work.

4. Contractor shall at their expense and without limitation, remove, extend and/or relocate temporary water systems as rapidly as required in order to provide for progress of the Work.

D. Temporary Electric:

1. Contractor shall furnish, install, maintain and pay for all necessary permits, inspections, temporary wiring, metering devices and use charges, move ins/outs, connections and fees, service, extension and distribution, deliveries/pickups, rentals, storage, transportation, taxes, labor, insurance, bonds, materials, equipment and all other required miscellaneous items for the temporary electric systems and upon Substantial Completion of Work, removal of all such temporary electric systems and appurtenances.

2. Contractor shall furnish, install, maintain, extend and distribute temporary electric area distribution boxes, so located that individual trades can obtain adequate power and artificial lighting, at all points required for the Work, for inspection and for safety.

3. Contractor shall provide temporary electric for construction, temporary facilities, and connections for construction equipment requiring power or lighting, at all points required for the Work, for inspection and safety.

4. Contractor shall provide 20 foot candles minimum lighting levels inside building(s) and 5 foot candles outside for safety and security.

5. Contractor shall ensure welding equipment is supplied by electrical generators.

6. Contractor shall at their expense and without limitation remove, extend and/or relocate temporary electric systems as rapidly as required in order to provide for progress of the Work.

E. Temporary Gas:

1. Contractor shall furnish, install, maintain and pay for all necessary permits, inspections, metering devices and use charges, move ins/out, extension and distribution, deliveries/pickups, rentals, storage, transportation, equipment and piping, rentals, taxes, labor, material, insurance, bonds, and all other required miscellaneous items for the temporary gas systems necessary to perform the Work, and upon Substantial Completion of the Work, removal of all such temporary gas system devices and appurtenances.

2. Contractor shall at their expense and without limitation remove, extend and/or relocate temporary gas systems as rapidly as required in order to provide for progress of the Work.

F. Temporary Heating, Ventilation and Air Conditioning:

1. Contractor shall furnish, install, maintain, and pay for all necessary permits, inspections, move ins/out, extensions and distribution, connections and fees, use charges, metering

devices and use charges, equipment, rentals, deliveries/pick-ups, storage, transportation, taxes, labor, insurance, bonds, material, equipment and all other required miscellaneous items for temporary heat and ventilation needed for proper installation of the Work and to protect materials and finishes from damage due to weather. Upon Substantial Completion of the Work, CONTRACTOR shall remove all such temporary heating and ventilating system devices and appurtenances.

2. Contractor shall provide, maintain and pay for all temporary ventilation of enclosed Work areas to cure materials, disperse humidity, remove fumes, and to prevent accumulation of dust, irritants, or gases.

3. Owner will not accept utilization of the permanent HVAC system for temporary HVAC until Substantial Completion.

4. Contractor shall maintain manufacturer required levels of room and/or space temperature, humidity and ventilation necessary to install products, materials and/or systems of the Work.

5. Contractor shall at their expense and without limitation, remove, extend and/or relocate temporary heating and ventilating systems as rapidly as required in order to provide for progress of the Work.

G. Temporary Telephone and Data:

1. Contractor shall furnish, install, maintain and pay for all necessary permits, inspections, move ins/outs, extensions and distribution, devices, connections and fees, use charges, rentals, deliveries/pickups, storage, transportation, taxes, labor, insurance, bonds, material, equipment and all other required miscellaneous items for temporary phone, data service and distribution to Project Site temporary offices as required by this Section and Section 015000 “Construction Facilities and Temporary Controls” – 3.03.

2. Contractor shall at their expense and without limitation, remove, extend and/or relocate temporary phone service and distribution as rapidly as required in order to provide for progress of the Work.

3. Upon Substantial Completion of the Work, CONTRACTOR shall remove all such temporary phone service, distribution, devices and appurtenances.

3.3 CONTRACTOR PROVIDED FACILITIES

A. Contractor shall provide temporary offices, utilities, storage units, fencing, barricades, chutes, elevators, hoists, scaffolds, railings and other facilities or services as required. CONTRACTOR shall be responsible for providing, installation, maintenance, supplying, and all use charges for the items provided under Section 015000 “Construction Facilities and Temporary Controls” – 3.03.

B. INSTALLATION, GENERAL

1. Prepare a plan showing location or relocation of temporary facilities for the OWNER’S review. OWNER shall approve location of all temporary facilities prior to installation.

2. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

3. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

4. Restore all areas to condition prior to start of construction.

C. Temporary Offices:

1. Field Office for Contractor: Prefabricated or mobile trailer unit(s) with serviceable finishes, temperature controls, and foundations adequate for normal loading. Furnish and equip office as necessary for Contractor's field staff, including the DBE architect and as follows:

a. This office shall be of substantial waterproof construction with adequate natural light and ventilation by means of stock windows.

b. The Contractor shall provide and pay for adequate electric lights, private local telephone services with a loud exterior bell, and an adequate heating and cooling system. For the duration of the Project and coordination with the Owner.

c. Provide a dedicated DSL line-multiple jacks or dedicated wireless internet connection, phone line, desk, office chair, plan rack, Two (2) power surge protectors, a conference room with table and chairs for 12 people. Security pad for the trailer system, mini blinds for the windows, A/C and Heating and a Clock.

d. Contractor to provide all entry locks keyed alike, an exterior locking bar device each office to have lockable doors. Offices to be at each end of the trailer with Conference area in the center

e. Install a plan reviewing table secured to the wall.

f. Provide a plan rolling plan rack and drawing sticks to hold 12 sets of plans on 42" drawing sticks.

2. Temporary Offices: Contractor acknowledges that the building footprint may occupy/occupies the majority of the project site and that the Contractor may have to secure additional areas off-site for the location of temporary office facilities for Contractor parking, lay-down and storage areas.

3. Field office for Construction Manager and Inspector of Record (IOR): separate from contractor, to be prefabricated or mobile trailer unit(s) by Design Space Modular or similar and be 12'x60' with built in restroom, approximately 720 square feet of office space with serviceable finishes, temperature controls, and foundations adequate for normal loading. Furnish and equip as necessary to provide for one (1) Construction Manager office 11'x15', and one (1) IOR office 11'x12'.

a. Provide dedicated individual office space for one (1) IOR and two (2) Construction Managers, to include their own desks, chairs, and internet connections.
b. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
c. Conference room of sufficient size to accommodate meetings of 12 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4 foot square tack and marker boards.
d. Drinking water and built-in private restroom in prefabricated or mobile trailer unit.
e. The Contractor to provide 8 ½x11 and 11x17 all-in-one printer including paper, toner, and maintenance services.
f. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 degree F.
g. Lighting fixtures capable of maintaining average illumination of 20 foot candles at desk height.
h. Install a plan reviewing table secured to the wall.
i. Provide a plan rolling plan rack and drawing sticks to hold 12 sets of plans on 42" drawing sticks.
j. Provide mini refrigerator with freezer, microwave, and coffee maker.
    - Refrigerator: Daewoo 4.4 cu ft Energy Star Spotless Steel Compact Refrigerator FR-044RVSE or similar.
    - Microwave: Hamilton Beach 1.6 Cu. Ft. Digital Microwave Oven, Stainless Steel or similar.
    - Coffee maker: Cuisinart Coffee Makers 12 Cup Programmable Coffeemaker or similar.

D. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
    a. Store combustible materials apart from building(s).

E. At Contractor's expense and without limitation remove and/or relocate temporary office(s) and related facilities as rapidly as required in order to provide for progress of the Work.

F. Temporary Storage Units:
    1. Contractor shall provide secure and waterproof storage units for the temporary storage of equipment and other items requiring protection.
    2. Contractor shall be responsible for all delivery charges and will install the storage unit in an appropriate area.
    3. Contractor shall remove the storage unit from the Project Site when the storage unit is no longer required for the Work or upon Substantial Completion of the Work.

4. Contractor shall at their expense and without limitation remove and/ or relocate storage units as rapidly as required in order to provide for progress of the Work.

G. Temporary Sanitary Facilities:

1. Contractor shall provide portable chemical toilet facilities. Quantity of portable chemical toilet facilities shall be based on total number of workers and shall be in accordance with CAL/OSHA standards.

2. Portable chemical toilet facilities shall be maintained with adequate supplies and in a clean and sanitary condition and shall be removed from the Project Site upon Substantial Completion of the Work. CONTRACTOR shall keep both OWNER chemical toilet facilities and OWNER trailer restroom clean and operational at all times.

3. Contractor employees shall not use District's toilet facilities.

4. At Contractor's expense and without limitation remove and/or relocate portable chemical toilet facilities as rapidly as required in order to provide for progress of the Work.

5. Contractor will contain their breaks and lunch periods to the areas designated by OWNER'S REPRESENTATIVE or any public area outside the Project Site. CONTRACTOR shall provide a suitable container within the break/lunch area for the placement of trash. Areas used for break/lunch must be maintained clean and orderly. Once finish flooring has been installed in a particular area, no food or beverages will be permitted in that area.

H. Temporary Security Fence/Barricade:

1. Contractor is responsible for providing Site enclosure, other fences, and barricades prior to starting construction operations. Install portable chain-link enclosure fence with lockable entrance gates. Locate as required or enclose entire Project Site or portion determined sufficient by the OWNER'S REPRESENTATIVE to accommodate construction operations. Install in a manner that will prevent people, dogs and other animals from easily entering Project Site except by entrance gates.

2. Where the District has currently or previously installed a perimeter fence to this project, but if the CONTRACTOR needs to relocate or temporarily move any of these fence panels, then it is the Contractors responsibility for this work and any subsequent cost. Security of Project Site and contents is a continuous obligation of Contractor.

   a. Existing Construction Fence. Currently, a portion of the project site is enclosed with a construction fence and green-screens, which are leased from National Construction Rentals. Within 10 Calendar Days after the effective date of the NTP, the Contractor shall contact National Construction Rentals to transfer the lease agreement to the Contractor. The Contractor shall pay for and maintain the fence in good order and provide additional fencing as required for the longevity of the project as stated above.

3. The CONTRACTOR is responsible for maintaining the wind screen to the fence Windscreen, all rips, tears, missing sections shall be corrected by the CONTRACTOR upon notification by OWNER'S REPRESENTATIVE.

4. At Contractor's expense and without limitation remove and/or relocate fencing, fabric and barricades or other security and protection facilities as rapidly as required in order to provide for progress of the Work.

I. Other Temporary Enclosures and Barricades:

1. Provide lockable, temporary weather-tight enclosures at openings in exterior walls to create acceptable working conditions, to allow for temporary heating and for security.

2. Provide protective barriers around trees, plants and other improvements designated to remain. Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

3. Temporary partitions shall be installed at all openings where additions connect to existing building(s), and where to protect areas, spaces, property, personnel, students and faculty and to separate and control dust, debris, noise, access, sight, fire areas, safety and security. Temporary partitions shall be as designated on the Drawings or as specified by Architect. At Contractor's expense and without limitation remove and/or relocate enclosures, barriers and temporary partitions as rapidly as required in order to provide for progress of the Work.

4. Since the Work of this Project may be immediately adjacent to existing occupied structures and vehicular and pedestrian right of ways, CONTRACTOR shall, in his sole judgment and in accordance with applicable safety standards, provide all temporary facilities, additional barricades, protection and care to protect existing structures, occupants, property, pedestrians and vehicular traffic. CONTRACTOR is responsible for any damage, which may occur to the property and occupants of the property of OWNER or adjacent private or public properties which in any way results from the acts or neglect of Contractor.

5. Contractor shall be responsible for cleaning up all areas adjacent to the construction Project Site which have been affected by the construction; and for restoring them to at least their original condition - including landscaping; planting of trees, sod, and shrubs damaged by construction; and raking and disposal of debris such as roofing shingles, paper, nails, glass sheet metal, bricks, and waste concrete. Construction debris shall be removed and properly disposed of. Culverts and drainage ditches with sediment from the construction area shall be cleared routinely to maintain proper drainage and re-cleaned prior to completion of the contract.

6. Contractor shall ensure sediment does not block storm drains. CONTRACTOR shall be responsible for cleaning storm drains blocked due to erosion or sediment from the work area.

7. Contractor to ensure all Project Site drive entrances have rumble plates to remove dirt from construction vehicles before leaving the Project Site.

J. Temporary Storage Yards:

1. Contractor shall fence and maintain storage yards in an orderly manner.

2. Provide storage units for materials that cannot be stored outside.

3. At Contractor's expense and without limitation remove and/or relocate storage yards and units as rapidly as required in order to provide for progress of the Work.

K. Temporary De-watering Facilities and Drainage:

1. For temporary drainage and de-watering facilities and operations not directly associated with construction activities included under individual sections, comply with de-watering requirements of applicable Division 01 sections and requirements of authorities having jurisdiction. CONTRACTOR shall maintain the Work, Project Site, excavations, construction and related areas free of water.

2. For temporary drainage and de-watering facilities and operations directly associated with new building(s)s, additions or other construction activities, comply with Division 01 and 02 Sections. CONTRACTOR shall be responsible for, but not limited to, de-watering of excavations, trenches and below grade areas of building(s)s, structures, the Project Site and related areas.

3. Dispose of rainwater in a lawful manner and will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.

L. Temporary Protection Facilities Installation:

1. Contractor shall not change over from using temporary facilities and controls to permanent facilities until Substantial Completion, except as permitted by OWNER'S REPRESENTATIVE.

2. Until permanent fire protection needs are supplied and approved by authorities having jurisdiction, CONTRACTOR shall provide, install and maintain temporary fire protection facilities of the types needed in order to adequately protect against fire loss. Comply with NFPA 241.

   a. Contractor shall prohibit smoking in construction areas.

   b. Contractor shall supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.

   c. Contractor shall develop and supervise an overall fire-prevention and -protection program for personnel at Project Site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

   d. When required, provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

   e. If fire-suppression sprinkler systems or other permanent fire-protection systems are used, insert specific requirements.

3. Contractor shall provide, install and maintain substantial temporary enclosures of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security. Where materials, tools and

equipment are stored within the Work area, CONTRACTOR shall provide secure lock up to protect against vandalism, theft and similar violations of security. OWNER accepts no financial responsibility for loss, damage, vandalism or theft.

4. Contractor operations shall not block, hinder, impede or otherwise inhibit the use of required exits and/or emergency exits to the public way, except as approved by OWNER'S REPRESENTATIVE. CONTACTOR shall maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for firefighting equipment and/or personnel.

5. With approval of OWNER'S REPRESENTATIVE and at the earliest feasible date in each area of the Work, complete installation of the permanent fire protection facilities including connected services and place into operation and use. Instruct OWNER personnel in use of permanent fire protection facilities.

6. In the event of an emergency drill or an actual emergency, designated by the sounding of the fire alarm and/or other sounding device, all construction activities must cease. CONTRACTOR shall evacuate the Work area and remain outside the Work area until permitted to return. No Work shall be conducted during the evacuation of a building or during an emergency.

M. Temporary Security and Safety Measures:

1. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

   a. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

   b. Install lighting for Project identification sign.

2. During performance of the Work, CONTRACTOR shall provide, install and maintain substantial temporary barriers and/or partitions separating all Work areas from areas occupied by students, faculty and/or administrative staff.

3. Contractor shall employ and maintain sufficient security and safety measures to effectively prevent vandalism, vagrancy, theft, arson, and all other such negative impacts to the Work. Any impacts to the progress of the Work of CONTRACTOR, OWNER, or OWNER'S forces, due to loss from inadequate security, will be the responsibility of Contractor.

4. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

   a. Truck cranes and similar devices for hoisting materials and considered "tools and equipment" and not temporary facilities.

5. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

6. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

7. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project Site where hazardous operations may occur overhead. Coordinate

with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction and requirements indicated on Drawings.

a. Construct covered walkways using scaffold or shoring framing.

b. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.

c. Paint and maintain appearance of walkway for duration of the Work.

N. Temporary Access Roads and Staging Areas:

1. Traffic Controls: Comply with requirements of authorities having jurisdiction.

a. Protect existing Project Site improvements to remain including curbs, pavement, and utilities.

b. Maintain access for fire-fighting equipment and access to fire hydrants.

c. Provide a minimum of two (2) flagmen on each side of vehicles entering or exiting Site through adjacent drives or parking lots at all times.

1) In no case shall vehicles be allowed to pass through adjacent driveways, walkways, or parking lots unescorted by marked flagmen.

2. Due to the limited amount of on and off Project Site space for the parking of staff and school visitor's vehicles there will be no parking of CONTRACTOR vehicles in areas designated for school use only. CONTRACTOR shall provide legal access to and maintain CONTRACTOR designated areas for the legal parking, loading, off-loading and delivery of all vehicles associated with the Work. CONTRACTOR shall be solely responsible for providing and maintaining these requirements whether on or off the Project Site. CONTRACTOR shall provide and maintain ample onsite parking spaces designated for the exclusive use of OWNER. CONTRACTOR shall erect signs as required by OWNER each of these spaces and prevent all unauthorized vehicles from parking in the Owner-reserved spaces.

3. Temporary access roads are to be installed and maintained by CONTRACTOR to all areas of the Project Site.

4. Contractor will be permitted to utilize existing facility campus roads as designated by OWNER'S REPRESENTATIVE. CONTRACTOR shall only utilize those entrances and exits as designated by OWNER'S REPRESENTATIVE and CONTRACTOR shall observe all traffic regulations of OWNER.

5. Contractor shall maintain roads and walkways in a clean condition including removal of debris and/or other deleterious material on a daily basis.

O. Moisture and Mold Control

1. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

2. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

a. Protect porous materials from water damage.

b. Protect stored and installed material from flowing or standing water.

c. Keep porous and organic materials from coming into prolonged contact with concrete.

d. Remove standing water from decks.

e. Keep deck openings covered or dammed.

3. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

a. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.

b. Keep interior spaces reasonably clean and protected from water damage.

c. Periodically collect and remove waste containing cellulose or other organic matter.

d. Discard or replace water-damaged material.

e. Do not install material that is wet.

f. Discard, replace, or clean stored or installed material that begins to grow mold.

g. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

4. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

a. Control moisture and humidity inside building by maintaining effective dry-in conditions.

b. Use permanent HVAC system to control humidity.

c. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

1) Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.

2) Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record daily readings over a forty-eight hour period. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.

3) Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.4 PROJECT SIGNAGE

A. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
3. Maintain and touchup signs so they are legible at all times.

B. No other signs shall be displayed without approval of OWNER'S REPRESENTATIVE. At Contractor's expense and without limitation, remove and/or relocate Project signage and related facilities as rapidly as required in order to provide for progress of the Work.

C. Contractor shall remove Project signage at Substantial Completion of the Work.

D. Until Substantial Completion of the Work, CONTRACTOR shall employ appropriate means to remove all graffiti from buildings, equipment, fences and all other temporary and/or permanent improvements on the Project Site within twenty-four (24) hours from the date of report or forty-eight (48) hours of each occurrence.

E. Contractor shall provide and install signage to provide directional, identification, and contact information to construction personnel and visitors as follows and as reviewed by OWNER'S REPRESENTATIVE.

1. For construction traffic control/flow at entrances/exits, and as designated by OWNER'S REPRESENTATIVE.
2. To direct visitors.
3. For construction parking.
4. To direct deliveries.
5. For Warning Signs as required.
6. In accordance with CAL/OSHA standards as necessary.
7. For trailer identification and Project Site address.
8. For "No Smoking" safe work site at designated locations.
9. Emergency contact information and phone number of CONTRACTOR.
10. Emergency contact information and phone number of local police, fire, and emergency personnel.
11. For Labor Compliance Program (LCP) as required under the General Conditions (Prevailing wage rates and Notice of LCP)
12. Employee benefits payments paid to trust funds are required under the General Conditions.

3.5 TRENCHES

A. Open trenches for installation of utility lines (water, gas, electrical and similar utilities) and open pits outside barricaded working areas shall be barricaded at all times in a legal manner determined by CONTRACTOR. Trenches shall be backfilled and patch-paved within twenty-four (24) hours after approval of installation by authorities having jurisdiction or shall have "trench

plates" installed. Required access to buildings shall be provided and maintained. CONTRACTOR shall comply with all applicable statutes, codes and regulations regarding trenching and trenching operations. Open trenches deeper than 3'-6", and not located within a public street access, shall be enclosed within an 8'-0" high chain-link fence.

3.6 DUST CONTROL

A. Contractor is responsible for dust control on and off the Project Site. When Work operations produce dust the Project Site and/or streets shall be sprinkled with water to minimize the generation of dust. CONTRACTOR shall clean all soils and debris from construction vehicles and cover both earth and debris loads prior to leaving the Project Site. CONTRACTOR shall, on a daily basis, clean all streets and/or public improvements within the right of way of any and all debris, dirt, mud and/or other materials attributable to operations of CONTRACTOR.

3.7 WASH OUT

A. Contractor shall provide and maintain a minimum of four (4) wash out boxes of sufficient size and strength to provide for concrete mixer wash out. CONTRACTOR shall locate and relocate both the wash out boxes and wash out areas in order to accommodate the progression of the Work. The wash out area shall be located as to minimize the amount of potential run off onto adjacent private and/or public property. CONTRACTOR shall legally dispose of the contents of the wash out boxes and area on an as needed basis or as required by OWNER'S REPRESENTATIVE.

3.8 WASTE DISPOSAL

A. Comply with requirements specified in Division 01 - Section 017419 "Construction Waste Management".

B. Contractor shall provide and maintain trash bins on the Project Site. Trash bins shall be serviced on an as needed basis and CONTRACTOR is responsible for the transportation of and the legal disposal of all contents.

3.9 ADVERSE WEATHER CONDITIONS

A. Should warnings of adverse weather conditions such as heavy rain and/or high winds be forecasted, CONTRACTOR shall provide every practical precaution to prevent damage to the Work, Project Site and adjacent property. CONTRACTOR precautions shall include, but not be limited to, enclosing all openings, removing and/or securing loose materials, tools, equipment and scaffolding.

B. Contractor shall provide and maintain drainage away from building(s) and structures.

C. Contractor shall implement all required storm water mitigation measures as required under related Division 01 - Sections.

3.10 DAILY AND MONTHLY REPORTS

A. Contractor shall provide and maintain in the Project Site office of CONTRACTOR, a daily sign in sheet for use by all employees of CONTRACTOR and all Subcontractors at whatever tier. At the beginning of each work day, the foreman, project manager, superintendent of CONTRACTOR and/or Subcontractors shall visit the Project Site office of CONTRACTOR and shall enter onto the daily sign in sheet: all employee names; trade classification; and represented company. The completed sign in sheet shall serve as the basis of and shall be submitted with the Daily Construction Report as set forth in Section 015000 “Construction Facilities and Temporary Controls” – 3.10B.

B. By the end of each workday, CONTRACTOR shall submit to OWNER’S REPRESENTATIVE and Inspector of Record a Daily Construction Report denoting the daily manpower counts and a brief description/location of the workday activities. Manpower shall be broken down by trade classification such as foreman, journeyman or apprentice. The report shall also note the date, day of the week, weather conditions, deliveries, equipment on the Project Site whether active and/or idle, visitors, inspections, accidents and unusual events, meetings, stoppages, losses, delays, shortages, strikes, orders and requests of governing agencies, Construction Directive and/or Change Orders received and implemented, services disconnected and/or connected, equipment start up or tests and partial use and/or occupancies. CONTRACTOR shall also include on the Daily Construction Report the above information for all Subcontractors at whatever tier.

C. Contractor shall submit on a monthly basis the forms found in Sections 015000 “Construction Facilities and Temporary Controls” certifying CEQA Mitigations and all forms as required within the approved Storm Water Pollution Prevention Plan (SWPPP).

D. Postage and Delivery Costs: Postage and delivery costs for CONTRACTOR generated materials are the responsibility of the CONTRACTOR and shall not be charged to OWNER, regardless of whether the postage and/or delivery of CONTRACTOR generated materials resulted from a request and/or direction from OWNER.

E. All other expendable field office support items specified elsewhere, including, but not limited to, furnishing toner cartridges, equipment maintenance, and bottled water, are to be supplied and paid for by CONTRACTOR. These costs are not to be deducted for the periodic replenishment of OWNER field office supplies.

3.11 CEQA MITIGATIONS – CONTRACTOR RESPONSIBILITIES

A. Air Quality

MMIII-1. Contractor shall comply with and implement the applicable provisions of the most recently adopted South Coast Air Quality Management District Rule 403 and Rule 403 Implementation Handbook.

B. Cultural Resources

CR-1 Contractor shall notify OWNER in the event that an archaeological find or a potential archaeological find is discovered and shall cease construction activities in affected area. CONTRACTOR may resume construction activities only after receiving written notice from OWNER. For work cessation beyond **five (5)** days on the critical path, CONTRACTOR will be entitled to additional days.

CR-2 Contractor shall notify OWNER in the event that human remains, or possible human remains are discovered and shall cease construction activities in affected area. CONTRACTOR may resume construction activities only after receiving written notice from OWNER. For work cessation beyond **five (5)** days on the critical path, CONTRACTOR will be entitled to additional days.

C. Noise

Noise-1. During construction, CONTRACTOR shall ensure that all construction is performed in accordance with City of Los Angeles noise standards. No noise intensive construction or repair work shall be performed between the hours of 9:00 pm and 7:00 am on any weekday, nor before 8 am or after 6 pm on any Saturday, or at any time on Sundays or federal holidays.

Noise-2. Contractor shall ensure that all internal combustion powered equipment shall be equipped with properly operating mufflers and kept properly tuned to alleviate noise and pollution.

Noise-3. During construction, CONTRACTOR shall locate portable equipment as far as possible from nearby residents.

Noise-4. Contractor shall store and maintain equipment as far as possible from nearby residents.

APPENDIX A How to format Appendix A

CONSTRUCTION INDOOR AIR QUALITY (IAQ) PLAN

The CONTRACTOR shall complete and submit this Plan to the OWNER'S REPRESENTATIVE no later than **one hundred twenty (120) days** after receipt of Notice to Proceed.

Contractor:

Name: _____ Title: _____

Telephone: _____ Fax: _____

Email: _____

I have read and understood and will implement the following Construction IAQ Plan.

Signature: _____ Date: __

I. CONSTRUCTION VENTILATION

List all project materials requiring Construction Ventilation per Specifications and CHPS Best Practices Manual, Volume III (2006 Edition), Prerequisites EQ2.0.P7-P9 and EQ2.0.P14-P15 Attach additional sheets if necessary. Circle the following Temporary Construction Ventilation approach to be used.	
A	Ventilation will be supplied via building's HVAC system. • Return air grilles are sealed. Exhaust is provided via open windows or doors. • All outside make-up air will be filtered (MERV 8) at the make-up source. • HVAC in dust-producing areas will be turned off during dust-producing activities. Exhaust for dust-producing areas will be provided using temporary fans ducted directly to the outdoors via open windows and doors
B	Ventilation will be accomplished via open windows, temporary ducts, and/or temporary fans ducted directly to the outdoors. • Supply air diffusers, return air grilles, and/or open ducts will be sealed. Make-up air will be provided through open windows or doors or other transfer air devices. • Return air grilles will be sealed.
Required	• Ventilation will provide no less than three air changes per hour. • Ventilation will be continuous for a period no less than seventy-two (72) hours after completion of installation of VOC emitting materials. • All filters used during Construction Ventilation will be replaced prior to commencing building flush-out and upon completion of building flush-out.

II. PRECONDITIONING

List all project materials requiring Preconditioning per Specifications and CHPS Best Practices Manual, Volume III (2006 Edition), Prerequisites EQ2.0.10 Attach additional sheets if necessary.

Circle the following Preconditioning approach to be used.

A	Preconditioning will occur in dry and well-ventilated offsite location. Where is the offsite location?
B	Preconditioning will occur onsite. Check the applicable approach. ☐ Ventilation will be supplied via building's HVAC system. ☐ Ventilation will be accomplished via open windows, temporary ducts, and temporary fans.
Required	• Containers and packaging will be removed prior to Preconditioning. • Preconditioning will occur for **fourteen (14)** continuous days prior to installation

III. SEQUENCING

List all project porous and fibrous materials requiring Sequencing consideration per Specifications and CHPS Best Practices Manual, Volume III (2006 Edition), Prerequisites EQ2.0.P11 Attach additional sheets if necessary.	
Required	• Previously installed Porous or Fibrous Materials located in a room where VOC-Emitting Materials are to be installed will be protected with polyethylene vapor retarder. Polyethylene will not be removed until completion of a 72-hour ventilation period. • Installation of interior finish materials will complete **fourteen (14)** days prior the commencement of building flush-out/

IV. PROTECTION

List all project materials requiring Protection per Specifications. Describe the specifics of the plan for protecting materials from dust and moisture during transportation, delivery, storage and construction. Attach additional sheets if necessary.	
Required	• Weatherproof enclosures shall be provided to store and protect the materials from moisture sources. Materials shall be protected from rain and other moisture sources and, if resting on the ground, spacers shall be used to allow air to circulate between the ground and the materials. • Materials, including porous or Fibrous Materials, with visible microbial growth shall not be installed. • Materials that are not defined as Porous or Fibrous, but with visible microbial growth, shall be decontaminated prior to installation. Lumber exhibiting a minor amount of “lumberyard mold” need not be discarded. • Temporary ventilation will be provided during all dust producing activities. See Item I, Construction Ventilation. All supply air diffusers and return air grilles in the immediate vicinity of the dust producing activities will be sealed and the HVAC system turned off . • Ductwork will be sealed during transportation, delivery, and construction.

END OF SECTION 015000 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

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SECTION 015639 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

1.2 DEFINITIONS

A. Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and defined by a circle concentric with each tree or shrub with a radius 1.25 times the diameter of the drip line unless otherwise indicated.

1.3 SUBMITTALS

1. Product Data: For each type of product indicated.
2. Samples: For each type of organic mulch in sealed plastic bags labeled with composition of materials by percentage of weight, protection-zone fencing and protection-zone signage.
3. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
4. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.
5. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.
6. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1.4 QUALITY ASSURANCE

A. Arborist Qualifications: Certified Arborist as certified by ISA, licensed arborist in jurisdiction where Project is located, current member of ASCA, or registered Consulting Arborist as designated by ASCA.

B. Preinstallation Conference: Conduct conference at Project Site.

1.5 PROJECT CONDITIONS

A. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: Natural or cultivated top layer of the soil profile or manufactured topsoil; containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 1 inch in diameter; and free of weeds, roots, and toxic and other non-soil materials.

B. Topsoil: Stockpiled topsoil from location shown on Drawings.

C. Organic Mulch: Ground or shredded bark, free from deleterious materials.

D. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements. Previously used materials may be used when approved by Architect.

1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2-inch opening, 0.148-inch- diameter wire chain-link fabric; with pipe posts, minimum 2-3/8-inch- OD line posts, and 2-7/8-inch- OD corner and pull posts; with 1-5/8-inch- OD top rails and 0.177-inch- diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.
2. Height of Fencing: 6 feet.
3. Gates: Swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones.

E. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Erosion and Sedimentation Control: Examine the Project Site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

C. Protection Zones: Mulch areas inside protection zones and other areas indicated with 6 inch average thickness of organic mulch. Do not place mulch within 6 inches of tree trunks.

3.2 PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones in a manner that will prevent people from easily entering protected area except by entrance gates.

Retain first subparagraph below for chain-link fencing.

1. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.
2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.
3. Access Gates: Install where indicated.

B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by OWNER / Architect.

C. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

D. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete, and equipment has been removed from the Project Site.

E. Upon written request from the CONTRACTOR and written approval by the OWNER and In the event that protection-zone fencing is not feasible due to construction activities, the CONTRACTOR shall provide continuous vertical 2x4 wood slat protection around the circumference of the tree up to a height of 16’-0”. The tree shall be wrapped with 1” diameter backer rod at 4’-0” on-center with the 2x4’s attached to the tree with friction securing methods only. No nails or screws shall be placed into the trees to secure the 2x4 wood slat protection system.

3.3 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Division XX – Section XXXXXX “Earth Moving / Earthwork”.

B. Trenching near Trees: Where utility trenches are required within protection zones, hand excavate under or around tree roots or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots for root pruning.

C. Do not allow exposed roots to dry out before placing permanent backfill.

3.4 ROOT PRUNING

Retain first paragraph below if construction excavation near or within a protection zone is unavoidable.

A. Prune roots that are affected by temporary and permanent construction. Prune roots as follows:

1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
2. Temporarily support and protect roots from damage until they are permanently covered with soil.
3. Cover exposed roots with burlap and water regularly.
4. Backfill as soon as possible according to requirements in Division XX – Section XXXXXX “Earth Moving / Earthwork”.

B. Root Pruning at Edge of Protection Zone: Prune roots by cleanly cutting all roots to the depth of the required excavation.

C. Root Pruning within Protection Zone: Clear and excavate by hand to the depth of the required excavation to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

3.5 CROWN PRUNING

A. Prune branches that are affected by temporary and permanent construction. Prune branches as follows:

1. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.
2. Pruning Standards: Prune trees according to ANSI A300 (Part 1).
3. Cut branches with sharp pruning instruments; do not break or chop.
4. Do not apply pruning paint to wounds.

B. Chip removed branches and dispose of offsite.

3.6 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

C. Minor Fill within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

3.7 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.8 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

1. Have arborist perform the root cutting, branch pruning, and damage repair of trees and shrubs.
2. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
3. Perform repairs within 24 hours.
4. Replace vegetation that cannot be repaired and restored to full-growth status, as determined by Architect.

3.9 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash and debris, and legally dispose of them off OWNER’S property.

END OF SECTION 015639

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SECTION 015723 - STORM WATER POLLUTION CONTROL MEASURES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The CONTRACTOR shall exercise every reasonable precaution to protect channels, storm drains, and bodies of water from pollution.

B. Conduct and schedule operations to minimize or avoid muddying and silting channels, drains, and waters.

C. As required, obtain permits for erosion and water pollution control from the appropriate jurisdictional agency before starting Work.

D. Provide any necessary water pollution control devices to prevent, control, and abate water pollution, and implement good housekeeping pollution control measures to reduce the discharge of pollutants from worksites to the maximum extent practicable. These water pollution control devices include drains, gutters, slope protection blankets and retention basins and shall be constructed concurrently with other Work at the earliest practicable time.

E. Exercise care in preserving vegetation and protecting property, to avoid disturbing areas beyond the limits of the Work. Promptly repair any damage caused by CONTRACTOR operations.

F. Comply with the specific requirements based on acreage of disturbed soil.

G. Penalties: Failure to comply with this Section may result in significant fines and possible imprisonment. The RWQCB or other prosecuting authority may assess fines of up to $32,500 per day for each violation. Should the OWNER be fined or penalized as a result of the CONTRACTOR failing to comply with this Section, the CONTRACTOR shall reimburse the OWNER for any and all fines, penalties and related costs.

H. Notification and Report: If pollution occurs in the work area for any reason or when the CONTRACTOR becomes aware of any violation of this Section, correct the problem and immediately notify the Inspector. In addition, submit a written report to the Engineer within **seven (7)** calendar days describing the incident and the corrective actions taken. If either the Inspector or Engineer is first to observe pollution or a violation, the CONTRACTOR shall also explain in the written report why the Work was inadequately monitored.

I. The provisions of this Section describe minimum compliance and do not preclude other more stringent stormwater pollution control measures that may be required in the Contract.

1.2 DEFINITIONS

A. “Construction activity": Operations such as clearing, grading, disturbances to the ground such as stockpiling, or excavation that results in soil disturbances. If construction activity is part of a larger common plan of development, the amount of disturbed soil is the total land area of disturbed soil that results under the common plan.

1.3 PAYMENT

A. All costs for work required for compliance with this Section shall be included within the Bid Prices for other items of work.

1.4 LIABILITIES AND PAYMENTS

A. A. Payment of penalties for non-compliance by CONTRACTOR shall be the sole responsibility of Contractor.

B. B. Compliance with the Clean Water Act pertaining is the sole responsibility of CONTRACTOR.Any fine against OWNER due to non-compliance by CONTRACTOR, OWNER shall recover all costs of the fine by appropriate OWNER Assessment.

1.5 COMPLIANCE PROCEDURES

A. The project requires the CONTRACTOR to develop and implement the use of storm water “Best Management Practices” (BMP) and monitoring by a Qualified SWPPP Practitioner (QSP) to comply with all provisions of the developed SWPPP for the project by the Qualified SWPPP Developer. The CONTRACTOR must fulfill all National Pollutant Discharge Elimination System (NPDES) regulatory requirements including providing a Project Site specific SWPPP.

B. The QSP and QSD shall be certified by a State Water Board – sponsored or approved training course.

C. The CONTRACTOR and any Subcontractor involved in earthwork shall:

1. Review the SWPPP.
2. Indicate, in the SWPPP, the names of all key Subcontractors involved in earthwork/ land disturbing activities.
3. Ensure that all key Project Site personnel involved in earthwork operations understand the requirements of the SWPPP.
4. Maintain a copy of the Storm Water Pollution Prevention Plan onsite at all times.

1.6 UNAUTHORIZED DISCHARGE

A. The CONTRACTOR will ensure that no unauthorized discharges leave the Project Site.

B. Failure to comply with this Specification Section may result in significant fines and possible imprisonment. The RWQCB or other prosecuting authority may assess fines for each violation. Should the OWNER be fined or penalized as a result of the CONTRACTOR failing to comply with this Section, the CONTRACTOR shall reimburse the OWNER for any and all fines, penalties and related costs.

C. The CONTRACTOR shall notify the OWNER of any discharges of other than storm water in accordance with the procedures contained in the CGP Order NO. 2009-009-DWQ.

D. If pollution occurs in the work area for any reason or when the CONTRACTOR becomes aware of any violation of this Section, immediately correct the problem and notify the inspector. In addition, submit a written report to the Engineer within **seven (7)** calendar days describing the incident and the corrective action taken. If either the Inspector or Engineer is first to observe pollution or a violation, the CONTRACTOR shall also explain in the written report why the Work was inadequately monitored.

1.7 STORMWATER POLLUTION PREVENTION PLAN

A. The BMPs contained in the Development Best Management Practices Handbook – Part A, Construction Activities cover the following categories of construction activities:

1. Site preparation/ earth removal
2. Underground structures
3. Aboveground structures
4. Roadways, walkways and parking lots
5. Planting and landscaping

B. Shall be written and amended by the Contractors Qualified SWPPP Developer (QSD).

C. The Contractors qualified SWPPP Practitioner (QSP) is required to oversee implementation of the BMPs necessary to comply with the general permit. A QSP is required to comply with:

1. Develop Rain Event Action Plan (REAP) 48 hours prior to any likely precipitation event.
2. Begin implementation of the REAP no later than 24 hours prior to the likely precipitation event.

D. The CONTRACTOR is responsible for complying with the following forms, procedures and requirements:

1. Notice of Intent
    a. The CONTRACTOR shall fill out, sign and date the Notice of Intent (NOI). Submission of the NOI is required for land disturbance as contained in the CGP Order No. 2009-009-DWQ. Before construction operations begin.
2. Notice of Termination

a. Upon Completion of the final stabilization of the construction Project Site, the CONTRACTOR shall file a Notice of Termination for the project, at the completion of the project.

3. Retention of Records

a. Keep a copy of the SWPPP in a readily accessible location at the construction Project Site from the commencement of construction activity until submission of the Notice of Termination (NOT) for storm water discharges associated with construction activity. Contractors with day to day operation control over SWPPP implementation shall have a copy of the SWPPP available at a central location, onsite, for the use of all operators and those identified as having responsibilities under the SWPPP.

4. Inspection and Monitoring Requirements

a. Inspections and monitoring shall be conducted in accordance with CGP Order NO. 2009-009-DWQ.

5. Certification Requirements

a. The persons or firms responsible for maintenance and inspection of the erosion and sediment control measures shall adhere to the minimum requirements as specified in CGP Order NO. 2009-009-DWQ.

E. Additional Permits

1. The CONTRACTOR is required to adhere to all local regulations and obtain all necessary permits as required by the local jurisdictions.

1.8 SUBMITTAL

A. Submit qualifications and certifications of qualified SWPPP Practitioner (QSP) and develop QSD.

B. Forms and documents as required by SWPPP and the QSP.

C. Submit Stormwater Pollution Prevention Plan

PART 2 - PRODUCTS

2.1 CONSTRUCTION ACTIVITY

A. Comply with the following minimum water quality protection requirements.

B. Retain eroded sediments and other pollutants onsite and do not allow transportation from the Project Site by sheet flow, swales, area drains, natural drainage, or wind. Control slope and channel erosion by implementing an effective combination of best management practices (BMPs). Such BMPs include scheduling grading during non-rainy seasons, planting and maintaining vegetation on slopes and covering erosion-susceptible slopes.

C. Protect stockpiles of earth and other construction-related materials from being transported from theProject Site by wind or water.

D. Properly store and handle fuels, oils, solvents, and other toxic materials to not contaminate the soil or surface waters, enter the groundwater, or be placed where they may enter a live stream, channel, drain, or other water conveyance facility. Protect all approved toxic storage containers from weather. Clean spills immediately and properly dispose of cleanup materials. Spills shall not be washed into live streams, channels, drains, or other water conveyance facilities. If rain or storm water runoff comes in contact with pollutants (such as soil stabilizers, paint or fluid from vehicles) report to inspector immediately. CONTRACTOR will be required to sample and remediate contaminated water.

E. Do not wash excess or waste concrete into the public way or any drainage system. Retain concrete wastes onsite until they can be appropriately disposed of or recycled.

F. Deposit trash and construction-related solid wastes in covered receptacles to prevent contamination of rainwater and dispersal by wind.

G. Do not allow sediments and other materials to be tracked from theProject Site by vehicle traffic. Stabilize construction entrance roadways to inhibit sediments from being deposited onto public ways. Immediately sweep up accidental depositions. Do not allow depositions to be washed away by rain or by any other means.

H. Contain non-stormwater runoff from equipment or vehicle washing and any other activity at the Project Site.

I. At completion of the Work, clear the worksite of debris and restore to a condition at least equal to or better than prior to construction.

J. When working in live streams, these are additional water pollution control requirements.

1. Erect barriers sufficient to prevent muddying or polluting streams.
2. Prior to removing materials from a flowing stream, use a stream bypass or other equivalent means to keep the flow in the stream free of the mud or silt from the removal operations.
3. Avoid transporting materials across live streams. If not possible, the transportation operation must be designed to prevent materials from falling into the stream and cannot muddy the stream.
4. Equipment may not be operated in a live stream or channel unless the CONTRACTOR can demonstrate to the Engineer’s satisfaction that no other practical alternatives exist. The equipment must be designed to prevent materials from falling into the stream and cannot muddy the stream.
5. Do not allow fresh Portland cement or fresh Portland cement concrete to enter the water flowing in streams, channels or drains.
6. Do not allow material derived from the Work to be deposited in a live stream, channel or drain.

PART 3 - EXECUTION

3.1 MAINTAINANCE

A. To ensure the proper implementation and functioning of control measures, the CONTRACTOR shall regularly inspect and maintain the construction Project Site. The CONTRACTOR shall identify corrective actions and time needed to address any deficient measures or reinitiate any measures that have been discontinued. Inspections of the construction Project Site shall be conducted by the CONTRACTOR to identify deficient measures, as follows.

1. Prior to a forecast storm.
2. At 24-hour intervals during extended precipitation events.
3. After all precipitation, which causes runoff capable of carrying sediment from the construction Project Site.
4. Routinely, at a minimum of once every week during the rainy season (October 1st – April 30th) and once every month during non-rainy season (May 1st – September 30th)

All temporary and/or permanent post-construction control measures shall be maintained and regularly inspected by the CONTRACTOR after all improvements are in place and accepted by the OWNER. Temporary and/or permanent post-construction landscaping maintenance shall include but not limited to, watering, seeding, hydro-seeding, matting, slope stabilization, re-vegetation, and any other maintenance control measures recommended by the OWNER to insure proper erosion control and plant growth.END OF SECTION 015723 - STORM WATER POLLUTION CONTROL MEASURES

SECTION 016010 - MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division I Specifications, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 – Section 014200 "References" specifies the applicability of industry standards to products specified.
2. Division 01 – Section 013300 "Submittal Procedures" and "Construction Schedule" specifies requirements for submittal of the Contractor's Construction Schedule and the Submittal Schedule.
3. Division 01 – Section 012500 "Substitution Procedures" specifies administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
    a. "Named Products" are items identified by the manufacture's product name, including make or model number or other designation, shown or listed in the manufacture's published product literature that is current as of the date of the Contract Documents.
2. "Materials" are products substantially shaped, cut worked, mixed finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
3. "Equipment" is a product with operation parts, whether motorized or manually operated, that requires service connections, such as wiring or piping

1.4 SUBMITTALS

A. Product List: Verify the list showing products specified in tabular form shown in the Specifications, by signing and returning the Submittal Register. Include the generic names of products required. Add the manufacturer's name and proprietary product names for each item listed.

1. Coordinate product list with the Contractor's Construction Schedule.
2. Form: Prepare product list with the information on each item tabulated under the following column headings:
    a. Submittal number per the submittal register.
    b. Proprietary name, model number, and similar designations.
    c. Manufacturer's name.
    d. Installer's name and address.
3. Initial Submittal: Within **fifteen (15)** days of the first Notice to Proceed, submit one electronic copy of all required submittals. Provide a written explanation for omissions of data and for known variations from Contract requirements.
4. Architect Action: The Architect will respond in writing to CONTRACTOR within **twenty-one (21)** days of receipt of the submittals. A review constitutes no objection to listed manufacturers or products but does not constitute a waiver of the requirements that products comply with Contract Document.

1.5 QUALITY ASSURANCE

A. Source Limitation: To the fullest extent possible, provide products of the same kind a single source.

1. When specified product are available only from sources that do not, or cannot, produce a quantity adequate to complete project requirements in a timely manner consult with the OWNER'S REPRESENTATIVE and the Architect to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability or compatibility. When a determination has been made, select products from sources producing products that possess these qualities, to the fullest extent possible.

B. Compatibility of Option: When the CONTRACTOR is given the option of selecting between two (2) or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. Contractor is responsible for providing products and construction methods that are compatible with products and construction methods of other the Subcontractors.
2. If a dispute arises between Subcontractors over concurrently selectable, but incompatible products, the CONTRACTOR will determine which products shall be retained and which are incompatible and must be replaced.

C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data.

a. Name of product and manufacturer

b. Model and serial number

c. Capacity

d. Speed

e. Ratings

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products according to the manufacture's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.

1. Provide products completed with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.

2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selections Procedures: The Contract Documents and governing regulations govern product selection. Procedures governing product selections include the following:

1. Proprietary Specifications Requirements: Where Specifications name only a single product or manufacturer, and indicate "no substitutions" permitted, provide the product indicated. No substitutions will be permitted.

2. Semi Proprietary Specifications Requirements: Where Specifications name two (2) or more products or manufacturers, provide one (1) of the products indicated. No substitutions will be provided.

a. Where Specifications specify products or manufacturers by name accompanied by the term “or equal” or “or approved equal,” comply with the Contract Document provisions concerning “substitutions” to obtain approval for use of an unnamed product.

3. Nonproprietary Specifications: When Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the CONTRACTOR to use of these products only, the CONTRACTOR may propose any available product that complies with Contract Requirements. Comply with Contract Document provisions concerning “substitutions” to obtain approval for use of an unnamed product.

4. Descriptive Specifications Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics. And otherwise complies with Contract requirements.

5. Performance Specifications Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated.

   a. Manufacturer’s recommendations may be contained in published product literature or by manufacturer’s certification of performance.

6. Compliance with Standards, Codes, and Regulations: Where Specifications only required compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.

7. Visual Matching: Where Specifications required matching an established Sample, the Architect’s decision will be final on whether a proposed product matches satisfactorily.

   a. Where no product available within the specified category matches satisfactorily and/or complies with other specified requirements, comply with provisions of the Contract Documents concerning “substitutions,” for selecting the matching product in another product category.

8. Visual Selection: Where specified product requirements include the phrase “…as selected from manufacturer’s standard colors, patterns, textures…” or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern, and texture from the product line selection.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Comply with manufacturer’s instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 016010 - MATERIALS AND EQUIPMENT

SECTION 017000 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

B. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.
9. Correction of the Work.
10. Final Acceptance

C. Related Sections:

1. Division 01 - Section 012500 "Submittal Procedures" for submitting surveys.
2. Division 01 - Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
3. Division 02 - Section XXXXXX "Selective Demolition" for demolition and removal of selected portions of the building.
4. Division 07 Section XXXXXX "Through-Penetration Firestop Systems" for patching penetrations in fire-rated construction.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Land Surveyor or Professional Engineer.

B. Certificates: Submit certificate signed by Land Surveyor or Professional Engineer certifying that location and elevation of improvements comply with requirements.

C. Certified Surveys: Submit seven (7) copies signed by Land Surveyor or Professional Engineer. Provide both electronic CAD file and hard copy.

D. Final Property Survey: Submit seven (7) copies showing the Work performed and record survey data. Provide both electronic CAD file and hard copy.

1.4 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional Land Surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Professional Engineer Qualifications: A Professional Engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

C. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: Do not cut and patch structural elements unless detailed on structural drawings.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include but are not limited to the following:

    a. Primary operational systems and equipment.

    b. Fire separation assemblies.

    c. Air or smoke barriers.

    d. Fire-suppression systems.

    e. Mechanical systems piping and ducts.

    f. Control systems.

    g. Communication systems.

    h. Conveying systems.

    i. Electrical wiring systems.

    j. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
    a. Water, moisture, or vapor barriers.
    b. Membranes and flashings.
    c. Exterior curtain-wall construction.
    d. Equipment supports.
    e. Piping, ductwork, vessels, and equipment.
    f. Noise- and vibration-control elements and systems.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

D. Cutting and Patching Conference: Before proceeding, meet at Project Site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

E. Manufacturer's Installation Instructions: Obtain and maintain onsite manufacturer's written recommendations and instructions for installation of products and equipment.

1.5 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
    1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project Site.
3. Contractor shall locate by tracing/potholing all existing utilities in the areas where new trenching/utilities are proposed to be provided to avoid conflict and causing damage to existing utilities. All cost for repair of utilities damaged during trenching or placement of new utilities shall be borne by the CONTRACTOR.CONTRACTOR shall sequence potholing in advance or ahead of each such activities and show sequence of potholing. Plan to be submitted to OWNER'S REPRESENTATIVE for approval.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations. Examine surfaces to be cut and patched. Determine conditions under which cutting and patching are to be performed.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
    a. Description of the Work.
    b. List of detrimental conditions, including substrates.
    c. List of unacceptable installation tolerances.
    d. Recommended corrections.
2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility and the OWNER'S REPRESENTATIVE and Architect that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the CONTRACTOR, submit a request for information or interpretation to Architect according to requirements in Division 01 - Section 013100 "Project Management and Coordination."

E. Surface and Substrate Preparation: Comply with manufacturer's recommendations for preparation of substrates to receive subsequent work.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify OWNER'S REPRESENTATIVE and Architect promptly.

B. General: Engage a Land Surveyor or Professional Engineer to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
3. Inform installers of lines and levels to which they must comply.
4. Check the location, level and plumb, of every major element as the Work progresses.
5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
6. Close Project Site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out Project Site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Identification Identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project Site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major Project Site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and Project Site work.

E. Final Property Survey: Engage a Land Surveyor or Professional Engineer to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by Land Surveyor or Professional Engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, Project Site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
   4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.

B. Contractor shall coordinate work prior to field installation. CONTRACTOR will receive a ‘no merit’ response on any change request for failure by the CONTRACTOR or it’s Sub-Contractors improperly or insufficiently coordinate their work with the drawings, Specifications, manufacturer’s installation instructions and other trades work.

C. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

D. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

E. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
   2. Allow for building movement, including thermal expansion and contraction.

3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project Site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Temporary Support: Provide temporary support of work to be cut.

C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements of Division 01 - Section 011100 "Summary."

E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Division 02 Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

6. Proceed with patching after construction operations requiring cutting are complete.

G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

a. Clean piping, conduit, and similar features before applying paint or other finishing materials.

b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather tight condition.

H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project Site for OWNER'S construction personnel working on Campus.

B. Coordination: Coordinate construction and operations of the Work with work performed by OWNER'S construction personnel and other Contractors working on Campus.

1. Construction Schedule: Inform the OWNER'S REPRESENTATIVE of Contractor's preferred Construction Schedule for OWNER'S portion of the Work. Adjust Construction

Schedule based on a mutually agreeable timetable. Notify the OWNER'S REPRESENTATIVE if changes to schedule are required due to differences in actual construction progress.

2. Preinstallation Conferences: Include OWNER'S construction personnel at preinstallation conferences covering portions of the Work that are to receive OWNER'S work.

3.8 PROGRESS CLEANING

A. General: Clean Project Site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold waste materials more than **seven (7)** days during normal weather or **three (3)** days if the temperature is expected to rise above 80 deg F (27 deg C).

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

a. Utilize containers intended for holding waste materials of type to be stored.

B. Site: Maintain Project Site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials onsite. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 - Section 017419 "Construction Waste Management."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components.

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Division 01 - Section 014000 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.11 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

3.12 FINAL ACCEPTANCE

A. Contractor shall satisfy or correct all deviations cited on the Deviation Notices issued by the Project Inspector and/or DSA Field Engineer before Substantial Completion can be established and before Final Acceptance. Any correction or remedy shall be at no cost to the OWNER, but not limited to, design fees, labor, material and equipment cost.

END OF SECTION 017000 - EXECUTION REQUIREMENTS

SECTION 017123 - FIELD ENGINEERING AND SURVEY CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

B. Section Includes

1. Surveying requirements for the Work.

C. Related Sections

1. Division XX – Section XXXXXX “Earth Moving / Earthwork”
2. Division XX – Section XXXXXX “Asphalt Pavement”
3. Division XX – Section XXXXXX “Storm Utility Drainage Piping”
4. Division XX – Section XXXXXX “Cast-in-Place Concrete”
5. Division XX – Section XXXXXX “Sanitary Sewer”

1.2 WORK INCLUDED

A. Work by CONTRACTOR under this Section shall include but may not be limited to the following.

1. Establish and maintain additional horizontal and vertical control, lines and grades as required for construction layout survey.
2. Survey and measurement necessary to establish design lines and grades shown on the Construction Documents.
3. Document and field verify removal of foundations and other structures to the specified elevations.
4. Document foundations and new and existing utilities to remain.
5. Provide a certified as-built survey based upon the field measurements of all utilities and drainage work in accordance with the State of California Business and Professional Code Sec. 6735.6.
6. All maps, plans, reports, descriptions or other documents issued by the Contractor’s Licensed Land Surveyor shall be stamped and signed by the Registered Professional responsible for the work.
7. Land Surveyor shall provide one (1) electronic copy and one (1) hard copy of the cut sheets upon completion of staking to the OWNER.

1.3 SURVEY SERVICE

A. Unless otherwise stated by the Architect or noted in the Special Provisions, the CONTRACTOR shall provide all surveying services.

B. All surveying shall be performed by a State of California Licensed Land Surveyor or a Registered Civil Engineer authorized to practice Land Surveying in the State of California or under his/her direction in conformance with the requirements of the Professional Land Surveyors Act.

1.4 QUALITY CONTROL

A. The CONTRACTOR shall maintain a complete and accurate log of all control and survey work as it progresses.

B. The District, or their consultants, reserves the option to check the Contractor's field survey measurements and calculations. Whether the District exercises this option or not, the CONTRACTOR shall perform accurate survey work meeting recognized industry standards.

1.5 PAYMENT FOR SURVEYING

A. The payment for surveying shall be included in respective items of work and shall include, but not to be limited to, construction staking, location and/or relocation of conflicting utilities, locating survey monuments, setting of survey monuments and center line ties, preparing and filing centerline tie sheets and Corner Records, locating Bench Marks and notifying the Office of the County Surveyor of same, professional office services and field calculations, and furnishing all labor, materials, tools, equipment and incidentals for doing all work involved. No additional compensation shall be allowed unless a separate bid item is provided.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 SUBMITTALS

A. CONTRACTOR shall submit the name and address of the State of California licensed surveyor to OWNER'S REPRESENTATIVE, Architect and OWNER including any changes as they may occur.

B. Contractor shall submit to OWNER'S REPRESENTATIVE, Architect and/or OWNER copies of cut sheets, coordinate plots, data collector printouts, and other documentation as available to verify completeness and/or accuracy of field surveying work.

C. Statement of Compliance: CONTRACTOR shall submit a statement of certification signed and sealed by Surveyor, counter-signed by CONTRACTOR indicating compliance with grade elevations, slopes and tolerances.

3.2 PAYOUT OF THE WORK

A. CONTRACTOR shall employ a State of California licensed surveyor to lay out the entire Work, set grades, lines, levels, control points, vertical and horizontal control, elevations, grids and positions. Before the commencement of Work, surveyor shall, , locate all reference points and benchmarks, then lay out all lines, elevations, and measurements for the entire Work including but not limited to, buildings, grading, paving and utilities.

B. All work under this contract shall be built in accordance with the lines and grades shown on the plans. Field survey for establishing these, and for the control of construction, shall be the responsibility of the CONTRACTOR. All such survey work including construction staking shall be done under the supervision of a California Licensed Land Surveyor or authorized Civil Engineer. Staking shall be done on all items ordinarily requiring grade and alignment, at intervals normally accepted by the agencies and trade involved.

C. The CONTRACTOR shall be responsible for any errors in the finished work, and shall notify the District, in writing, within 24 hours, of any discrepancies, or design errors during the construction staking.

D. Contractor shall immediately remediate any areas found not to meet specification requirements.

3.3 PERMANENT SURVEY MARKERS

A. Prior to the start of construction, the Contractor’s licensed Land Surveyor or qualified Civil Engineer shall, in conformance with Section 8771 of the California State Business and Professions Code, locate all monuments (both of record and not of record), bench marks, and centerline ties within the construction zone, i.e., within one hundred feet of the construction activity. Additional ties to monuments shall be set when ties are missing (min. 4 ties per monument). The Contractor’s Surveyor or qualified Civil Engineer shall prepare and submit for review to the City Engineer separate tie sheets and Corner Record sheets (monuments not of record shall have only tie sheets prepared). Corner Records shall conform to the County Engineers’ Association of California’s “Guide to the Preparation of Records of Survey and Corner Records” document as provided by the County Surveyor’s Office. Upon review by the City Engineer, the Land Surveyor shall file the Corner Records with the County Surveyor’s Office. Certified Corner Records shall be filed with the City Engineer of the City that the work is being completed in.

B. After construction and prior to final acceptance by the OWNER of the construction project, the Contractor’s Land Surveyor or qualified Civil Engineer shall re-survey all field monuments and centerline ties within the construction zone, prepare tie sheets and Corner Record sheets as indicated above, and file them with the City Engineer for review. After review by the City Engineer, the Land Surveyor shall file the Corner Records with the County Land Surveyors Office, and file certified copies of the Corner Records with the City Engineer.

C. All survey monuments removed or altered as a result of construction shall be reset, Corner Records filed with the County Surveyor’s Office, and approved final Corner Records filed with

the City Engineer. Centerline ties removed as a result of construction shall be reset and tie sheets filed with the City Engineer.

D. The Land Surveyor shall provide a letter of certification for all monuments having four or more existing ties which are within 0.02 ft plus or minus of the original City tie sheet records. When several monuments and ties appear on one tie sheet and one of the ties has changed the Land Surveyor shall re-measure all of the ties and re-file a new tie sheet with the City as required herein.

E. County of Los Angeles permanent and temporary bench marks within the construction zone shall be located by the surveyor, and the Contractor's Land Surveyor shall send a written notification of impending construction to the County of Los Angeles Surveyor's Office two weeks prior to construction.

3.4 SURVEY REQUIREMENTS

A. Utilize a minimum of two Record Control points on the Project Site, remote from the building area, referenced to data established by the survey control points.

1. Re-establish the basis of bearings and benchmark as shown on the approved plans.
2. All control to be tied to the basis of bearings and benchmarks.

B. Indicate the reference points on the project record drawings with the basis of elevation being the established benchmarks.

C. Establish lines, grades, locations and dimensions by instrumentation. From time to time, verify the layout of all Work by the same methods.

D. Provide grade stakes and elevations to construct over excavation and re-compaction, rough and final grades, paved areas, curbs, gutters, sidewalks, building pads, landscaped areas, and other areas as required.

E. Calculate and layout proposed finished elevations and intermediate control as required to provide smooth transitions between the spot elevations indicated in the Contract Documents.

F. Provide stakes and elevations for grading, fill, and topsoil placement.

G. Provide adequate horizontal and vertical control to locate utility lines, including but not limited to, storm, sewers, water mains, gas, electric and signal and provide vertical control in proportion to the slope of the line as required for accurate construction. Dry utilities will be based upon adequate horizontal and vertical control layout. Prior to trench closure, survey and record invert and flow line elevations. Survey and record top of curb and flow line elevations on finished concrete or AC surfaces at key locations such as BC's, EC's, grade breaks, corners or angle points in sufficient number to demonstrate the Work complies with the intent of the Contract Documents.

H. Provide horizontal and vertical control for batter boards for drainage, utility, and other onsite structures as required.

I. Furnish building corner offsets as required to adequately locate building pads. Provide cut and fill stakes within the building pad perimeter adequate to control both over excavation and re-compaction and the final sub-grade elevation of the building pad.

J. Submit a certification, signed by the surveyor, confirming the elevations and locations of improvements are in conformance with the Contract Documents. The statement shall include survey notes for the finish floor and building pad, showing the actual measured elevations on the completed sub-grade, recorded to the nearest 0.01'. Building pad tolerance will be +- 0.10'.

3.5 ESTABLISHMENT OF GRADES IN HARDSCAPE AREAS

A. All work shall conform to the lines, elevations, and grades shown on the Grading Plans. Three consecutive points set on the same slope shall be used together so that any variation from a straight grade can be detected. Any such variation shall be reported to the Engineer. In the absence of such report, the CONTRACTOR shall be responsible for any error in the grade of the finished work.

B. Areas having drainage gradients of 2 percent or more shall have elevation stakes, set with instrument, at grid intervals of 25 feet. Intermediate stakes may be set by using a tightly-drawn string line over the tops of adjacent stakes. Grade stakes must be set at all grade breaks, grade changes, etc.

C. Areas having drainage gradients of less than 2 percent shall have elevation stakes, set with instrument, at 10 foot intervals. Grade stakes must be set at all grade breaks, grade changes, etc.

D. Protect and maintain stakes in place until their removal is approved by the OWNER. Grade or location stakes lost or disturbed by CONTRACTOR, shall be reset by the Surveyor at the expense of Contractor.

3.6 STORM DRAIN AND SANITARY SEWER PIPE INSTALLATION

A. All storm drain pipelines, sanitary sewer pipelines, trench drains, catch basins, cleanouts and drain inlets shall be staked by a licensed surveyor if slope of grade is less than 2% and a complete set of cut sheets shall be supplied to the Inspector. All construction staking shall be installed and verified for grade and alignment prior to the start of construction.

3.7 UTILITY BACKFILL

A. Prior to placing backfill, the CONTRACTOR shall perform as-built surveys based upon field measurements by the Land Surveyor to accurately record the installed depth, alignment, location of bends, valves, vaults, duct banks, manholes and all other items or conditions to provide an accurate record of all below–grade utilities. The field survey shall consist of Point number, Northing/Easting coordinates and Elevation (based on project datum), and limits of any structure, utility or other existing or new underground feature that will remain in place and be covered by the backfill.

3.8 RECORD DRAWINGS

A. Upon Substantial Completion, CONTRACTOR shall obtain and pay for electronic copies (CADD and pdf) of the as built survey drawings. Deliver to OWNER'S REPRESENTATIVE, Architect, final "record" drawings of the original drawings and completed Work within specified tolerances.

B. Record drawings shall indicate locations by coordinate of all utilities onsite with top of pipe elevations at major grade and alignment changes, rim grate or top-of-curb and flow line elevations of all drainage structures and manholes.

C. Completed record drawing shall be signed and certified as correct and within specified tolerances by the licensed surveyor.

D. Contractor to provide one (1) hard copy and one (1) electronic CADD copy of the completed record drawings certified by the licensed surveyor.

E. Attention is called to other sections of the Contract Documents requiring verification or measurements of installed Work by survey. Surveyor shall perform and certify all such surveys or verification are completed in accordance with the Contract Documents.

END OF SECTION 017123 - FIELD ENGINEERING AND SURVEY CONTROL

SECTION 017417 - CLEANING AND SITE APPEARANCE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DESCRIPTION

A. Principal work in this Section:

1. Keep premises, adjacent private properties and public properties free from accumulations of waste, debris and rubbish caused by construction operations daily.
2. Maintain construction area in a neat and workmanlike manner. Keep all tools, equipment, and materials stored in an organized and secure fashion. Avoid layouts or methods that create a public eyesore.
3. At completion of work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all exposed surfaces.

B. Related Documents:

1. General Conditions – Article 3.12.2 for information on scope of general final clean up.

1.3 SAFETY REQUIREMENTS

A. Standards: Maintain project in accord with State and local safety standards.

B. Hazard Control

1. Store volatile wastes in covered metal containers and remove waste from premised daily.
2. Prevent accumulation of wastes which create hazardous conditions.
3. Provide adequate ventilation during use of volatile or noxious substances.
4. Prevent accumulation of waste that may attract rodents, insects, or other pests.

C. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

1. Do not turn or bury rubbish and waste materials on Project Site.
2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains, or the OWNER'S waste containers. Store in containers with tight-fitting lids and remove to legal dump site.

3. Comply with the Los Angeles County, State of California, or City of Inglewood, which ever applies, Stormwater Pollution Control Requirements for Construction Sites which require implementation of the NPDES standards and SCAQMD requirements. The cost of implanting these standards and adhering to the Stormwater Pollution Control Requirements must be included in the lump sum bid for the Project.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Use cleaning materials which will not create hazardous to health or property and which will not damage materials. Use cleaning materials and methods recommended by the manufacturer of the surface material to be cleaned. Use cleaning materials only on surfaces recommended by the cleaning materials manufacturer.

PART 3 - EXECUTION

3.1 CLEAN-UP DURING CONSTRUCTION

A. Keep premises, adjacent properties and public properties free from accumulations of waste materials and rubbish. Remove debris and dirt from public property promptly: sweep sidewalks and adjacent streets daily when soiled by work performed under this Contract. Maintain the existing landscaped areas within the fenced area of the construction Project Site, including but not limited to weekly mowing and irrigation as required.

B. Remove or paint over, as appropriate to the substrate, graffiti on the Project Site or surrounding fence daily.

C. Wet down materials and rubbish to settle dust and prevent it from blowing.

D. At least once a week, or more often if required, dispose of waste materials, debris and rubbish off the Project Site in a legal manner. Remove combustible materials such as paper and cardboard daily. Bury no such waste material and debris on the Project Site. Burning of trash and debris on the Project Site will not be permitted. All containers must be emptied as soon as they reach 75% of capacity.

E. Provide onsite containers for collection of waste materials, debris and rubbish. Provide a collection can at each location used as an eating area. Pick-up all garbage daily.

F. At the conclusion of each work day, CONTRACTOR will walk the Project Site and collect all debris and rubbish and store all loose materials.

G. Remove waste materials, debris and rubbish from Project Site and legally dispose of at legal public or private dumpling areas off OWNER’S property. Location of dump for trash and debris and length of haul is to the Contractor’s responsibility.

H. Handle materials in a controlled manner with as few handlings as possible, do not drop or throw materials from heights.

I. Owner's right to provide clean up at the Contractor's Expense.

1. Should the OWNER'S REPRESENTATIVE, or Inspector of Record determine that the CONTRACTOR is failing to maintain the Project Site in a properly clean and safe manner, they will notify the CONTRACTOR that corrective action must be taken. Should the Contractors fail to clean the Project Site after sufficient notification, the OWNER reserves the right to have the Project Site cleaned at the Contractor's expense.

2. In the case of public or safety hazard, the OWNER reserves the right to have the hazard corrected immediately at the Contractor's expense.

J. Contaminated Earth:

1. Clean-up operations include the removal and disposal of earth contaminated or unsuitable for support of plant life in planting areas. Clean-up operations also include filling of resulting excavations with suitable soil.

2. Contaminated areas include those used for disposal of waste concrete, mortar, plaster, masonry, and similar materials, areas in which washing out of concrete and plaster mixers or washing of tools and like cleaning operations have been performed, and areas that have been oiled, paved, or chemically treated.

3. Do not dispose of waste oil, solvents, paint, solutions, mortar, concrete of any construction material or like penetrating material by depositing or burying on the OWNER'S property.

3.2 FINAL SITE CLEAN-UP:

A. In preparation of Substantial Completion or Occupancy conduct a thorough cleaning of all work.

B. Before final inspection and after all construction activity is essentially complete, thoroughly clean the buildings, utilizing professional building cleaners. Items to be cleaned include, but are not limited to: all glass, plastic, doors, opening frames, grilles, trim, exposed nonferrous metal surfaces, floor covering, light fixtures and plates, plumbing fixtures and trim, and all finish surfaces throughout the construction. Thoroughly remove ink trademarks from all surfaces, Vacuum clean the buildings (s) and remove all spots, smears, dust, debris, hand prints and defacements of every sort, including those of vandals. Follow the recommendations of the manufacturer of the materials and items to be cleaned for all cleaning, polishing, and treatment such as waxing.

C. Repair, patch and touch-up marred surfaces to specified finish to match adjacent surfaces.

D. Also, before final inspection, thoroughly clean the entire Project Site and put it into a neat, acceptable condition. Remove from the entire Project Site all construction waste and unused materials, rubbish, loose rock and stones, excess earth, roots, weeds, and all debris of any description resulting from the Work. Hose down and scrub where necessary all new concrete and asphalt pavement and walks dirtied as a result of the Work. Thoroughly remove mortar droppings from concrete walks and other pavements.

E. Keep project clean until Final Acceptance by the OWNER.

1. 1Should the OWNER'S REPRESENTATIVE or Inspector of Record determine that the CONTRACTOR is failing to maintain the Project Site in a properly clean and safe manner, they will notify the CONTRACTOR that corrective action must be taken. Should the CONTRACTOR fail to clean the Project Site after sufficient notification, the OWNER reserves the right to have the Project Site cleaned at the Contractor's expense.

2. In the case of public or safety hazard, the OWNER reserves the right to have the hazard corrected immediately, at the Contractor's expense.

END OF SECTION 017417 - CLEANING AND SITE APPEARANCE

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for the following:

1. Recycling nonhazardous demolition and construction waste.
2. Disposing of nonhazardous demolition and construction waste.

B. Related Sections include the following:

1. Division 01 - Section 015000 "Construction Facilities and Temporary Controls" for environmental-protection measures during construction.
2. Division XX Section XXXXXX "Selective Demolition" for disposition of waste resulting from partial demolition of building(s), structures, and Project Site improvements.
3. Division XX Section XXXXXX "Site Clearing" for disposition of waste resulting from Project Site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

A. Construction Waste: Building and Project Site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and Project Site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal offsite of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE GOALS

A. Salvage/Recycle Goals: OWNER'S goal is to salvage and recycle not less than 50 percent of nonhazardous demolition and construction waste including the following materials:

1. Demolition Waste:

a. Asphaltic concrete paving.

b. Concrete.

c. Concrete reinforcing steel.

d. Brick.

e. Concrete masonry units.

f. Wood studs.

g. Wood joists.

h. Plywood and oriented strand board.

i. Wood paneling.

j. Wood trim.

k. Structural and miscellaneous steel.

l. Rough hardware.

m. Roofing.

n. Insulation.

o. Doors and frames.

p. Door hardware.

q. Windows.

r. Glazing.

s. Metal studs.

t. Gypsum board.

u. Acoustical tile and panels.

v. Carpet.

w. Carpet pad.

x. Demountable partitions.

y. Equipment.

z. Cabinets.

aa. Plumbing fixtures.

bb. Piping.

cc. Supports and hangers.

dd. Valves.

ee. Sprinklers.

ff. Mechanical equipment.

gg. Refrigerants.

hh. Electrical conduit.

ii. Copper wiring.

jj. Lighting fixtures.

kk. Lamps.

ll. Ballasts.

mm. Electrical devices.

nn. Switchgear and panel boards.

oo. Transformers.

2. Construction Waste:

a. Site-clearing waste.

b. Lumber.

c. Wood sheet materials.

d. Wood trim.

e. Metals.

f. Roofing.

g. Insulation.

h. Carpet.

i. Gypsum board.

j. Piping.

k. Electrical conduit.

l. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

1) Paper.

2) Cardboard.

3) Boxes.

4) Plastic sheet and film.

5) Polystyrene packaging.

6) Wood crates.

7) Plastic pails.

1.5 SUBMITTALS

A. Waste Management Plan: Submit one electronic copy of plan to OWNER'S REPRESENTATIVE within **ten (10)** days of date established for the Notice to Proceed.

B. Contractor shall submit weight tickets, bill of ladings, or tonnage reports of any waste materials sent out for recycling from a work Project Site within the District to the OWNER'S REPRESENTATIVE on a monthly basis with the Pay Application submission.

1.6 INFORMATIONAL SUBMITTALS

A. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

B. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

C. Qualification Data: For refrigerant recovery technician.

D. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

B. Regulatory Requirements:

1. Comply with hauling and disposal regulations of authorities having jurisdiction.
2. Comply with applicable provisions in California Integrated Waste Management Act of 1989 (AB 939).
3. Comply with applicable provisions in California Code of Regulations Title 14, Section 18700 et seq.

C. Waste Management Conference: Conduct conference at Project Site to comply with requirements in Division 01 - Section 013100 "Project Management and Coordination". Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of Design-Builder's Waste Management Coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.

3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.8 WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification, waste reduction work plan. Include separate sections in plan for demolition and construction waste. Indicate quantities by weight or volume but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
   1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
   2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
   3. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project Site where materials separation will be located.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement waste management plan as approved by OWNER. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
   1. Comply with Division 01 - Section 015000 "Construction Facilities and Temporary Controls" for operation, termination, and removal requirements.

B. Training: Train workers, Subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project Site.

1. Distribute waste management plan to everyone concerned within **three (3)** days of submittal return.
2. Distribute waste management plan to entities when they first begin work onsite. Review plan procedures and locations established for salvage, recycling, and disposal.

C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project Site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Division 01 - Section 015000 "Construction Facilities and Temporary Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by onsite workers.

B. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project Site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project Site. Include list of acceptable and unacceptable materials at each container and bin.
    a. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials onsite without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off OWNER’S property and transport to recycling receiver or processor.

3.3 RECYCLING DEMOLITION WASTE

A. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.

B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

1. Break up and transport concrete to concrete-recycling facility.

C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. Clean and stack undamaged, whole masonry units on wood pallets.

2. Transport masonry to masonry-recycling facility.

D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

E. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.

2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

F. Asphalt Roofing: Separate organic and glass-fiber asphalt felts. Remove and dispose of nails, staples, and accessories.

G. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

H. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

1. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.

I. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

1. Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

J. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

K. Plumbing Fixtures: Separate by type and size.

L. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

M. Lighting Fixtures: Separate lamps by type and protect from breakage.

N. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panel boards, circuit breakers, and other devices by type.

O. Conduit: Reduce conduit to straight lengths and store by type and size.

3.4 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.

2. Polystyrene Packaging: Separate and bag materials.

3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project Site. For pallets that remain onsite, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Site-Clearing Wastes: Chip brush, branches, and trees onsite or at landfill facility.
1. Comply with requirements in Division XX Section XXXXXX "Exterior Plants" for use of chipped organic waste as organic mulch.

C. Wood Materials:
1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
a. Comply with requirements in Division XX Section XXXXXX "Exterior Plants." for use of clean sawdust as organic mulch.

D. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.
1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
a. Comply with requirements in Division XX Section XXXXXX "Exterior Plants." for use of clean ground gypsum board as inorganic soil amendment.

3.5 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project Site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate onsite.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off OWNER’S property and legally dispose of them.

END OF SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Project record documents submittal
4. Operation and maintenance manual submittal
5. Warranties.
6. Owner orientation and instruction
7. Final cleaning.

B. RELATED SECTIONS

1. Division 01 - Section 017000 "Execution Requirements" for progress cleaning of Project Site.
2. Division 01 - Section 017839 “Project Record Documents” for submitting Record Drawings, Record Specifications, and Record Product Data.
3. Division 01 - Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
4. Division 01 - Section 017900 "Demonstration and Training" for requirements for instructing OWNER’S personnel.
5. Divisions 02 through XX Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.

2. Advise OWNER of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting OWNER unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by OWNER. Label with manufacturer's name and model number where applicable.
7. Make final changeover of permanent locks and deliver keys to OWNER. Advise OWNER'S personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project Site, along with mockups, construction tools, and similar elements.
11. Advise OWNER of changeover in heat and other utilities.
12. Completion of Commissioning and addressing all commissioning items from the final report.
13. Submit changeover information related to OWNER'S occupancy, use, operation, and maintenance.
14. Complete final cleaning requirements, including touchup painting.
15. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
16. Receive signed entire scope of work DSA form 6-PI from project Inspector of Record and signed entire scope of work DSA form 6-AE from the Architect of Record and the project design engineers of record.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, the OWNER'S REPRESENTATIVE and Inspector of Record will either proceed with inspection or notify CONTRACTOR of unfulfilled requirements. The OWNER'S REPRESENTATIVE will prepare the Certificate of Substantial Completion after inspection or will notify CONTRACTOR of items, either on Contractor's list or additional items identified by the OWNER'S REPRESENTATIVE, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.4 PROJECT RECORD DOCUMENT SUBMITTAL

A. General: Do not use project record documents for construction purposes. Protect record documents from deterioration and loss. Provide access to record documents for OWNER'S REPRESENTATIVE or Inspector of Record and reference during normal working hours. Project record document shall be updated on a weekly basis. Prior to submitting each application for payment, secure Inspector of Record and OWNER'S REPRESENTATIVE approval of project record documents.

B. Record Drawings: Maintain, in accordance with specification 17839 – Project Record Documents, one (1) electronic copy of the drawings and one (1) clean, undamaged set of blue or black line white prints of Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which Drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Drawings. Provide detailed and accurate field dimensions for concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work. Date and number entries in the same format as submitted. Call attention to entry by a "cloud" around the affected areas.
2. Mark new information important to OWNER but was not shown on Drawings or Shop Drawings.
3. Utility location and depth below finished grade and above ceilings and attic spaces shall be fully dimensioned and indicated on record drawings. Dimensions shall be measured from building lines or permanent landmarks and shall be triangulated to those features.
4. Note related Change Order or Construction Directive numbers where applicable. RFI submissions shall be referenced on each affected sheet, Drawing and Shop Drawing.
5. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.
6. Prior to Contract Completion of the Work, review and approval of the project record drawings by the CONTRACTOR and Architect is required. Prepare a final set of project record drawings using reproducible vellum. Submit final set of Record Drawings in pdf format and CADD/BIM, to OWNER'S REPRESENTATIVE for review and acceptance.

C. Record Specifications: Maintain, in accordance with specification 17839 – Project Record Documents, one (1) electronic copy of the specification and two (2) hard copies of the Specifications, including Addenda. Include with the Specifications two copies of other written Contract Documents, such as Change Orders or Construction Directives issued during construction.

1. Mark these record documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
2. Give particular attention to substitutions and selection of options and information on concealed Work that cannot otherwise be readily discerned later by direct observation.

3. Note related record document information with Product Data.
4. Prior to Contract Completion of the Work, submit record Specifications to OWNER records.

D. Record Product Data: Maintain two copies of each Product Data submittal. Note related Change Orders and Construction Directives and mark-up of record drawings and Specifications.

1. Mark these documents to illustrate significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the Project Site and from the manufacturer's installation instructions and recommendations.
2. Provide detailed and accurate information regarding concealed products and portions of Work that cannot otherwise be readily discerned later by direct observation.
3. Prior to Contract Completion, submit complete set of record Product Data to OWNER records.

E. Record Samples: Immediately prior to Substantial Completion, CONTRACTOR shall meet with OWNER'S REPRESENTATIVE at the Project Site to determine which Samples are to be transmitted to OWNER for record purposes. Comply with OWNER'S REPRESENTATIVE instructions regarding delivery to OWNER storage area.

F. Miscellaneous Records: Refer to other Specification sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Prior to the date of Contract Completion, complete and compile miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit for OWNER records.

G. Maintenance Manuals: Prior to Substantial Completion, organize operation and maintenance data into suitable two sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-3", 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Submit to OWNER records. Include the following types of information. All information contained in the Maintenance Manuals are also required in pdf. electronic format. PDF documents shall be readable, searchable and provide bookmarks to separate sections to properly organize the information.

1. Emergency instructions
2. Spare parts list
3. Copies of warranties
4. Wiring diagrams
5. Recommended "turn-around" cycles
6. Inspection procedures
7. Shop Drawings and Product Data
8. Fixture lamping schedule

H. Verified Reports: Construction progress of the Work shall be reported to DSA via a duly verified report as per Sections 4-336 and 4-343 of the California Building Standards Administrative Code.

1.5 OPERATION AND MAINTENANCE:

A. Operation and Maintenance Instructions: Prior to Substantial Completion, arrange for each installer of equipment that requires regular operation and maintenance to meet with designated OWNER personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:

1. Maintenance manuals
2. Spare parts and materials
3. Tools
4. Lubricants
5. Fuels
6. Identification systems
7. Control sequences
8. Hazards
9. Cleaning
10. Warranties and bonds
11. Maintenance agreements and similar continuing commitments

B. As part of instruction for operating equipment, demonstrate the following procedures:

1. Start-up
2. Shutdown
3. Emergency operations
4. Noise and vibration adjustments
5. Safety procedures
6. Economy and efficiency adjustments
7. Effective energy utilization

C. Notice Of Termination: CONTRACTOR shall submit a Notice of Termination (NOT) to the local Regional Water Quality Control Board, RWQCB. Provide a copy of NOT to OWNER'S REPRESENTATIVE.

1.6 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Division 01 - Section 012900 "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct OWNER'S personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify CONTRACTOR of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify CONTRACTOR of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by CONTRACTOR that are outside the limits of construction. Use CSI Form 14.1A or Contractor's comparable form.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
    a. Project name.
    b. Date.
    c. Name of the OWNER'S REPRESENTATIVE
    d. Name of Architect.
    e. Name of Contractor.
    f. Page number.
4. Submit list of incomplete items in the following format:

a. One (1) PDF and two (2) paper copies of list, unless otherwise indicated. Architect will return one copy.

1.8 WARRANTIES

A. Submittal Time: Submit written warranties for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within **fifteen (15)** days of completion of designated portions of the Work that are completed and occupied or used by OWNER during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with maximum allowable VOC levels of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project Site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

d. Remove tools, construction equipment, machinery, and surplus material from Project Site.

e. Remove snow and ice to provide safe access to building.

f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

h. Sweep concrete floors broom clean in unoccupied spaces.

i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.

j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

k. Remove labels that are not permanent.

l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.

m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

n. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

q. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter upon inspection.

1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report upon completion of cleaning.

r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

s. Leave Project clean and ready for occupancy.

C. Final Cleaning: The OWNER will install its furnishings and equipment following cleaning included in Section B above and before Final Acceptance. The CONTRACTOR shall include an additional final cleaning of all surfaces of furnishing, equipment, and the balance of the Project interior following installation of furnishings, equipment, etc. by OWNER'S vendor.

D. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

E. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 - Section 017419 "Construction Waste Management."

END OF SECTION 017700 - CLOSEOUT PROCEDURES

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SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Maintenance manuals for the care and maintenance of products, materials, finishes, systems and equipment.

B. Related Sections include the following:

1. Division 01 - Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Division 01 - Section 017700 “Closeout Procedures” for submitting operation and maintenance manuals.
3. Division 01 - Section 017839 “Project Record Documents” for preparing Record Drawings for operation and maintenance manuals.
4. Divisions 2 through XX Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

Definition in section paragraphs below are from ASHRAE's "Technology Handbook."

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Initial Submittal: Submit one electronic pdf draft copy of each manual at least **fifteen (15)** days before requesting inspection for Substantial Completion. Include a complete operation and

maintenance directory. Architect will return one copy of draft and mark whether general scope and content of manual are acceptable.

B. Final Submittal: Submit one electronic pdf copy of each manual in final form at least **twenty-one (21)** days before final inspection. OWNER'S REPRESENTATIVE will return copy with comments within **twenty-one (21)** days after final inspection.

1. Correct or modify each manual to comply with Architect's comments. Submit revised copy of each corrected manual within **fifteen (15)** days of receipt of Architect's comments.
2. Provide an external hard drive with the capacity to hold four (4) Terabytes of Information to the OWNER upon final completion that contains the finalized and approved manuals.

1.5 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Format: Provide one (1) hard copy per the requirements listed within the specification and one electronic pdf copy that is a clean copy of the original editable document printed to a ".pdf" file format and text searchable capable and organized in the same format as the hard copy.

B. Organization: In electronic format, include a section and folder in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

C. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

D. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

E. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

F. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to

ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL (ONE SCANNED ELECTRONIC COPY ALSO REQUIRED)

A. Format: Provide one (1) hard copy per the requirements listed within the specification and one electronic pdf copy that is searchable and organized in the same format as the hard copy.

B. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

C. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of OWNER.
4. Date of submittal.
5. Name, address, and telephone number of Design-Builder.
6. Name and address of Architect.
7. Cross-reference to related systems in other operation and maintenance manuals.

D. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

E. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.

b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.

4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.

5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.

b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.

2. Emergency instructions.

3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.

2. Flood.

3. Gas leak.

4. Water leak.

5. Power failure.

6. Water outage.

7. System, subsystem, or equipment failure.

8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of OWNER’S operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions.
2. Performance and design criteria if Design-Builder is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.

3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard printed maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training videotape, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by OWNER’S operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.

2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by OWNER’S operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and

flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared Record Drawings in Division 01 - Section 017839 “Project Record Documents."

G. Comply with Division 01 - Section 017700 “Closeout Procedures” for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823 - OPERATION AND MAINTENANCE DATA

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SECTION 017836 - WARRANTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers and/or installer's standard warranties on products and special product warranties.

1. Refer to the General Conditions for terms of the guarantee period for the Work.

1.2 RELATED SECTIONS

A. Division 01 - Section 016010 "Materials and Equipment"

B. Division 01 - Section 017700 "Closeout Procedures"

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 WARRANTY REQUIREMENTS

A. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties shall not relieve CONTRACTOR of the warranty of the Work incorporating such materials, products, and/or equipment. Manufacturer's disclaimers and limitations on warranties do not relieve suppliers, manufacturers, installers, and Subcontractors of the requirement to countersign special warranties with Contractor.

B. Standard warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to OWNER.

C. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for OWNER.

D. Related Damages and Losses: When correcting failed or defective warranted Work, remove and replace Work that has been damaged as a result of such failure or which must be removed and replaced to provide access for correction of warranted Work.

E. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement with the reinstated warranty equal to the original warranty.

F. Replacement Cost: Upon determination the Work covered by a warranty has failed and/or is defective, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. CONTRACTOR is responsible for the cost of replacing or rebuilding defective Work regardless of whether OWNER has benefited from use of the Work through a portion of its anticipated useful service life.

G. Owner Recourse: Expressed warranties made to OWNER are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which OWNER can enforce such other duties, obligations, rights, or remedies.

H. Rejection of Warranties: OWNER'S REPRESENTATIVE reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

I. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, OWNER'S REPRESENTATIVE reserves the right to refuse to accept the Work until CONTRACTOR presents evidence the entities required to countersign such commitments have done so.

3.2 SUBMITTALS

A. Submit written preliminary warranties prior to Substantial Completion, and final warranties prior to Contract Completion. If the certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, submit written warranties as set forth in the certificate of Substantial Completion.

1. When a designated portion of the Work is partially used and/or occupied by OWNER, submit properly executed warranties to Architect within **fifteen (15)** days of the Partial Use or Occupancy of the designated portion of the Work.

B. When the Contract Documents require CONTRACTOR, or CONTRACTOR and a Subcontractor, installer, supplier or manufacturer to execute a special warranty, prepare a written document containing appropriate terms and identification, ready for execution by the required parties. Submit a draft to OWNER'S REPRESENTATIVE, through the Architect, for approval prior to final execution.

1. Refer to Divisions 02 through XX for specific content requirements and particular requirements for submitting special warranties.

C. Form of Submittal: Prior to Contract Completion, compile two copies of each required final warranty properly executed by CONTRACTOR, or by CONTRACTOR and Subcontractor, installer, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the Specifications.

D. Once draft warranties are approved, provide an electronic copy of all warranties as well as one original "hard Copy" in a heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf

binders, thickness as necessary to accommodate contents, and sized to receive 8½ by 11” (115 by 280 mm) paper.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the item or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the installer.
2. Identify each binder on the front and spine with the typed or printed title “WARRANTIES,” Project title and/or name, and name of CONTRACTOR.
3. When warranted Work requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

E. Contractor to provide a directory in electronic excel format and hard copy with information sorted by specification to list the following information, at a minimum: Specification Section, Description of Specification Section, Actual System or Work Installed, Subcontractor, Subcontractor Contact Person, Subcontractor Contact Person Phone Number, Subcontractor Contact Person e-mail address.

END OF SECTION 017836 - WARRANTIES

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SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings and Documents - Provide Hard copy and electronic files in both of the following formats:
    a. Readable and searchable PDF format
    b. BIM (Revit, ArchiCAD, etc. to match files as provided by the Design Team.) and/ or CADD (to match files as provided by the Design Team.)
2. Record Specifications - Provide Hard copy, pdf format, and word document files.
3. Record Product Data - Provide Hard copy and pdf format.

B. Related Sections include the following:

1. Division 01 - Section 017700 “Closeout Procedures” for general closeout procedures.
2. Division 01 - Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Divisions 02 through XX Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set of corrected Record Drawingsand one set of marked-up Record Prints and electronic files with above information.

B. Record Specifications: Submit one electronic and two hard copies of Project's Specifications, including Addenda and Contract Modifications.

C. Record Product Data: Submit one electronic and two hard copies of each Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

D. Miscellaneous Record Submittals: Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one electronic and two hard copies of each submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Construction Working Drawings and As-Built PDF files: Maintain one set of PDF files of the Contract Drawings and Shop Drawings. This set shall be maintained continuously by the GENERAL CONTRACTOR with access rights for viewing by the OWNER'S REPRESENTATIVE, Architect of Record, Inspector of Record and any other group authorized by the OWNER'S REPRESENTATIVE or General Contractor.

1. Preparation: Mark PDF files to show the actual installation where installation varies from that shown originally. Date each entry on the Drawings. Require individual or entity who obtained record data, whether individual or entity is Installer, Subcontractor, or similar entity, to prepare the marked-up Record PDFs. CONTRACTOR shall use Bluebeam Revu or equal software in order to generate the PDF mark ups. CONTRACTOR shall store the electronic PDF files in a central web based location and allow viewing access to the Project team.
    a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    b. Accurately record information in an understandable drawing technique.
    c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
2. Content: Types of items requiring marking include, but are not limited to, the following:
    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings.
    c. Depths of foundations below first floor.
    d. Locations and depths of underground utilities.
    e. Revisions to routing of piping and conduits.
    f. Revisions to electrical circuitry.
    g. Actual equipment locations.
    h. Duct size and routing.
    i. Locations of concealed internal utilities.

j. Changes made by Change Order or Construction Change Directive.

k. Changes made following Architect's written orders. (ASIs, responses to RFIs, etc.)

l. Details not on the original Contract Drawings.

m. Field records for variable and concealed conditions.

n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.

4. Mark record sets with red-color. Use other colors to distinguish between changes for different categories of the Work at same location.

5. Mark important additional information that was either shown schematically or omitted from original Drawings.

6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where OWNER'S REPRESENTATIVE determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.

2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2. Record PDFs: Organize Record PDFs and newly prepared Record Drawing PDFs into manageable sets. Include identification in each PDF file.

3. Record Transparencies: Organize into unbound sets matching Record Prints. Place transparencies in durable tube-type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.

4. Record CADD Drawings: Organize CADD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CADD file.

5. Identification: As follows:
    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect.
    e. Name of Contractor.

2.2 RECORD AS-BUILT DRAWINGS

A. As-Built Drawings: Drawings showing final as-built conditions of the project. The final BIM and CADD as-built drawings/model shall consist of one set of electronic BIM or CADD drawing files in the specified format, and one set of the approved working as-built drawings.

B. As-Built Drawings as Applies to BIM and CADD.

1. It is the scope of this section to provide guidance to the CONTRACTOR on preparing as-built drawings for construction projects. An as-built drawing is a construction drawing revised to reflect the final as-built conditions of the project as a result of modifications and corrections to the project design required during construction. The final as-built drawings shall not have the appearance of marked up drawings, but that of professionally prepared drawings as if they were the "as designed" drawings.

C. Maintenance of As-Built Drawings

1. Provide timely updates of the as-builts, carefully maintaining a record set of working as-built drawings at the job site, marked in red, of all changes and corrections from the contract drawings. Enter changes and corrections on drawings promptly to reflect "Current Construction". Provide this update on a weekly basis for the PDF drawings and on a quarterly basis for the BIM / CADD files. Provide confirmation that the as-builts are up to date with the submission of the monthly project schedule.

2. Contractor to review and provide written documentation or stamp each month signifying review / completeness that the as-builts are updated.

3. If the Contractors fails to maintain the as-built drawings, the District will retain an amount from the monthly payment representing the estimated monthly cost of maintaining the as-built drawings. Final payment with respect to separately priced facilities or the contract as a whole, will be withheld until the CONTRACTOR submits acceptable as-built drawings and the District approves them.

4. The marked-up set of PDF drawings shall reflect any changes, alterations, adjustments or modifications. Changes must be reflected on all sheets affected by the change. Changes shall include marking the drawings to reflect structural details, foundation layouts, equipment sizes, and other extensions of design.

5. Typically, room numbers shown on the contract drawings are selected for design convenience and do not represent the actual numbers intended for use by the end user. Final as-built drawings shall reflect actual room numbers adopted by the end user.

6. Indicate on the drawings the actual location, kinds and sizes of all sub-surface utility lines. On the as-built drawings, show offset dimensions of each end run, including changes of direction by two permanently fixed surface features in order for the underground utility lines to be located in the future.

7. Show valves, splice boxes and similar appurtenances by dimensioning along the utility run from a reference point. Record the average elevation of the top of each run or underground structure.

D. As-Built Conditions that are Different from the Contract Drawings

1. Accurately reflect all as-built conditions that are different, such as dimensions, road alignments and grades, and drainage and elevations, from the contract drawings on each drawing. If the as-built condition is accurately reflected on a shop drawing, then furnish that shop drawing in BIM or CADD format. Reference on the final as-built construction drawing the shop drawing file that includes the as-built information. In turn, the shop drawing will reference the applicable construction as-built drawing. Delete any options shown on drawings and not selected, clearly reflect options selected on final as-built drawings.

E. Additional As-Built Information that Exceeds the Detail Shown on the Contract Drawings:

1. These as-built conditions include those that reflect structural details, foundation layouts, equipment, sizes, mechanical and electrical room layouts and other extensions of design, that were not shown in the project design documents because the exact details were not known until after the time of approved shop drawings. It is recognized that these shop drawing submittals revised to show as-built conditions will serve as the as-built record without actual incorporation into the contract drawings. Include fire protection details, such as wiring, piping, and equipment drawings.

F. The District will withhold the amount of $50,000., or 1% of the total construction contract value, whichever is greater, until the final as-built drawing submittal has been approved by the District.

2.3 RECORD SPECIFICATIONS

A. Preparation: This manual shall be maintained continuously by the GENERAL CONTRACTOR with access rights for viewing by the OWNER'S REPRESENTATIVE, Architect of Record, Inspector of Record and any other group authorized by the OWNER'S REPRESENTATIVE or GENERAL CONTRACTOR. Mark PDF files of the Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, Addenda, and Contract Modifications. CONTRACTOR shall use Bluebeam Revu or equal software in order to generate the PDF mark ups. CONTRACTOR shall store the electronic PDF files in a central web based location and allow viewing access to the Project Team.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related ASIs, RFIs, Change Orders, Change Directives, Record Product Data, and Record Drawings where applicable.

2.4 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Include significant changes in the product delivered to Project Site and changes in manufacturer's written instructions for installation.
   3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

2.5 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Samples in the field office. Store Record Documents in PDF format on a shared web based location. apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in legible condition, protected from deterioration and loss. Provide access to the electronic Project Record Documents for Design Team, OWNER’S REPRESENTATIVE and the Inspector of Record's reference at all times.

END OF SECTION 017839 - PROJECT RECORD DOCUMENTS

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for instructing OWNER'S personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training videotapes.

B. Related Sections include the following:

1. Division 01 - Section 013100 "Project Management and Coordination" for requirements for pre-instruction conferences.
2. Divisions 02 through XX Sections for specific requirements for demonstration and training for products in those Sections.

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit three copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. At completion of training, submit two complete training manual(s) for OWNER'S use.

B. Attendance Record: For each training module, submit list of participants and length of instruction time.

C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Videotapes: Submit two copies within **seven (7)** days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:
    a. Name of Project.
    b. Name and address of photographer.
    c. Name of Architect.
    d. Name of Owner’s Representative
    e. Name of Design-Builder.
    f. Date videotape was recorded.
    g. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
2. Transcript: Prepared on 8-1/2-by-11-inch (215-by-280-mm) paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of videotape on each page.

1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 - Section "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Photographer Qualifications: A professional photographer who is experienced photographing construction projects.

D. Pre-instruction Conference: Conduct conference at Project Site to comply with requirements in Division 01 - Section 013100 “Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
    1. Inspect and discuss locations and other facilities required for instruction.
    2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
    3. Review required content of instruction.
    4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

A. Coordinate instruction schedule with OWNER’S operations. Adjust schedule as required to minimize disrupting OWNER’S operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

D. Coordination of training for all systems requiring training noted within division 2 through 48 shall be scheduled to occur within a one (1) week period. Do not schedule any training until all systems are signed off by the project inspection and Cx agent.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

1. Motorized doors, including overhead coiling doors, overhead coiling grilles and automatic entrance doors.
2. Equipment, including projection screens, waste compactors, food-service equipment, appliances and other miscellaneous equipment.
3. Fire-protection systems, including fire alarm, fire pumps and fire-extinguishing systems.
4. Intrusion detection systems.
5. Conveying systems, including conveyor Equipment.
6. Medical equipment, including medical gas equipment and piping.
7. Laboratory equipment, N/A
8. Heat generation, including boilers, feed water equipment, pumps, steam distribution piping and water distribution piping.
9. Refrigeration systems, including chillers, cooling towers, condensers, pumps and distribution piping.
10. HVAC systems, including air-handling equipment, air distribution systems and terminal equipment and devices.
11. HVAC instrumentation and controls.
12. Electrical service and distribution, including transformers, switchboards, panelboards, uninterruptible power supplies, monitoring controls and motor controls.
13. Packaged engine generators, including transfer switches.
14. Lighting equipment and controls.
15. Communication systems, including intercommunication, surveillance, clocks and programming, voice and data, AVIT Equipment and television equipment.

16. Any Fire Alarm equipment, Monitoring equipment and Energy Management system.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Design-Builder is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.
2. Documentation: Review the following items in detail:
    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project Record Documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments.
    h. Monitoring Equipment
3. Emergencies: Include the following, as applicable:
    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.
    g. Monitoring Equipment
4. Operations: Include the following, as applicable:
    a. Startup procedures.
    b. Equipment or system break-in procedures.

c. Routine and normal operating instructions.

d. Regulation and control procedures.

e. Control sequences.

f. Safety procedures.

g. Instructions on stopping.

h. Normal shutdown instructions.

i. Operating procedures for emergencies.

j. Operating procedures for system, subsystem, or equipment failure.

k. Seasonal and weekend operating instructions.

l. Required sequences for electric or electronic systems.

m. Special operating instructions and procedures.

n. Monitoring Equipment

5. Adjustments: Include the following:

   a. Alignments.

   b. Checking adjustments.

   c. Noise and vibration adjustments.

   d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

   a. Diagnostic instructions.

   b. Test and inspection procedures.

7. Maintenance: Include the following:

   a. Inspection procedures.

   b. Types of cleaning agents to be used and methods of cleaning.

   c. List of cleaning agents and methods of cleaning detrimental to product.

   d. Procedures for routine cleaning

   e. Procedures for preventive maintenance.

   f. Procedures for routine maintenance.

   g. Instruction on use of special tools.

8. Repairs: Include the following:

   a. Diagnosis instructions.

   b. Repair instructions.

   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.

   d. Instructions for identifying parts and components.

e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Provide overview of actual installation of system and overview of the contract documents. Note any deviations of the installed system from the contract documents during training.

C. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate with OWNER for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct OWNER'S personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Owner will furnish CONTRACTOR with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with OWNER with at least **seven (7)** days advance notice.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral, a written, or a demonstration performance-based test.

E. Cleanup: Collect used and leftover educational materials and give to OWNER. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEOTAPES

A. General: Engage a qualified commercial photographer to record demonstration and training videotapes. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Videotape Format: Provide high-quality VHS color videotape in full-size cassettes.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.

D. Narration: Describe scenes on videotape by audio narration by microphone while videotape is recorded or by dubbing audio narration offsite after videotape is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.

E. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

END OF SECTION 017900 - DEMONSTRATION AND TRAINING

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SECTION 018620 - TEST AND BALANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provision of the Contract, including General and Special Conditions and other Division 01 Specification Sections apply to this Section.

1.2 SECTION INCLUDES

A. This Section specifies the requirements for test and balance of HVAC and related systems.

B. Related Sections:

1. Division 01 - Section 011000 “Summary”
2. Division 01 - Section 013300 “Submittal Procedures”
3. Division 01 - Section 013210 “Construction Schedule”
4. Division 01 - Section 017700 “Closeout Procedure”
5. Division XX - Section XXXXXX “Heating Ventilating and Air Conditioning”

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 DEFINITIONS AND APPLICABLE PUBLICATIONS

A. For the purposes of this Section definitions are as indicated in applicable publications of AABC, NEBB, TABB, ASHRAE, ANSI and SMACNA.

1. TAB: Testing, Adjusting and Balancing.
2. TABB: Testing, Adjusting and Balancing Bureau.
3. AABC: Associated Air Balance Council
4. NEBB: National Environmental Balancing Bureau.
5. OAR: OWNER’S Authorized Representation
6. Inspector of Record: Inspector of Record

~~3.2 QUALITY ASSURANCE~~

A. The test and balance agency shall be directly subcontracted to CONTRACTOR.The qualifications of the agency shall comply with Section 3.02, Quality Assurance. The agency shall be responsible for furnishing labor, instruments, and tools required to test, adjust and balance the heating, ventilating and air conditioning (HVAC) systems and related plumbing systems, as described and/or as indicated in the Contract Documents.

B. Contractor shall obtain services of an independent, qualified testing agency acceptable to Architect and Districts Commissioning Agent (if one is employed) to perform testing and balancing Work as specified and as follows:

1. ~~Agency shall be currently certified by either The Associated Air Balance Council (AABC), The National Environmental Balancing Bureau (NEBB) or Testing, Adjusting and Balancing Bureau (TABB). NEBB or TABB certification shall be for Air and Hydronic Testing, Adjusting and Balancing and Sound and Vibration Measurement.~~

2. ~~Work shall be in accordance with the latest edition of the AABC, NEBB or TABB National Standards. Where the requirements of the two standards are different, the more stringent requirements shall prevail. Also, if the Contract Documents impose a more stringent standard then the Contract Documents shall prevail.~~

C. Performance Criteria: Work of this Section shall be performed in accordance with approved Testing, Adjusting and Balancing agenda.

D. Test Equipment Criteria: Basic instrumentation requirements and accuracy/calibration required by Section Two of the AABC or Section II of the NEBB or TABB Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems.

E. Verification: The Test and Balance Agency shall recheck ten (10) percent (minimum ten) of the measurements listed in the report. The locations shall be selected by Inspector of Record/O. The recheck will be witnessed by Inspector of Record/Owner’s Representative. If twenty percent of the measurements that are retested differ from the report and are also out of the specified range, an additional ten percent will be tested. If twenty percent fall outside the specified range, the report will be considered invalid and all test and balance work shall be repeated.

F. Due to more stringent acoustical requirements in the educational environment, the Test and Balance Agency shall recheck the air systems where the sound level is higher than the specified requirements and demonstrate compliance with the methodology specified in this document with emphasis on fan speed adjustment and balancing for optimum acoustical performance. The recheck will be witnessed by Inspector of Record/Owner’s Representative. When there are multiple air systems, a system selected by Inspector of Record/Owner’s Representative shall be rechecked. If this system is found to be not in compliance, a second system shall be checked. If the second system if also found to be not in compliance, the report will be considered invalid and all test and balance work shall be repeated. page

3.3 SUBMITTALS

A. Submit name of agency to perform the Work. Include in the submittal the certified qualifications of all persons responsible for supervising and performing actual Work of this Section. Agency shall submit a minimum of five (5) commercial or industrial HVAC system TAB projects of similar type, size, and degree of difficulty completed within the last two years. Agency shall provide name and telephone number of contact person for each listed project.

B. Submit, for approval, 6 copies of the Agenda as indicated in Section 018620 " Test and Balance" 3.06 to test and balance all mechanical and relevant plumbing systems.

C. Preliminary Report: Review the Contract Documents, examine Work installations and submit a written report to Architect and/or Inspector of Record/Owner's Representative indicating deficiencies in Work precluding proper testing and balancing of the Work.

D. Final TAB Report: Submit the final TAB report for review by Architect and/or Inspector of Record/Owner's Representative outlining the conditions and Work completed on each HVAC system. All outlets, devices, HVAC equipment, etc. shall be identified, along with a numbering system corresponding to report unit identification.

E. Submit an AABC "National Project Performance Guaranty" or "NEBB Quality Assurance Certification" assuring the Project systems were tested, adjusted and balanced in accordance with the Specifications and AABC, NEBB or TABB National Standards.

F. CADD drawings: Submit single line, multi-color CADD drawings indicating outside return and supply air, volume control boxes, each outlet and inlet, room numbers, duct sizes at traverse locations, temperatures and pressures, systems balanced, components changed, and CONTRACTOR installed access points. In addition, drawings shall identify controls, equipment settings, including manual damper quadrant positions, manual valve indicators, fan speed control levers, and similar controls and devices shall be marked on the drawings to show final settings. CADD files shall be submitted on CD-ROM upon final submittal of TAB report. Reports shall identify discrepancies between completed Work and the Contract Documents affecting the performance and longevity of the system.

3.4 GENERAL SCOPE OF WORK

A. The general scope of Work shall include but not be limited to the following:

1. Measure airflow rates of HVAC systems and adjust to achieve design airflow rate. Tabulate results and submit reports.
2. Measure water flow rates of HVAC systems and adjust to achieve design water flow rates. Tabulate results and submit reports.
3. Measure flow velocities, temperatures, static pressures or head, rotational speed, and electrical power demand of fans, pumps and other related HVAC system components, tabulate results and submit reports.
4. Measure sound levels in each conditioned space, tabulate results and submit reports.

5. Measure ambient sound levels of outdoor HVAC units and system components such as chillers and cooling towers, tabulate results and submit reports.
6. Reports shall contain sufficient data for the system designer to evaluate system performance and solve installation problems such as system pressure profiles and pressure drops across system components

3.5 SPECIFIC SCOPE OF WORK

A. The specific scope of Work shall include the following HVAC system components as indicated on the Drawings:

1. Air Handling Units
2. Air Conditioning Units
3. Heating and Ventilating Units
4. Heating and Cooling Coils
5. Supply, Return, Relief and Exhaust Fans
6. Outside Air and Return Air Plenums
7. Outside Air Intakes
8. All Supply and Return Ductwork
9. All associated Air Terminal Devices, i.e. Supply Diffusers, Return Registers, etc.
10. Mixing Boxes and Variable Air Volume (VAV) boxes
11. Reheat Coils (Electric or Hot Water)
12. Exhaust Duct Systems
13. Fire and Fire/Smoke Dampers
14. Kitchen Hoods
15. Heat Exchangers
16. Chillers
17. Boilers
18. Chilled water, heating hot water pumps

3.6 TESTING, ADJUSTING AND BALANCING AGENDA

A. Provide proposed materials, methods, procedures, forms, diagrams and reports for test and balance Work.

B. Agenda to be completed by the test and balance agency and submitted to Architect and Inspector of Record/Owner's Representative for review and approval.

C. Agenda shall include one complete set of AABC, NEBB or TABB publications listed in Section 018620 "Test and Balance 3.02B2, applicable publications, or, in case of other test and

balance agencies and or organizations, comparable publications to establish an approved, systematic and uniform set of procedures.

D. Agenda shall also include the following detailed narrative procedures, system diagrams and forms for test results:

1. ~~Specific standard procedures required and proposed for each system of the Work.~~
2. ~~Specified test forms for recording each procedure and for recording sound and vibration measurements.~~
3. ~~Systems diagrams for each air, water and steam system. Diagrams may be single line.~~

E. In addition to information recorded for standard AABC, NEBB or TABB procedures, the following information is required:

1. ~~Fan Data~~
2. ~~System number, Location, Manufacturer, Model and Serial Number~~
3. ~~Fan wheel type and size~~
4. ~~Motor horse power, type and rpm~~
5. ~~Drive size, type, number of grooves, and open turns on Variable Pitch Drives~~
6. ~~Number and size of belts, motor and fan shaft sizes, center-to-center of shafts in inches, and adjustment available motor data, including nameplate data, actual amps, rated and actual motor rpm, volts, phase, hp, kW, starter heater size, and capacity~~
7. ~~Fan design airflow and service (Supply, return, outdoor air or exhaust)~~
8. ~~Fan static pressure, suction/discharge, static profile and static control point.~~

F. The following traverse data is required:

1. ~~Traverse location, size of duct (inside dimensions), Area of duct in square feet~~
2. ~~Column for each hole traversed/lines for each reading~~
3. ~~Barometric pressure~~
4. ~~Temperature/Static Pressure in the duct~~
5. ~~Actual CFM corrected to SCFM~~
6. ~~Notes~~

G. The following air distribution data is required:

1. ~~Room identification~~
2. ~~Outlet or intake balance sequence number~~
3. ~~Size of outlet or inlet~~
4. ~~AK Factor~~
5. ~~Design and Actual FPM and CFM~~
6. ~~Notes~~

H. The following hydronic coil data is required:

1. ~~Air flow through the coil in CFM~~
2. ~~Dry bulb and wet bulb temperatures entering/leaving coil~~
3. ~~Enthalpy or total heat differences in BTU/lb.~~
4. ~~Capacity in BTU/hr at time of test~~
5. ~~Water temperature and pressure entering/leaving coil~~
6. ~~Flow (in GPM) through coil~~
7. ~~Air pressure drop across coil~~
8. ~~Water head drop across coil~~
9. ~~Notes~~

I. The following DX coil data is required:

1. ~~Air flow through the coil in CFM~~
2. ~~Dry and wet bulb temperatures entering/leaving coil~~
3. ~~Enthalpy or total heat difference across coil in BTU/ lb.~~
4. ~~Capacity in BTU/hr at time of test~~
5. ~~Air pressure drop across coil~~
6. ~~Notes~~

J. The following data is required for steam to water heat exchangers for heat and/or domestic generation:

1. ~~Exchanger identification number~~
2. ~~Nameplate data; manufacturer, model and serial number~~
3. ~~Temperature entering/leaving unit~~
4. ~~Flow through unit in GPM~~
5. ~~Pressure drop through unit~~
6. ~~Entering steam pressure~~
7. ~~Notes~~

K. The following electric heating coil data is required:

1. ~~Heating coil identification number~~
2. ~~Nameplate data; manufacturer, model and serial number~~
3. ~~Amperage/Voltage on each phase~~
4. ~~Phase, kW and Stages~~
5. ~~Safety device installed~~
6. ~~Air pressure drop across coil~~

7. Notes

L. The following water-cooled chiller data is required:

1. Identification number
2. Nameplate data; manufacturer, model and serial number
3. Chilled water flow through evaporator in GPM
4. Water temperature entering/leaving evaporator
5. Pressure drop through evaporator
6. Condenser water flow through
7. Pressure drop through condenser
8. Water temperature entering/leaving condenser
9. Motor data, amps, volts, rpm, starter type, overload protection type, phase, hertz, nameplate, and actual measured kW input
10. Type of refrigerant
11. Notes

M. The following cooling tower data is required:

1. Identification number
2. Nameplate data; manufacturer, model and serial number
3. Performance test results for rated capacity
4. Water flow through the tower in GPM
5. Water temperature entering/leaving tower
6. Outside Air dry and wet bulb temperatures
7. Motor data, amps, volts, phase, hertz, and kW input
8. Starter size and type and heater size and capacity
9. Water droplets leaving tower - yes/no
10. Water balanced across tower pans and basins
11. Airflow across the tower within design rating according to fan curves
12. Notes

N. The following boiler and domestic water heater data is required:

1. Performance test results for rated capacity
2. Boiler identification number
3. Nameplate data; manufacturer, model and serial number
4. Water temperature entering/leaving the boiler
5. Outside conditions: temperature, humidity, general cloud cover

6. Barometric pressure

O. The following air-cooled split system condensing unit data is required:

1. Performance test results for rated capacity
2. Unit identification number
3. Nameplate data, manufacturer, model and serial number.
4. Compressor nameplate and actual amps, volts, phase, and hertz
5. RPM of motors, where applicable
6. Refrigerant type
7. Suction/Discharge pressure when gauge installed
8. Number of stages
9. Low-pressure/High-pressure control setting
10. Condenser fan sequence stages
11. Crankcase heater watts (nameplate)
12. Hot gas bypass installed - yes/no
13. SCFM Air Flow Measurement vs. Design CFM

P. The following air-cooled split system heat pump data is required:

1. Performance test results for rated heating and cooling capacities
2. Unit identification number
3. Nameplate data, manufacturer, model and serial number.
4. Compressor nameplate and actual amps, volts, phase, and hertz
5. RPM of motors, where applicable
6. Refrigerant type
7. Suction/Discharge pressure for both heating and cooling modes when gauge installed
8. Number of stages
9. Low-pressure/High-pressure control setting
10. Condenser fan sequence stages
11. Crankcase heater watts (nameplate)
12. Hot gas bypass installed - yes/no
13. SCFM Air Flow Measurement vs. Design CFM

Q. The following sound test data is required:

1. Area or location
2. Sound level in dB(A) as specified in Section 018620 “Test and Balance” 3.19.

3. ~~Sound level at the center band frequencies of eight non-weighted octaves with equipment on and off for 5 rooms selected by the Inspector of Record/Owner's Representative.~~
4. ~~Plot corrected sound-level reading on Noise Criteria (NC) curve for the measurements in Q 3 above.~~

R. The following vibration test data is required:

1. ~~Equipment identification number~~
2. ~~Vibration levels at all accessible bearings, motors, fans, pumps, casings, and isolators~~
3. ~~Measurements in mils defection and velocity in inches per second as specified per section XIV of this document~~
4. ~~Each measurement taken in horizontal, vertical, and axial planes as accessible.~~

S. The following mixing damper leakage test data is required:

1. ~~Equipment identification number (unit, box, zone, etc.)~~
2. ~~Dry bulb temperature in the cold/hot (or bypass) deck~~
3. ~~Dry bulb temperature in the mixed air stream~~
4. ~~Calculated percent leakage~~
5. ~~Data above taken in the full cool and full heat (or bypass) mode~~
6. ~~Notes~~

T. The following airflow station data is required:

1. ~~Station identification number~~
2. ~~Nameplate data including effective area~~
3. ~~Differential test pressure or velocity~~
4. ~~Calculated CFM~~
5. ~~Actual CFM (From Pitot tube traverse form)~~
6. ~~Read out CFM~~
7. ~~Notes~~

U. The following unit heater data is required:

1. ~~Equipment identification number~~
2. ~~Nameplate data; manufacturer, model and serial number~~
3. ~~Test CFM (use manufacturer rated CFM if not ducted)~~
4. ~~Heat test data per applicable procedure (hot water, electric, etc.)~~
5. ~~Notes~~

V. The following fan coil and unit ventilator data is required:

1. ~~Equipment identification number~~

2. Nameplate data; manufacturer, model and serial number
3. Tested supply CFM or manufacturer rated CFM if not ducted
4. Tested outside air in CFM
5. Motor data and actual amps and volts
6. Cooling/Heating test data
7. Static pressure
8. Notes

W. The following kitchen hood data is required:

1. Hood identification number
2. Nameplate data; manufacturer, model and serial number
3. Pitot-tube traverse total air flow
4. Exhaust and supply (when part of hood) CFM
5. Exhaust and supply (when part of hood) test velocities shown on hood face diagram
6. Face velocities
7. Hood opening dimensions
8. Notes (turbulence and flow patterns at the face and inside the hood)

X. The following laboratory hood data is required:

1. Hood identification number
2. Nameplate data; manufacturer, model and serial number
3. Pitot-tube traverse total air flow
4. Exhaust and supply (when part of hood) CFM
5. Exhaust and supply (when part of hood) test velocities shown on hood face diagram
6. Face velocities
7. Hood opening dimensions
8. Notes (turbulence and flow patterns at the face and inside the hood)

Y. The following data for water-to-water heat exchangers for domestic and/or heating is required:

1. Exchanger identification number
2. Nameplate data; manufacturer, model and serial number
3. GPM and Pressure drop through each side
4. Capacity of each side
5. Notes

Z. The following pump data, including but not limited to, chilled water, heating hot water, cooling tower water, boiler feed, domestic hot water booster, domestic hot water circulation, sewage ejectors, sump pumps and domestic hot water booster is required:

1. ~~Pump number~~
2. ~~Nameplate data; manufacturer, model and serial number~~
3. ~~Motor data including nameplate data, actual amps, volts, RPM, horsepower, starter heater size and capacity~~
4. ~~Pump discharge and suction pressure along with total dynamic head in the following modes~~
5. ~~Shut-off head FT, Wide open Head FT and Final operating Head FT~~
6. ~~Final GPM Test plotted on a pump curve~~
7. ~~Notes~~

AA. The following water flow station data is required:

1. ~~Station identification number~~
2. ~~Nameplate data; manufacturer, model, and serial number~~
3. ~~Design and actual GPM~~
4. ~~Differential test pressure~~
5. ~~Setting (open turns, degree, etc.) if required GPM~~
6. ~~Notes~~

BB. The following terminal box data is required:

1. ~~Box identification number~~
2. ~~Node, address or designation on system~~
3. ~~Box size~~
4. ~~Cooling CFM~~
5. ~~Minimum CFM (if applicable)~~
6. ~~Heating CFM (if applicable)~~
7. ~~Box fan amps and volts (if applicable)~~
8. ~~For DDC controlled boxes, record computer readout maximum, minimum, and heat, along with box correction factor for calibrating to true CFM~~
9. ~~Notes~~

~~3.7 PROCEDURES~~

A. Schedule the Work of this Section in order for test and balance activities to be completed prior to the date of Substantial Completion. CONTRACTOR shall place all heating, ventilating, and air conditioning equipment into operation during each day and until all HVAC adjusting, balancing, testing, demonstrations, and instructions on systems are completed. Agency shall prepare and

submit reports within **ten (10)** days from completion of the Work of this Section to allow sufficient time for corrective measures to be completed before Substantial Completion of the Work. When an individual building or portion thereof is ready for occupancy, all equipment relative to such portion of Work shall be put into service, tested and balanced.

B. Prior to the date of Substantial Completion, and upon completion of test and balance Work, place all exhaust fans in operation, force all air handling units and air conditioning units into a 100% outdoor air economizer mode with heating and cooling locked out and flush the building continuously for a period of **fourteen (14)** days.

C. Coordinate test and balance procedures with any phased Project requirements so test and balance procedures on each phased portion of the Work will be completed prior to completion of said designated phase.

~~3.8 FIELD EXAMINATION~~

A. Before the commencement of test and balance Work, CONTRACTOR shall ascertain that following conditions are fulfilled:

~~1. Ensure that all water heating and water cooling systems have been flushed, cleaned, filled and high points vented~~

~~2. Boilers, steam and hot water, are filled~~

~~3. Refrigerant systems are fully charged with specified refrigerant~~

~~4. Over-voltage and current protection have been provided for motors~~

~~5. Equipment has been labeled as required~~

~~6. Curves and descriptive data on each piece of equipment to be tested and adjusted are available as required~~

~~7. Operations and maintenance manuals have been supplied~~

~~8. Controls manufacturer and boiler-burner representatives shall be available for consultation and supervision of adjustments during tests~~

~~9. Verify that heating and cooling coil fins are cleaned and combed and air filters clean and installed~~

~~10. Verify that duct systems are clean of debris and leakage is minimized, access doors are closed, and duct end caps are in place, fire and volume dampers are in place and open~~

~~11. Automatic control systems are completed and operating~~

~~12. Start up and initial commissioning of all HVAC equipment except fans shall be by the manufacturer.~~

B. In addition to the above, CONTRACTOR shall establish a specific, coordinated plan which details how each area of existing building will be balanced during the various phases of the Work. The evaluation shall address, at a minimum, the following concerns:

~~1. Owner operations~~

2. Building safety and security policies. Prior to any fire safety or security systems shutdown at any time during the Work, CONTRACTOR shall first advise and coordinate with OWNER to ensure all concerned parties are notified.
3. Protecting furniture, computers, photocopiers, and other office equipment.
4. Protecting classroom fixtures and equipment.
5. Concerns specific and unique to building related issues.
6. Downtime required for each AHU including projected time to return each portion of the building back to its normal occupancy temperature and humidity.
7. Shutdown and reactivation of the fire alarm system to avoid accidental alarms during test and balance and related Work.

3.9 TEST AND BALANCE

A. For each heating, ventilating, or air conditioning system specific for the project in hand the following shall be performed, recorded and submitted in an approved format for review. Make, type, and model of unit, and location of each piece of equipment shall be included in the report. Readings shall include but not be limited to following:

1. Air Systems:

a. General

1) Verify all ductwork, dampers, grilles, registers, and diffusers have been installed per design and set in the full, open position. Agency shall perform the following TAB procedures in accordance with AABC or NEBB National Standards. Where the requirements of the two standards are different, the more stringent requirements shall prevail. Also, if the Contract Documents impose a more stringent standard then the Contract Documents shall prevail.

b. Zone, Branch and Main Ducts:

1) Adjust ducts to within design CFM requirements by means of Pitot-tube duct traverse.

c. Supply Fans:

1) Fan speeds: Test and adjust fan RPM to achieve maximum or design CFM. CONTRACTOR shall provide new belt pulleys when required.

2) Current and Voltage: Test and record motor voltage, and amperage, and compare data with the nameplate limits. Ensure fan motor is not in or above the service factor as published by the motor manufacturer.

3) Pitot-Tube Traverse: Perform a Pitot-tube traverse of main supply and return ducts, record total CFM.

4) Outside Air: Test and adjust the outside air using Pitot-tube traverse.

5) Static Pressure: Test and record system static profile of each supply fan.

6) Current and Voltage: Test and record motor voltage, and amperage, and compare data with the nameplate limits. Ensure fan motor is not in or above the service factor as published by the motor manufacturer.

d. Return, Relief and Exhaust Fans:

1) Fan speeds: Test and adjust fan RPM to achieve maximum or design CFM. CONTRACTOR shall provide new belt pulleys where required.

2) Pitot-Tube Traverse: Perform a Pitot-tube traverse of the main return ducts to obtain total CFM.

3) Static Pressure: Test and record system static profile of each fan.

e. VAV Systems:

1) Set volume regulators on all terminal boxes to meet design maximum and minimum CFM requirements.

2) Identification: Identify the type, location, and size of each terminal box. This information shall be recorded on terminal box data sheets.

f. Diffusers, Registers and Grilles:

1) Tolerances: Test and balance each diffuser, grille, and register to within 5% of design requirements.

2) Identification: Identify the type, location, and size of each grille, diffuser, and register. This information shall be recorded on air outlet data sheets.

g. Coils: Air Temperature: Once airflow is set to acceptable limits, agency shall take wet bulb and dry bulb air temperatures on the entering and leaving side of each cooling coil. Dry-bulb temperature shall be taken on the entering and leaving side of each heating coil.

h. Duct Leakage Testing:

1) On existing ductwork, agency shall calculate duct leakage by traversing the unit and reading associated diffusers.

2) On new installations each and every section of the entire air distribution system (all supply, return, exhaust and relief ductwork) shall be tested at one and one-half times (1-1/2) design static pressure. All ducts shall demonstrate 5% leakage maximum (per CBC 2013 Sec 905.7.3.).

i. Air Handling Units:

1) Prepare pressure profile and show design and actual CFM (outside air, return air, and supply air).

2) Measure and record each mode (minimum OA and 100% OA) where economizer cycle is specified.

3) Record pressure drops of all components (coils, filters, sound attenuators, louvers, dampers, and fans) and compare with design values.

4) Pressure profile and component pressure drops are performance indicators and are not to be used for flow measurements.

j. System Pressure Profiles:

1) Prepare pressure profiles from fan (supply, return exhaust) or air handling unit to extremities of system.

2) As a minimum, show pressure at each floor, main branch, and airflow, measuring device.

3) Make pilot tube traverses of all trunk lines and major branch lines where required for analysis of distribution system. Airflow measuring devices installed in ductwork, if available, may be utilized.

4) Record residual pressures at inlets of volume controlled terminals at ends of system.

5) Show actual pressures at all static pressure control points utilized for constant or variable flow systems.

k. Fan Speed Adjustments and Balancing for Optimum Acoustical Performance:

1) As the very first step, the speed of all fans (supply, return, exhaust, inside packaged equipment or air handling units) shall be adjusted to deliver the required fan total air quantity with all volume dampers and other flow rate control devices fully open. Adjustments shall be made with the outdoor air intake dampers, return air dampers and relief air dampers in the minimum outdoor air position. The adjustments shall be made again in the100% outdoor air position in systems with 100% outdoor air economizers.

2) The above adjustment shall be done with wet cooling coils where cooling coils are provided.

3) The airflow rates at each branch duct shall be adjusted as the second step with air with all volume dampers and other flow rate control devices fully open.

4) The airflow rates at each air inlet and outlet shall be adjusted as the final step. The volume damper in the branch duct shall be used for balancing. Opposed blade dampers at air inlets and outlets where provided shall only be used for fine adjustments and shall not be closed beyond 60% open or when the dampers start to generate audible noise.

5) Contractor shall provide the labor and materials for all dampers, pulleys and belt changes required for balancing. The design documents indicate the worst-case scenario with safety factors in fan static pressures for contingency. Properly coordinated and installed air systems may require a lower static pressure and a reduction in fan speed.

~~2. Water Systems: CONTRACTOR shall confirm all equipment, piping, and coils have been filled and purged, strainers are clean and all balancing valves (except bypass valves) are~~

~~set full open. Agency shall perform the following TAB procedures in accordance with the AABC, TABB or NEBB National Standards:~~

B. Pumps:

~~1. Test and adjust chilled water, hot water, and condenser water pumps to achieve maximum or design GPM.~~

~~2. Measure and record suction and discharge pressures.~~

~~3. Check pumps for proper operation. Pumps shall be free of vibration and cavitation.~~

~~4. Current and Voltage: agency shall test and record motor voltage, and amperage, and compare data with the nameplate limits. Ensure pump motor is not in or above the service factor as published by the motor manufacturer.~~

~~5. Adjust pump flow by adjusting and setting balancing valves, to obtain amperage reading on a clamp-on ammeter, to correspond to amperage indicated on pump's curves for required flow.~~

~~6. Verify that the motor is not drawing more current than indicated on motor plate rating. When actual flows of primary pumps are found by test to vary more than 5% from specified amount, system shall be re-balanced to regulate flow within this tolerance. When a flow indicating device(s) is in circuit, it shall be used to verify pump flows.~~

~~7. When testing is completed, a pump capacity chart with pump number and location indicated shall be marked indicating operating point of pump on the curve. Chart shall then be included in the report.~~

C. Chillers: (Start-up and initial commissioning by manufacturer only.)

~~1. Test and balance chiller water flows to achieve maximum or design GPM.~~

~~2. Current and Voltage: Test and record motor voltage, and amperage, and compare data with the nameplate limits. Ensure compressor motor is not in or above the service factor as published by the motor manufacturer.~~

~~3. Test and record temperature and pressure profiles of chillers;~~

a. Inlet and outlet water temperature.

b. Inlet and outlet water pressure.

c. Evaporator temperature.

d. Condensing temperature pressure.

e. Purge pressure.

f. Oil temperature and pressure.

~~4. Outside Climatic Conditions: Outside air DB, WB, atmospheric conditions, during temperature profile runs.~~

D. Boilers: (Start-up and initial commissioning by manufacturer only.)Test and balance boilers only after test and balance of pumps have been completed. Boilers shall not be initially operated,

or tests performed with students or faculty on the Project Site. Boilers shall be tested for the following:

1. Heating Hot Water Boilers and Domestic Hot Water Boilers:
    a. Current and Voltage: Test and record motor voltage, and amperage, and compare data with the nameplate limits. Ensure motor is not in or above the service factor.
    b. Test and balance water flow through water boilers.
    c. Test and record temperature and pressure profiles of water and/or steam boilers.
    d. Upon completion of tests, controls and devices shall be returned to their normal operating condition and boiler shall remain in service.
2. Steam Boilers: Start-up and initial commissioning by manufacturer only.

E. Heat Exchangers:

1. Steam-to-Hot-Water Heat Exchanger: Steam pressure, entering and leaving hot water temperatures, gpm flow, pressure drop, and control set point.
2. Water to Water Heat Exchanger:
    a. Primary Heating Water: Entering and leaving hot water temperatures, gpm flow, and pressure drop.
    b. Secondary Heated Water: Entering and leaving hot water temperatures, gpm flow, pressure drop, and control set point.

F. Coils:

1. Tolerances: Test and balance all chilled-water and hot-water coils within 5% of design requirements.
2. Verify the type, location, final pressure drop and GPM of each coil.

G. System Mains and Branches including chilled water, heating hot water, cooling tower water, domestic hot water and domestic cold water:

1. Balance water flow in pipes to achieve maximum or design GPM.

H. Steam Heating Systems:

1. Heating Coils: Steam pressure at coils, cfm, coil pressure drop, entering and leaving air DB temperatures.
2. Boiler: Steam pressure, temperature and quantity of feed-water (see Testing and Adjusting procedures); boiler make, type, serial number and rated capacity; flue gas temperature at boiler outlet ahead of back-draft diverter; percent carbon dioxide in flue gas; condensate quantities and temperatures.
3. Air Conditioning Units: (Start-up and initial commissioning by manufacturer only.)
    a. Suction pressure and temperature.
    b. Discharge pressure and temperature.

c. Amps and volts.

d. Make, type, and model of unit, capacity rating.

e. Ambient temperature: WB, DB

f. Supply, return, relief and exhaust fans shall be balanced as indicated in Section 018629 “Test and Balance” 3.09A1, Air Systems.

g. Proper operation of controls: Temperature controllers and safety devices shall be tested during operating tests, with all other controls and devices, except one under test, being by-passed.

h. Upon completion of tests, controls and devices shall be returned to their normal operating condition and boiler shall remain in service.

~~4. Condensing and Refrigerating Units: (Start-up and initial commissioning by manufacturer only.)~~

a. Suction pressure and temperature.

b. Discharge pressure and temperature.

c. Amps and volts.

d. Make, type, and model of unit, capacity rating.

e. Ambient temperature: WB, DB

f. Proper operation of controls: Temperature controllers and safety devices shall be tested during operating tests, with all other controls and devices, except one under test, being by-passed.

g. Upon completion of tests, controls and devices shall be returned to their normal operating condition and boiler shall remain in service.

~~5. Split System Heat Pump Units: (Start-up and initial commissioning by manufacturer only.)~~

a. Suction pressure and temperature.

b. Discharge pressure and temperature.

c. Amps and volts.

d. Make, type, and model of unit, capacity rating.

e. Ambient temperature: WB, DB

f. Supply, return, relief and exhaust fans shall be balanced as indicated in Section 018620 “Test and Balance” 3.09A1. Air Systems.

g. Proper operation of controls:Temperature controllers and safety devices shall be tested during operating tests, with all other controls and devices, except one under test, being by-passed.

h. Upon completion of tests, controls and devices shall be returned to their normal operating condition and boiler shall remain in service.

~~6. Miscellaneous:~~

a. Electric Heaters:

1) Amperage.

2) Voltage.

3) Make, type, model, and name plate capacity rating.

~~3.10 VERIFICATION OF HVAC CONTROLS~~

A. Agency shall verify in conjunction with CONTRACTOR all control components are installed in accordance with the intent of the Contract Documents and are functioning according to the design intent, including all electrical interlocks, damper sequences, air and water resets, fire stat's, and other safety devices.

B. Contractor shall verify all control components are calibrated and set for design operating conditions and intent.

~~3.11 TEMPERATURE TESTING~~

A. To verify system control and operation, agency shall perform a series of three temperature tests taken at approximately two-hour intervals in each separately controlled zone. The resulting temperatures shall not vary more than two (2) degrees Fahrenheit from the thermostat or control set point during the tests. Outside temperature and humidity shall also be recorded during the testing periods.

~~3.12 KITCHEN HOOD TESTING~~

A. Agency shall test and adjust hood total airflow by duct Pitot-tube traverse. If a Pitot-tube traverse is not practical, an explanation of why a traverse was not made must be made in writing to Architect and subsequently appear on the appropriate data sheet. Face velocities shall be tested under design operating conditions using a maximum of a one square foot grid pattern across the entire open face. CONTRACTOR shall set sash height on hoods to obtain face velocities within 20% of 100 feet per minute unless specified otherwise. Agency shall test and adjust exhaust airflows and make-up air flows to maintain design hood pressures and face velocities, and design room pressurization. Agency shall test for turbulence and proper air flow patterns at the face and inside the hoods using a hand-held smoke puffer or other approved smoke-emitting device.

~~3.13 BUILDING/ZONE PRESSURIZATION~~

A. Agency shall test and adjust building/zone pressurization by setting the design flows to meet the required flow direction and pressure differentials. Positive/Negative area(s) supply air shall be set to design flow and exhaust air rates adjusted to obtain the required pressure differential(s).

~~3.14 FIRE AND SMOKE DAMPER TESTING~~

A. This work is to be performed by OWNER and State Fire Marshall. Do not include in agency scope of work.

~~3.15 LIFE AND SAFETY CONTROLS TESTING~~

A. This work is to be performed by OWNER and State Fire Marshall. Do not include in agency scope of Work.

~~3.16 FINAL TABULATION~~

A. After heating, ventilating, and air conditioning components are satisfactorily tested and balanced, entire system shall be put into operation and all pressures, temperatures, gpm, cfm, velocities, etc., shall be recorded and checked against design schedules. Design requirements shall be listed on reports and final tabulation shall be within a tolerance of plus or minus 5% of design requirements.

B. Readings at various locations as described herein will be made every hour for four (4) hours, during normal working hours for **three (3)** days. Boilers, forced-air furnaces, and chillers shall be started up far enough in advance to meet design conditions during period of testing.

~~3.17 VIBRATION TESTING~~

A. Furnish instruments and perform vibration measurements if specified in Division 015. Provide measurements for all rotating HVAC equipment half horsepower and larger, including reciprocating/centrifugal/screw/scroll compressors, pumps, fans and motors.

B. Record initial and final measurements for each unit of equipment on test forms. Where vibration readings exceed allowable tolerance and efforts to make corrections have proved unsuccessful, forward a separate report to Architect.

~~3.18 SOUND TESTING~~

A. Perform and record sound measurements as specified in this section and if specified in Section 015070 “Sound Vibration and Seismic Control”. Take additional readings if required by Architect.

B. Take measurements with a calibrated Type 1 sound level meter and octave band analyzer.

C. Sound reference levels, formulae and coefficients shall be according to ASHRAE handbook, Current Systems Volume; Chapter: Sound and Vibration Control.

D. Determine compliance with the Contract Documents as follows:

1. ~~Where sound pressure levels are specified as noise criteria or room criteria in Section 15070: Sound, Vibration and Seismic Control.~~

a. Reduce background noise as much as possible by shutting off unrelated audible equipment.

b. Measure octave band sound pressure levels with specified equipment "off".

c. Measure octave band sound pressure levels with specified equipment "on".

d. Use difference in corresponding readings to determine sound pressure due to equipment.

~~DIFFERENCE:~~	~~0~~	~~1~~	~~2~~	~~3~~	~~4~~	~~5~~	~~9-10 or More~~
~~FACTOR:~~	~~10~~	~~7~~	~~4~~	~~3~~	~~2~~	~~1~~	~~0~~

~~Sound pressure level, due to equipment, equals sound pressure level with equipment "on" minus factor.~~

e. Plot octave bands of sound pressure level due to equipment for typical rooms, on a graph, which also shows, noise criteria (NC) curves.

~~2. When sound power levels are specified:~~

a. Perform steps in Section 3.19, D, 1.a. through 1.d.

b. For indoor equipment: Determine room attenuating effect; i.e., difference between sound power level and sound pressure level. Determine sound power level will be sum of sound pressure level due to equipment, plus room attenuating effect.

c. For outdoor equipment: Use directivity factor and distance from noise source to determine distance factor, i.e., difference between sound power level and sound pressure level. Measured sound power level will be sum of sound pressure level due to equipment, plus distance factor.

~~3. Where sound pressure levels are specified in terms of dbA, measure sound levels using the "A" scale of meter. Single value readings will be used instead of octave band analysis.~~

E. Where measured sound levels exceed specified level, CONTRACTOR shall take all remedial action and necessary sound tests shall be repeated.

F. Measure and record sound levels in decibels at each diffuser, grille or register in occupied areas. Sound levels shall be measured approximately 5'-0" above floor on a line approximately 45 degrees to center of opening, on the "A" and "C" scales of a General Radio Company sound level meter, or similar instrument.

G. Report shall also include ambient sound levels of rooms in which above openings are located, taken without air-handling equipment operating. A report shall also be made of any noise caused by mechanical vibration.

~~END OF SECTION 018620 - TEST AND BALANCE~~

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SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provision of the Contract, including General and Special Conditions and other Division 01 Specification Sections apply to this Section.

1.2 DESCRIPTION

A. Commissioning

1. Commissioning is a systematic process of ensuring that all building systems perform interactively according to the OWNER'S project requirements and operational needs. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing adjusting and balancing, performance testing and training.
2. Commissioning during the construction phase is intended to achieve the following specific objectives:
    a. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing Contractors
    b. Verify and document proper functional performance of equipment and systems
    c. Verify that O&M documentation left onsite is complete.
    d. Verify that the OWNER'S operating personnel are adequately trained.

1.3 SUMMARY

A. Related Sections:

1. Division 01 - Section 013300 "Submittal Procedures
2. Division 01 - Section 017700 "Closeout Procedures"
3. Division XX - Section XXXXXX "Commissioning of Plumbing"
4. Division XX - Section XXXXXX "Commissioning of HVAC"
5. Division XX - Section XXXXXX – Commissioning of Electrical Systems

1.4 ABBREVIATIONS AND DEFINITIONS

A/E: Design Professional

ASI: Architectural Supplemental Instruction

BAS: Building Automation System

BoD: Basis of Design. A narrative of how the designer plans to achieve the OPR

CxA: Commissioning Authority

CxS: Commissioning Supervisor

CC: Controls Contractor

OR: Owner's Representative / District Project Manager

Cx: Commissioning

CxA: Commissioning Authority

CxS: Commissioning Supervisor

Cx Plan: Commissioning Plan

Cx RFI: Commissioning Request for Information

DDC: Direct Digital Control System

Deficiency: A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents and cannot be corrected in five (5) minutes time.

EC: Electrical Contractor

FBO: Furnished By Others

FT: Functional Performance Test

GC: General Contractor

IAW: In Accordance With

MC: Mechanical Contractor

O&M: Operation and Maintenance

OPR: Owner Project Requirement. A dynamic document expressing how the OWNER expects the building systems to perform upon project completion.

PC: Prefunctional Checklist

RFI: Request for Information

SI: Systems Integration Contractor

Sub(s): Subcontractors or Prime Contractor

TAB: Test, Adjust and Balance

TBD: To Be Determined

1.5 EQUIPMENT AND SYSTEMS TO BE COMMISSIONED

A. Plumbing Systems (and all integral equipment controls)

1. Instantaneous Hot Water Heaters
2. Gas-Fired Water Heater
3. Domestic Hot Water Circulation Pump
4. Air Compressor (existing)

B. Mechanical Systems (and all integral equipment controls)

1. Air Handling Units
2. Variable Air Volume Terminal Units
3. Fan Coil Units
4. Exhaust Fans
5. Building Automation System

C. Electrical Systems (and all integral equipment controls)

1. Exterior and Interior Lighting
2. Emergency Lighting
3. Light Control System

D. Exterior Improvements (and all integral equipment controls)

1. Landscape Irrigation System
2. Irrigation Control System

1.6 COMMISSIONING TEAM COORDINATION

A. Members

1. The members of the commissioning team consist of the Commissioning Authority (CxA), the OWNER'S REPRESENTATIVE facilities personnel, the CxS, the MC, the EC, the TAB representative, the SI, and any other installing Subs or suppliers of equipment. In addition, representatives of the A/E team are also commissioning team members and are invited to observe critical procedures and attend Cx coordination meetings.

B. Management

1. The CxA is hired by the OWNER and directs and coordinates the commissioning activities and reports to the OWNER'S REPRESENTATIVE. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.

C. Scheduling

1. The CxA shall work with the GENERAL CONTRACTOR, according to established protocols, to project an initial commissioning schedule. The GENERAL CONTRACTOR shall integrate the tentative commissioning schedule into the master schedule. All parties shall address scheduling problems and make necessary notification in a timely manner in order to expedite the commissioning process. The functional testing will not begin until the CxA is notified in writing by the GENERAL CONTRACTOR that all pre-functional checklists have been completed and the Subcontractors have functionally tested the systems.

2. The CxA will provide the initial schedule of primary commissioning events at the commissioning scoping meeting. As construction progresses, more detailed schedules are developed by the CxA and General Contractor.

1.7 SUBMITTALS

A. The GENERAL CONTRACTOR shall provide the CxA a list of required equipment/system submittals to the CxA. The CxA will identify submittals to be submitted to the CxA concurrent with submission to the A/E for review.

B. All Subs, through the GENERAL CONTRACTOR, shall submit required installation, start-up, and preventive maintenance equipment data sheets to the CxA within **fourty-five (45)** days of equipment approval by the A/E.

C. All Subs, through the GENERAL CONTRACTOR, shall submit O&M data for system and equipment being commissioned under this specification. O&M data shall be submitted within **fourty-five (45)** days of equipment approval by the A/E, but no less than **eight (8)** weeks prior to the beginning of functional testing.

D. The GENERAL CONTRACTOR shall submit a copy of the construction meeting minutes, updated Construction Schedule, RFI log, and ASI log to the CxA within **seven (7)** days of each meeting or update.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Division CONTRACTOR for the equipment being tested. For example, the mechanical CONTRACTOR of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC and control systems in Division 23.

B. Special equipment, tools, instruments, and setup software (only available from vendor/Subs, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be provided by the CONTRACTOR and left onsite, for the CxA and their test/adjust/balance (TAB) firm to use during TAB, functional testing, seasonal testing, and

deferred testing. The equipment, tools, instruments, and setup software will be returned to the vendor/Subs after successful conclusion of the commissioning effort.

C. The controls CONTRACTOR shall provide the CxA with temporary software license to be loaded on the CxA's and/or TAB firm's computer, and any necessary network connection cables, for accessing the direct digital control system field panels for system testing. The controls CONTRACTOR shall also provide a palm device with attachments, software, and cables, to check setpoint values of terminal device controllers. The controls CONTRACTOR shall provide the CxA with log-on ID, password, and modem phone number for remote dial-in connection to direct digital control system. All of the software, cables, and modems provided to the CxA will be returned at the successful conclusion of the commissioning effort.

D. All testing equipment used by the Contractors shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements shall apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.1°F and a resolution of +/- 0.1°F. Humidity sensors shall have a certified calibration within the past 6 months and a resolution of +/- 1%. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. Accuracy of other sensors shall be at least twice that of the instrumentation being tested. All equipment shall be calibrated according to the manufacturer's recommended intervals, in addition to just after being dropped or damaged. Calibration tags shall be affixed or certificates readily available.

PART 3 - EXECUTION

3.1 COMMISSIONING PROCESS

A. The following narrative provides an overview of the commissioning tasks during construction and the general order in which they occur.

1. Commissioning during construction begins with a scoping meeting conducted by the CxA where the commissioning process and the draft Cx Plan is reviewed with the commissioning team members. After this meeting, the draft Cx Plan, which is initially provided prior to the scoping meeting, is then updated with the project specific communication protocols, Cx team contact information, and the preliminary commissioning schedule, which is developed during the scoping meeting.

2. Additional meetings will be conducted as needed throughout construction. The OWNER'S REPRESENTATIVE, CxA and GENERAL CONTRACTOR will schedule these meetings with necessary parties attending. The meetings will be conducted in order to plan, scope, coordinate, schedule future activities and resolve problems. In general, the commissioning meetings will be held monthly during the construction period.

3. Equipment documentation is submitted to the CxA, concurrent with the normal submittals to the A/E, including detailed pre-startup checklists and startup procedures. Specific submittals requirements are detailed as referenced above, and in Subsection 1.06 above.

4. The CxA works with the GENERAL CONTRACTOR and its Subs in developing startup plans and startup documentation formats, including providing the Subs with pre-functional checklists to be completed, during the startup process. The pre-functional checklists are developed by the CxA for the equipment listed in Subsection 1.04 above, using the A/E approved submittals.
5. In general, the checkout and performance verification proceeds from simple to complex, from component level to equipment to systems and intersystem levels with pre-functional checklists being completed before functional testing.
6. The CxA will review shop drawings and material certifications, review reports from independent testing agencies, conduct independent onsite periodic construction observation and attend selected quality control-related and construction progress meetings.
7. The Subs, under their own direction, execute and document the pre-functional checklists and perform startup and initial checkout. The CxA documents that the checklists and startup were completed by the Subs. This will include the CxA witnessing start-up of selected equipment.
8. The CxA develops specific equipment and system functional performance test procedures. The CxA submits the proposed functional tests to the OWNER'S REPRESENTATIVE, A/E and GENERAL CONTRACTOR for their review and comment, and provides a copy of the proposed functional tests to the responsible Sub who shall review the tests for feasibility, safety and equipment warranty protection.
9. O&M data is submitted to the CxA prior to execution of functional tests. The CxA reviews the documentation for completeness. The CxA also uses the documentation for reference during the functional testing.
10. Manufacturers will perform and document all specified Factory Testing and start-up. Copies of test reports are provided to the A/E and CxA for review.
11. The functional test procedures are executed by the CONTRACTOR, under the direction of, and documented by the CxA.
12. Items of non-compliance in material, installation or startup are corrected at the Sub's expense and the system retested.
13. The CxA reviews and pre-approves the training provided by the Subs and verifies that it was satisfactorily completed.
14. Commissioning is completed before OWNER occupancy/use.
15. Deferred testing is conducted, as specified in these Specifications.

3.2 RESPONSIBILITIES

A. General Contractor

1. Shall verify completeness of the building envelope, perimeter and interior items, which affect proper operation and control of equipment and systems.

2. Shall schedule and coordinate participation and cooperation of all Subcontractors required for the commissioning process.
3. Shall incorporate commissioning tasks into the master Construction Schedule.
4. Shall be responsible for providing written responses to the CxA's submittal review comments.
5. Shall provide a Commissioning Supervisor (CxS) who will be responsible for communication between each individual Contractor/Subcontractor and the CxA. This representative shall be responsible to: coordinate meetings, plan and schedule Cx activities into the project schedule, distribute Cx documentation to responsible Contractors, receive written notification from Contractors that Cx issues are corrected, perform corrective actions for resolution of deficiencies, and handle required submittals to the CxA.
6. Review and approve the completion of the PCs, then notify the CxA that functional testing can proceed.
7. Ensure Installing Contractors or their Vendors provide all specialized tools or the use of specialized tools that may be required to start, check-out and functionally test equipment and systems.
8. Shall meet requirements of other commissioning requirements within the Project Manual.
9. Shall schedule and coordinate participation and cooperation of all Subcontractors and vendors in OWNER training.
10. Shall provide final operation and maintenance documentation in formats required including submission in scanned digital media format. Provide to CxA for the required Systems Manual.

B. Subcontractors/Suppliers

1. Shall be responsible for providing labor, material, equipment, etc., required within the scope of their specialty to implement and facilitate the commissioning process.
2. Shall include all special tools, software, and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these contract documents in the base bid price to the CONTRACTOR, except for stand-alone data-logging equipment that may be used by the CxA.
3. Shall demonstrate the operation of the equipment and systems is per the contract documents.
4. Shall assist the GENERAL CONTRACTOR in the development of the master schedule as relates to commissioning and milestones.
5. Shall respond in writing to written submittal review comments by the CxA.
6. Shall respond in writing as to the completion or resolution of each issue in the commissioning issue log.
7. Shall meet requirements of other commissioning requirements within the Project Manual.
8. Shall provide to GENERAL CONTRACTOR and CxA information required for the Systems Manual per CALGreen criteria.

C. Owner

1. Schedules the participation of facilities personnel in the commissioning process in writing.
2. Advises the CxA of any changes to the building's use or occupancy.

3.3 MEETINGS

A. Scoping Meeting: The CxA will schedule, plan, and conduct a commissioning scoping meeting with the entire commissioning team in attendance. Meeting minutes will be distributed to all parties by the CxA within two weeks after the meeting. Information gathered from this meeting will allow the CxA to revise the Commissioning Plan to its “final” version.

B. Miscellaneous Meetings: Other meetings will be planned and conducted by the CxA as construction progresses. These meetings will cover coordination, deficiency resolution, and planning issues with particular Subcontractors.

3.4 START-UP, PRE-FUNCTIONAL CHECKLISTS, AND INITIAL CHECKOUT

A. The following procedures apply to all equipment and building systems to be commissioned, according to Subsection 1.4, EQUIPMENT AND SYSTEMS TO BE COMMISSIONED. Some systems that are not comprised so much of actual dynamic machinery, e.g., electrical system power quality, may have very simplified PCs and start-up.

B. General. Prefunctional checklists are important to ensure that the equipment and systems are completely installed and integrated with other building components and systems, hooked up and operational. It ensures that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment or assembly receives full Prefunctional checkout. No sampling strategies are used. The Prefunctional testing for a given system must be successfully completed prior to formal functional performance testing of the equipment or subsystems of the given system.

C. Start-up and Initial Checkout Plan. The CxA shall assist the commissioning team members responsible for start-up of any equipment in developing detailed start-up plans for all equipment. The primary role of the CxA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed. Parties responsible for Prefunctional checklists and start-up are identified in the commissioning scoping meeting and in the checklist forms. Parties responsible for executing functional performance tests are identified in the testing requirements in Specification Sections XXXXXX, XXXXXX, XXXXXX, XXXXXX and any other sections where test requirements are found.

1. The CxA generates generic and representative Prefunctional checklists and procedures as required in Specification Sections XXXXXX, XXXXXX, XXXXXX and XXXXXX. These checklists will indicate required procedures to be executed as part of start-up and initial checkout of the systems and the party responsible for their execution.
2. These generic checklists and tests are provided by the CxA to the CONTRACTOR. The CONTRACTOR determines which trade is responsible for executing and documenting

each of the line item tasks and notes that trade on the form. Each procedure and associated forms may have more than one trade responsible for its execution.

3. The Subcontractor responsible for the purchase of the equipment develops the full start-up plan by combining (or adding to) the CxA's checklists with the manufacturer's detailed start-up and checkout procedures from the O&M manual and the normally used field checkout sheets. The plan will include checklists and procedures with specific boxes or lines/fields for recording and documenting the checking and inspections of each procedure and a summary statement with an initial block/ "completed by" associated with each procedure. The responsible party marks the applicable areas in the procedures and makes initial and date lines at each test procedure.

4. The full start-up plan could consist of something as simple as:

   a. The CxA's pre-functional checklists.

   b. The manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.

   c. The manufacturer's normally used field checkout sheets.

5. The Subcontractor submits the full start-up plan to the CxA for review and approval.

6. The CxA reviews and approves the procedures and the format for documenting them, noting any procedures that need to be added.

7. The full start-up procedures and the approval form may be provided to the OWNER'S REPRESENTATIVE for review and approval, depending on management protocol.

3.5 FUNCTIONAL PERFORMANCE TESTING

A. The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of material completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.

B. In general, each system shall be operated through all modes of operation where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions shall also be tested. Specific modes required in this project are given in Specification Sections 230800, 260800 and any other sections where test requirements are found.

C. The CxA shall review Owner-contracted, factory testing or required OWNER acceptance tests which the CxA is not responsible to oversee, including documentation format, and shall determine what further testing or format changes may be required to comply with the *Specifications*. Redundancy of testing shall be minimized.

D. The Subs shall provide sufficient notice to the CxA regarding their completion schedule for the Prefunctional checklists and start-up of all equipment and systems. The CxA will schedule functional tests through the OWNER'S REPRESENTATIVE, GENERAL CONTRACTOR, and

affected subs. The CxA shall direct, witness and document the functional testing of all equipment and systems. The CxA shall generally execute most standard tests with initial participation of the affected subs.

3.6 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation

1. The CxA will witness and document the results of all functional performance tests using the specific functional checklist forms developed for that purpose. Prior to testing, these forms are provided to the A/E, OWNER'S REPRESENTATIVE and Subs for review.

B. Non-Conformance

1. The CxA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues will be noted and reported to the OWNER'S REPRESENTATIVE in writing.
2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented.
3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CxA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the OWNER'S REPRESENTATIVE. A test shall be aborted if any system deficiency prevents the successful completion of the test or if any participating CONTRACTOR team member of which participation is specified is not present for the test.
4. As tests progress and a deficiency is identified, the CxA discusses the issue with the executing CONTRACTOR.
    a. When there is no dispute on the deficiency and the Sub accepts responsibility to correct it:
        1) The CxA documents the deficiency and the Sub's response and intentions and they go on to another test or sequence. After the day's work, the CxA submits the non-compliance reports to the OWNER'S REPRESENTATIVE for signature, if required. A copy of the deficiencies is provided to the GENERAL CONTRACTOR and Subs. The Sub corrects the deficiency, then signs-off that the correction has been made, certifying that the equipment is ready to be retested and sends it back to the CxA.
        2) The CxA reschedules the test and the test is repeated.
    b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
        1) The deficiency shall be documented, along with the Sub's response, and a copy given to the OWNER'S REPRESENTATIVE, the GENERAL CONTRACTOR and to the Sub representative assumed to be responsible.

2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the OWNER'S REPRESENTATIVE.

3) The CxA documents the resolution process.

4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, signs-off that the correction is complete, and provides the written sigh-off to the CxA. The CxA and GENERAL CONTRACTOR shall reschedule the test, and the test is repeated.

5. Cost of Retesting

a. The cost for the Sub to retest a pre-functional or functional test, if they are responsible for the deficiency, shall be theirs.

b. The time and expenses for the CxA to direct any retesting, above one retest, required because a specific pre-functional checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be back charged to the GENERAL CONTRACTOR, who may choose to recover costs from the responsible Sub.

6. The GENERAL CONTRACTOR shall respond in writing to the CxA and OWNER'S REPRESENTATIVE at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.

7. Any required retesting by any CONTRACTOR shall not be considered a justified reason for a claim of delay or for a time extension by the prime Contractor.

C. Failure Due to Manufacturer Defect

1. If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the GENERAL CONTRACTOR, the OWNER'S REPRESENTATIVE, the A/E, or the CxA. In such case, the responsible Sub shall provide the OWNER with the following:

a. Within one week of notification from the OWNER'S REPRESENTATIVE, the Sub or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the OWNER'S REPRESENTATIVE within two weeks of the original notice.

b. Within two weeks of the original notification, the CONTRACTOR or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.

c. The OWNER'S REPRESENTATIVE will determine whether a replacement of all identical units or a repair is acceptable.

d. Two examples of the proposed solution shall be installed by the Sub and the OWNER'S REPRESENTATIVE will be allowed to test the installations for up to one week, upon which the OWNER'S REPRESENTATIVE will decide whether to accept the solution.

e. Upon acceptance, the CONTRACTOR and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

f. The time and expenses for the CxA to direct any retesting, above one retest, required because of an equipment failure, will be back charged to the GENERAL CONTRACTOR, who may choose to recover costs from the responsible Sub. An example would be motor failures in series powered terminal induction units. Once all motors have been replaced, pre-functional checklists completed, and documents submitted that all repairs and corrections have been completed; the CxA will direct one retest. If any failures occur during the retest, the CxA will back charge the GENERAL CONTRACTOR for additional testing.

D. Approval

1. The CxA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CxA, if necessary. The CxA recommends acceptance of each test to the OWNER'S REPRESENTATIVE. The OWNER'S REPRESENTATIVE gives final approval on each test.

3.7 OPERATION AND MAINTENANCE MANUALS

A. Standard O&M Manuals.

1. The specific content and format requirements for the standard O&M manuals are detailed in Section 017700. Special requirements for TAB CONTRACTOR in appropriate Division 23 Sections and for the Controls CONTRACTOR are found in appropriate Division 23 Sections. Electrical requirements are located in the appropriate Division 26 Sections. A/E Contribution. The A/E will include in the beginning of the O&M manuals a separate section describing the systems including:

a. The design intent narrative prepared by the A/E, updated to as-built status by the A/E.

b. Simplified professionally drawn single line system diagrams on 8 ½" x 11" or 11" x 17" sheets. These shall include chilled water distribution system, water system, condenser water system, heating system, supply air systems, and exhaust systems and others as designated. These shall show major pieces of equipment such as pumps, heat exchangers, humidifiers, control valves, expansion tanks, coils, service valves, etc.

c. Completed Testing, Adjusting and Balancing reports.

d. As-built sequences of operations for all equipment including detailed sensor ranges and initial setpoints.

e. Seasonal operational guidelines by the equipment and system manufacturer.

f. Data sheets for all sensors and actuators by type and use for the equipment and systems including recommendations for recalibration.

g. Troubleshooting and diagnostic information for all equipment and systems.

h. Preventative maintenance procedures for all equipment and systems.

2. CxA Review and Approval. Prior to material completion, the CxA shall review the O&M manuals, documentation and redline as-builds *for systems that were commissioned* and list other systems documentation that the CxA should review to verify compliance with the *Specifications.* The CxA will communicate deficiencies in the manuals to the OWNER'S REPRESENTATIVE or A/E, as requested. Upon a successful review of the corrections, the CxA recommends approval and acceptance of these sections of the O&M manuals to the OWNER'S REPRESENTATIVE or A/E. The CxA also reviews each equipment warranty and verifies that all requirements to keep the warranty valid are clearly stated. This work does not supersede the A/E's review of the O&M manuals according to the A/E's contract.

3.8 TRAINING OF OWNER PERSONNEL

A. The GENERAL CONTRACTOR shall be responsible for training coordination and scheduling and ultimately for ensuring that training is complete.

B. The CxA will be responsible for overseeing and approving the adequacy of the training of OWNER personnel for commissioned equipment.

1. Instructor capabilities shall be commensurate with level of instruction required. Instructor qualifications shall be submitted to OWNER and CxA for review prior to training.

2. The specific training requirements of OWNER personnel by Subs and vendors are specified in Divisions 01, 22, 23, 26 and 32.

3. Each Sub and vendor responsible for training shall submit a written training plan to the CxA for review and approval prior to training. The plan shall include the following elements:

a. Equipment (included in training)

b. Intended audience

c. Location of training

d. Objectives

e. Subjects covered (description, duration of discussion, special methods, etc.)

f. Duration of training on each subject

g. Instructor name and qualifications for each subject

h. Methods (classroom lecture, video, Project Site walk-through, actual operational demonstrations, written handouts, etc.)

4. The CxA develops criteria for determining that the training was satisfactorily completed, including attending some of the training, etc. The CxA recommends approval of the training to the OWNER'S REPRESENTATIVE.

3.9 DEFERRED TESTING

A. Unforeseen Deferred Tests

1. If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the OWNER'S REPRESENTATIVE, A/E and CxA. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated.

B. Seasonal Testing

1. During the warranty period, seasonal testing shall be completed as part of this contract. Seasonal testing is intended to test the performance of systems under full load conditions that cannot be simulated during the functional testing period. For example, it is impossible to test the heating system under full load conditions in July, so the heating system would be full load tested during the winter months. The CxA will coordinate this activity. Tests will be executed, documented, and deficiencies corrected by the appropriate Subs, with facilities staff and the CxA witnessing. The GENERAL CONTRACTOR and its Subs will make any final adjustments to the O&M manuals and as-builts due to this testing.

END OF SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

SPECIFICATIONS
for

IUSD Sound Mitigation Program at
OAK STREET ELEMENTARY SCHOOL
633 S. Oak Street, Inglewood, CA 90301

Inglewood Unified School District
401 South Inglewood Avenue
Inglewood, California 90301

gkkworks
155 SOUTH FAIR OAKS AVENUE
PASADENA, CALIFORNIA 91105
626-666-6906

gkkworks Project Number 10292

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP. 03-119485 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 8/14/2019

SPECIFICATIONS

for

IUSD Sound Mitigation Program at

OAK STREET ELEMENTARY SCHOOL

633 S. Oak Street, Inglewood, CA 90301

Inglewood Unified School District

401 South Inglewood Avenue
Inglewood, California 90301

JAVAN NABILI, AIA, ARCHITECT
155 South Fair Oaks Avenue
Pasadena, California 91105
(626) 666-6906
License: C-24035

JAMES PEARSON, STRUCTURAL ENGINEER
700 South Flower Street, Suite 1800
Los Angeles, CA 90017
(323) 761-0830
License: SE-4335

JAMES SHWE, MECHANICAL ENG.
1106-B West Magnolia Boulevard
Burbank, CA 91506
(818) 840-0280
License: M-26903

JIMMY FONG, ELECTRICAL ENGINEER
2740 West Magnolia Boulevard, Suite 205
Burbank, CA 91505
(818) 748-1758
License: E-14126

BIDDING DOCUMENTS
TABLE OF CONTENTS

END OF TABLE OF CONTENTS

SECTION 01 1000
SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work under separate contracts.
5. Owner-furnished products.
6. Access to Project Site.
7. Coordination with occupants.
8. Work restrictions.
9. Specification and drawing conventions.

B. Related Section:

1. Division 01 – Section 015000 "Construction Facilities and Temporary Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Project Name, Project Description, Project Number

B. Project Location: Project Address.

C. Project Teams:

1. Identity of Project Teams listed below are consistent for all Contract Document Specifications.

Project Team	Project Team Information	
Owner	Name: Address: Phone: Fax:	Inglewood Unified School District 401 S. Inglewood Avenue, Inglewood, CA 90301 (310) 419-2700 (310) 680-5138
Owner's Representative	Name: Representative: Representative's Title: Address: Phone:	Cordoba Corporation, Bond Management Team XXXXXX XXXXXX 401 S. Inglewood Avenue, Inglewood, CA 90301 (310) 419-2766
Architect	Name: Representative: Representative's Title: Address: Phone: Fax:	XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. All references to work in Division 01 reference the Work of the Project as defined by the Contract Documents.

B. Scope of Work:

1.XXXXXX

C. Type of Contract

1. Project will be constructed under a Single Prime Contract with the CONTRACTOR.

1.5 PHASED CONSTRUCTION

A. The Work will be required to be completed in multiple phases as outlined in the General Conditions – Article 8.3.2.9-1.
1.XXXXXX

1.6 WORK UNDER SEPARATE CONTRACTS

A. General: Cooperate fully with separate Contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

1.7 OWNER-FURNISHED, CONTRACTOR-INSTALLED PRODUCTS

A. Equipment and fixtures noted in the drawings as OFCI (Owner-Furnished, Contractor-Installed).

B. For existing OFCI equipment: CONTRACTOR is responsible for the relocation of the existing equipment from its original location, including the work to uninstall the equipment, remove anchorage, etc. When relocating the existing equipment in its new location, the CONTRACTOR shall install/attach the equipment to match how it was placed or attached in its previous condition to achieve the District's intended use for the equipment.

1.8 ACCESS TO SITE

A. Use of Site: Limit use of Project Site to areas within the Contract Limits indicated. Do not disturb portions of Project Site beyond areas in which the Work is indicated. CONTRACTOR to coordinate with the OWNER'S REPRESENTATIVE on Project Site access.

1. Contract Limits: Confine construction operations to areas indicated on Drawings.

2. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to OWNER, OWNER'S employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

a. Schedule deliveries to minimize use of driveways and entrances by construction operations and prevent disruption to the District, especially during exam times.

b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment onsite.

c. All deliveries through public spaces, including parking lots, should be escorted to and from the Project Site by **two (2)** flag men at the front and rear of the vehicle.

B. Condition of Existing Site: CONTRACTOR is responsible to maintain condition of existing Project Site affected by construction operations. CONTRACTOR to repair damage to Project Site caused by construction operations.

C. Condition of Existing Building: CONTRACTOR is responsible to maintain condition of existing building(s) on Project Site affected by construction operations. CONTRACTOR will ensure existing building(s) are weather tight throughout construction period. CONTRACTOR to repair damage to building(s) caused by construction operations.

1.9 COORDINATION WITH OCCUPANTS

A. Full OWNER Occupancy: OWNER shall have access to the Project Site and adjacent building(s) during the entire construction period. Cooperate with OWNER during construction operations to minimize conflicts and facilitate OWNER usage. Perform the Work so as not to interfere with OWNER'S day-to-day operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from OWNER and approval of authorities having jurisdiction.

2. Notify the OWNER not less than **seventy-two (72)** hours in advance of activities that will

affect OWNER'S operations. Refer to the General Conditions for a list of notification time-frames.

B. Owner Limited Occupancy of Completed Areas of Construction: OWNER reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to OWNER acceptance of the completed Work.

2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited OWNER occupancy.

3. Before limited OWNER occupancy, mechanical and electrical systems shall be fully operational and required tests, inspections and commissioning shall be successfully completed. On occupancy, OWNER will operate and maintain mechanical and electrical systems serving occupied portions of Work.

4. On occupancy, OWNER will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.10 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and other requirements of authorities having jurisdiction. CONTRACTOR to be especially aware of the District's academic calendar and ensure no disruption to exam times or any other special events by the District, times and dates for which have not yet been identified.

B. On-Site Work Hours: Limit work in the existing building(s) to normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, except as otherwise indicated.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by OWNER or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify OWNER'S REPRESENTATIVE no less than a minimum two (2) weeks before proposed utility interruptions.

2. Obtain 's written permission before proceeding with utility interruptions.

3. All utilities cutovers should be performed after-hours or during weekends, unless otherwise indicated.

D. Noise, Vibration, and Odors: CONTRACTOR to coordinate operations with OWNER that may result in high levels of noise and vibration, odors, or other disruption during OWNER occupancy.

1. Notify OWNER'S REPRESENTATIVE no less than a minimum **one (1)** week in advance of proposed disruptive operations.

2. Obtain OWNER'S REPRESENTATIVE'S written permission before proceeding with disruptive operations.

E. Nonsmoking Building: Smoking is not permitted within the construction Project Site building(s) or on campus except for designated smoking areas.

F. Controlled Substances: Use of tobacco products and other controlled substances on the District's Property is not permitted.

G. Employee Identification: Provide identification tags for CONTRACTOR personnel working on the Project Site. Require personnel to utilize identification tags at all times.

H. Employee Screening: Comply with OWNER'S requirements regarding drugs and Background screening of GENERAL CONTRACTOR personnel working on the Project Site.

1. Provide and maintain list of approved screened personnel with OWNER'S REPRESENTATIVE.

1.11 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

2. Specification requirements are to be performed by CONTRACTOR unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on the Drawings are described in detail in the Specifications. One or more of the following are used on the Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.

3. Keynoting: Materials and products are identified by keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 1216
PHASING OF THE WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements for phasing of Work include logistics, phasing, and completion of designated phases prior to commencement of subsequent phases.

1.02 RELATED REQUIREMENTS

A. Section 01 1100: Summary of Work.

B. Section 01 3300: Submittal Procedures.

C. Section 01 3113: Project Coordination.

D. Section 01 3213: Construction Schedule.

E. Section 01 5000: Construction Facilities and Temporary Controls.

F. Section 01 7700: Contract Closeout.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 SUBMITTALS

A. CONTRACTOR shall submit a Project site logistics plans in accordance with and as required by this Section.

3.02 LOGISTICS

A. Prior to commencement of Work, CONTRACTOR shall prepare and submit to OAR, a detailed Project site logistic plan, in same size and scale of Drawings, setting forth CONTRACTOR plan of Work relative to following, but not limited to, items:

1 Hauling route shall be in accordance with local ordinances a truck access route to and from Project site.

2. The identification of any overhead wire restrictions for power, street lighting, signal or cable.

3. Local sidewalk access and street closure requirements.

4. Protection of sidewalk pedestrians and vehicular traffic.

5. Project site fencing and access gate locations.

6. Construction parking.

7. Material staging or delivery areas.

8. Material storage areas.

9. Temporary trailer locations.

10. Temporary service location and proposed routing of all temporary utilities.

11. Trash removal and location of dumpsters.

12. Location of portable sanitary facilities.

13. Stockpile or lay down areas.

B. Revised Project site logistic plan may be required by OAR for separately identified phases of Work as set forth in this Section.

C. CONTRACTOR is responsible for securing and/or obtaining all approvals and permits from authorities having jurisdiction relative to any activities set forth in Article 3.02.A.

3.03 PHASING OF THE WORK

A. Project will be constructed in separate Milestone increments, as identified or as described in this Section or Contract Documents. Phasing will also delineate Work to be completed in each designated phase. Unless otherwise approved or directed by OWNER, each phase shall be completed according to approved Baseline Schedule prior to commencement of next subsequent phase. CONTRACTOR shall incorporate and coordinate Work of Separate Work Contracts relative to this Project into the Phasing and Construction Schedule.

B. CONTRACTOR shall install all necessary Work for, but not limited to, power, lighting, signal, HVAC, drainage, and plumbing systems in phased Work before completion of designated phase. All valves, pull boxes, stub outs, temporary capping, and other Work necessary for phased completion and operation of all

necessary systems shall be provided whether or not such Work is specifically identified in Contract Documents.

3.04 PHASING OF THE WORK – GENERAL

A. CONTRACTOR shall prepare Construction Schedule in order to complete Work and related activities in accordance with phasing plan as established in Appendix "A". CONTRACTOR shall include all costs to complete all Work within Milestones or Contract Time.

B. OWNER will be seriously damaged by not having all Work completed within Milestones or Contract Time. It is mandatory Work be complete within Milestones or Contract Time.

3.05 PHASING OF THE WORK – SPECIFIC

A. CONTRACTOR shall prepare Construction Schedule, and shall complete following, but not limited to Milestones, as shown in Section 01 1219 – Appendix A and within designated phases in accordance with following:

1. Phase 0 Mobilization and Submittals – 32 calendar days:

2. Phase 1 Construction Buildings C, E, P and O – 68 calendar days.

3. Phase 2 Construction Buildings D and F – 70 calendar days.

4. Phase 3 Construction Buildings G and I – 70 calendar days.

5. Phase 4 Construction Buildings H and L – 70 calendar days.

6. Phase 5 Construction Buildings M, A and B – 70 calendar days.

7. Phase 6 POT Site Work and Administrative Closeout – 68 calendar days.

B. The Contract Time shall be a total of 450 calendar days from date of commencement of Contract Time.

END OF SECTION

SECTION 01 2100

ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing Allowances.

1. An Allowance has been established for conditions that may be encountered during the course of Construction.

B. Related Sections:

1. Divisions 02 through XX Sections for items of Work covered by Allowances.

1.3 SUBMITTALS

A. Submit proposed changes designated as Allowances, in the format specified for Change Orders.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the Project Site for use in fulfillment of each Allowance.

C. Coordinate and process submittals for Allowance items in same manner as for other portions of the Work.

1.4 COORDINATION

A. Coordinate Allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.5 ALLOWANCE COST PROPOSALS

A. Allowance Cost Proposals shall include cost to CONTRACTOR of specific products and materials ordered by OWNER or selected by Architect under Allowance and shall include taxes, freight, and delivery to Project Site.

B. Unless otherwise indicated, Contractor's Cost Proposals shall be inclusive of all material and labor, overhead and profit, and other costs, as included in the General Conditions for Change Orders.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an Allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each Allowance with related materials and installations to ensure that each Allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Unforeseen Conditions – One Hundred Thousand Dollars ($100,000.00)
B. Allowance No. 2: Unforeseen Utility Coordination & Repairs – One Hundred Thousand Dollars ($100,000.00)
C. Allowance No. 3: Unforeseen Site Repair – One Hundred Thousand Dollars ($1,000,000.00)
D. Allowance No. 4: Unforeseen for any Structural Repairs – Two Hundred Thousand Dollars ($200,000.00)

END OF SECTION

SECTION 01 2300

ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1. Drawings and general provisions of the Subcontract apply to this Section.
2. Review these documents for coordination with additional requirements and information that apply to work under this Section.

1.2 SUMMARY

A. Section Includes:

1. This section identifies each Alternate and describes basic changes to Work only when that Alternate is made a part of the Work by specific provision in the Subcontract
2. Base Bid and Alternates include costs of all supporting elements required, so that the combination of Base Bid and any Alternates are complete.
3. The scope of work for Alternates shall be in accordance with applicable Drawings and Specifications.

B. Related Sections:

1. Division 01 - Section 019113 "General Commissioning Requirements"

C. Except as otherwise indicated, complete work described in Alternates with no increase in Subcontract Time.

D. This section includes non-technical descriptions of Alternates. Refer to specific sections of the Specifications and to Drawings for technical descriptions of Alternates.

E. Coordinate related work and modify surrounding work as required to integrate Alternates into the Work.

F. Base Bid includes all work indicated, except work described as Alternates.

G. University reserves the right to award none, any one, or more in any order, or all Alternates in combination with work covered by Base Bid.

H. Alternates will not be awarded without awarding Base Bid.

I. University reserves the right to determine low bid as Base Bid alone or sum of Base Bid and any combination of Alternates.

J. Each Alternate is intended to cover all work required for a complete finished job.

K. Alternates are [additive] [deductive] to the Base Bid. Provide costs in appropriate spaces provided on Bid Form.

L. Submit bids for Base Bid and all Alternates listed on Bid Form. Failure to quote an amount, or insertion of the words "no bid," "none" or words of similar meaning, will be considered as not completing the proposal and may constitute disqualification of entire bid, at University's discretion. When there is no change in base bid due to using the Alternate, use the words "No Change". The words "No Change" will be interpreted to mean that work described in the Alternate shall be completed at no adjustment or change in cost of Base Bid.

M. Base Bid and Alternates are exclusive in their scope of work. There is no overlap between or among Base Bid and Alternates. The cost of any item of work shall be included only once, in Base Bid or in Alternates.

1.3 DESCRIPTION OF [ADDITIVE] [DEDUCTIVE] ALTERNATES

A. Fill in Additive and Deductive Alternates

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION NOT USED

END OF SECTION

SECTION 01 2500

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1. General Conditions – Article 1.1.47 for definition of substitutions.
2. General Conditions – Article 3.10 for more information on substitutions.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Sections:

1. Division 01 – Section 012100 "Allowances" for products selected under an Allowance.
2. Division 01 – Section 012300 "Alternates" for products selected under an alternate.
3. Division 01 – Section 016010 "Materials and Equipment" for requirements for submitting comparable product submittals for products by listed manufacturers.
4. Divisions 02 through XX Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by CONTRACTOR as defined by General Conditions Article 1.1.47.

1. Substitutions for Cause: Changes proposed by CONTRACTOR that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by CONTRACTOR or OWNER that are not required in order to meet other Project requirements but may offer advantage to CONTRACTOR or OWNER.

1.4 SUBMITTALS

A. Request for consideration of each product to be substituted. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing

numbers and titles.

1. Submittal Form: Use CSI Form 13.1A or Contractor's comparable form.

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

    a. Statement indicating why specified product, fabrication, or installation cannot be provided, if applicable.

    b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by OWNER and separate Contractors, that will be necessary to accommodate proposed substitution.

    c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

    d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

    e. Samples, where applicable or requested.

    f. Certificates and qualification data, where applicable or requested.

    g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and Owners.

    h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

    i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES or another model code organization acceptable to authorities having jurisdiction.

    j. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.

    k. Cost information, including a proposal of change, if any, in the Contract Sum.

    l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, is compatible with related materials, and is appropriate for applications indicated.

    m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within **seven (7)** days of receipt of a product substitution submittal. Architect will notify CONTRACTOR of acceptance or rejection of proposed substitution within **fifteen (15)** days of receipt of submittal, or **seven (7)** days of receipt of additional information or documentation, whichever is later.

   a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.

   b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

   1. Contractor is responsible for providing products and construction methods compatible with products and construction methods previously selected.

   2. If a dispute arises over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PROCEDURES

A. Coordination: Modify or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit product substitution submittal immediately upon discovery of need for change, but not later than **thirty-five (35)** days following the date of the OWNER'S Award of Contract to the CONTRACTOR by action of the Board of Education.

   1. Conditions: Architect will consider Contractor's product substitution submittal when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

      a. Substitute product offers OWNER a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities OWNER must assume. OWNER'S additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by OWNER, and similar considerations.

      b. Substitute product is consistent with the Contract Documents and will produce indicated results.

         1) Use of proposed product does not require revisions to the Contract

Documents.

c. Product substitution submittal is fully documented and properly submitted.

1) Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

2) List of similar installations for completed projects with project names and addresses and names and addresses of architects and Owners, if requested.

3) Samples, if requested.

d. Use of proposed product will not adversely affect Contractor's Construction Schedule.

e. Substitute product has received necessary approvals of authorities having jurisdiction.

f. Substitute product is compatible with other portions of the Work.

g. Use of proposed product has been coordinated with other portions of the Work.

h. Substitute product provides specified warranty.

i. If use of proposed product involves more than one CONTRACTOR, use of proposed product has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all Contractors involved.

B. Substitutions for Convenience: Architect will consider product substitution submittals if received within **thirty-five (35)** days after the Notice of Award unless otherwise indicated. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's product substitution submittal when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Substitute product offers OWNER a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities OWNER must assume. OWNER'S additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by OWNER, and similar considerations.

b. Substitute product is consistent with the Contract Documents and will produce indicated results.

1) Use of proposed product does not require revisions to the Contract Documents.

c. Product substitution submittal is fully documented and properly submitted.

1) Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes

suchas performance, weight, size, durability, visual effect, and specific features and requirements indicated.

2) List of similar installations for completed projects with project names and addresses and names and addresses of architects and Owners, if requested.

3) Samples, if requested.

d. Use of proposed product will not adversely affect Contractor's Construction Schedule.

e. Substitute product has received necessary approvals of authorities having jurisdiction.

f. Substitute product is compatible with other portions of the Work.

g. Use of proposed product has been coordinated with other portions of the Work.

h. Substitute product provides specified warranty.

i. If use of proposed product involves more than one CONTRACTOR, use of proposed product has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all Contractors involved.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 2513

PRODUCT SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes administrative and procedural requirements for handling requests for substitutions submitted 60 days after the date established in the Notice of Award and pursuant to Article 6.14 of the General Conditions.

1.02 RELATED REQUIREMENTS

A. Section 01 3239: Project Forms.

B. Section 01 3300: Submittal Procedures.

C. Section 01 6000: Product Requirements.

D. Section 01 7700: Contract Closeout.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 APPLICATION

A. CONTRACTOR proposed changes in products or materials required by the Contract Documents 60 days or more after the Notice of Award are considered to be requests for substitutions. OAR will consider requests for substitution if a product is no longer manufactured or the OAR and ARCHITECT, after a diligent search have verified that product or material is not available to CONTRACTOR. The following are not considered to be valid requests for substitutions:

1. Revisions to the Contract Documents requested by OAR or ARCHITECT.

2. Specified options of products included in the Contract Documents.

3. Substitutions requested on a “or equal” basis.

3.02 SUBMITTALS

A. Transmit submittals as described in related Sections for each request for substitution.

1. Identify the product to be replaced in each request. Include related Specification Section and Drawing number.

2. Provide complete documentation denoting compliance with the requirements for substitutions, and the following information, as appropriate.

    a. A detailed comparison of significant qualities of the proposed substitution with those specified in the Contract Documents. Significant qualities may include elements, such as performance, weight, size, durability, and visual effect.

    b. Product Data, including Drawings, descriptions of products, fabrication, and installation procedures.

    c. Samples, where applicable or requested.

    d. CONTRACTOR certification the proposed substitution conforms to requirements of the Contract Documents in every respect and is appropriate for the applications indicated.

    e. CONTRACTOR waiver of rights to an increase in the Contract Amount, Milestones and/or Contract Time that may subsequently become necessary because of the failure of the substitution to adequately perform.

3. If required, ARCHITECT will request additional information or documentation for evaluation. OAR will notify CONTRACTOR of acceptance or rejection of the substitution.

4. ARCHITECT will review and consider request for substitution and provide a recommendation to OAR

5. Where a proposed substitution involves and/or affects more than one Subcontractor, CONTRACTOR shall ensure each Subcontractor cooperates with the other Subcontractor involved to coordinate the Work, provide uniformity and consistency, and assure compatibility of all products.

6. CONTRACTOR submittal and ARCHITECT review of Shop Drawings, Product Data, material lists or Samples do not constitute an acceptable or valid request for substitution.

END OF SECTION

SECTION 01 2600

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1. General Conditions – Article 7 for more information on Contract Modification Procedures.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract Modifications.

B. Related Sections:

1. Division 01 – Section 012500 “Substitution Procedures" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 ADDENDA

A. Addenda shall be signed by Architect and approved by DSA.

1.4 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.5 REQUESTS FOR PROPOSAL

A. Owner-Initiated Requests For Proposal: OWNER’S REPRESENTATIVE will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Requests For Proposal issued by OWNER’S REPRESENTATIVE are not instructions either to stop work in progress or to execute the proposed change.

2. Within **ten (10)** days, unless indicated otherwise, after receipt of Request For Proposal (RFP), CONTRACTOR to submit a Change Order Request with a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

Refer to the General Conditions for additional requirements.

a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

c. Include costs of labor and supervision directly attributable to the change.

d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

e. Quotation Form: Use CSI Form 13.6B "Proposal Worksheet Summary" and 13.6C "Proposal Worksheet Detail" or Contractor's comparable forms.

B. Contractor Initiated Requests For Proposal: If latent or changed conditions require modifications to the Contract, CONTRACTOR may initiate a claim by submitting a Change Order Request to the OWNER'S REPRESENTATIVE and Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

4. Include costs of labor and supervision directly attributable to the change.

5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

6. Comply with requirements in Division 01 - Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

7. Change Order Request Form: Use CSI Form 13.6A "Change Order Request (Proposal)" with attachments CSI Form 13.6B "Proposal Worksheet Summary" and 13.6C "Proposal Worksheet Detail" or Contractor's comparable forms.

1.6 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: Refer to Division 01 - Section 012100 "Allowances" for administrative

procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of Allowances.

1.7 CHANGE ORDER PROCEDURES

A. On OWNER'S approval of a Change Order Request, the OWNER'S REPRESENTATIVE will issue a Change Order for signatures of OWNER, Architect, and CONTRACTOR.

1. Change Orders shall be signed by the Architect, CONTRACTOR, OWNER and the OWNER'S REPRESENTATIVE.

2. General Conditions – Article 7.7.3 for more information on formatting Change Order

1.8 CONSTRUCTION DIRECTIVE

A. Construction Directive: The OWNER'S REPRESENTATIVE may issue a Construction Directive, to instruct the CONTRACTOR to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Directive.

1. After completion of change, CONTRACTOR must submit Change Order Request with itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 2613

REQUEST FOR CLARIFICATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Procedure for requesting clarification of the intent of the Contract Documents.

1.02 RELATED REQUIREMENTS

A. Section 01 1100: Summary of Work.

B. Section 01 3113: Project Coordination.

C. Section 01 3213: Construction Schedule.

D. Section 01 3239: Project Forms.

E. Section 01 7700: Contract Closeout.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 PROCEDURE

A. CONTRACTOR shall prepare a Request for Clarification on the form provided in Section 01 3239. CONTRACTOR shall transmit the Request for Clarification to ARCHITECT with a concurrent copy to the OAR.

B. ARCHITECT response is a clarification of the intent of the Contract Documents and does not authorize changes in the Contract Amount, Milestones and/or Contract Time.

C. A Request for Clarification may be returned with a stamp or notation "Not Reviewed," if:

1. The requested clarification is ambiguous or unclear.

2. The requested clarification is equally available to the requesting party by researching and/or examining the Contract Documents.

3. CONTRACTOR has not reviewed the Request for Clarification prior to submittal.

D. Allow a minimum of nine days for review and response time, after receipt by ARCHITECT and OAR. CONTRACTOR shall verify and is responsible in verifying ARCHITECT and OAR receipt of a Request for Clarification.

E. Changes or alterations to the approved drawings or specifications shall be made by means of addenda or change orders as per section 4-338 of the California Building Standards Commission's, California Administrative Code.

END OF SECTION

SECTION 01 2900

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.
   1. General Conditions – Article 9 for more information on Schedule of Values and Payment Information.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections:
   1. Division 01 – Section 012100 "Allowances" for procedural requirements governing the handling and processing of Allowances.
   2. Division 01 – Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   3. Division 01 – Section 013210 "Construction Schedule" for administrative requirements governing the preparation and submittal of Contractor's Schedule.
   4. Division 01 – Section 013300 "Submittal Procedures" for administrative requirements governing the preparation and submittal of submittal schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by CONTRACTOR allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Schedule.
   1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
      a. Application for Payment forms with continuation sheets.
      b. Submittal Schedule.
      c. Items required to be indicated as separate activities in Baseline Schedule.

2. Submit to OWNER'S REPRESENTATIVE within **ten (10)** days after the Notice to Proceed, **one (1)** copy of an accurate and realistic Schedule of Values allocated to the various portions of the work

3. Sub-schedules for Phased Work: If at any time the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values correlated with each phase of payment.

4. Sub-schedules for Separate Elements of Work: Where the CONTRACTOR Schedule of Values defines separate elements of the Work; CONTRACTOR must provide sub-schedules showing values correlated with each element.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:

a. Project title and location.

b. Project number

c. Specification number.

d. Name and address of Contractor.

e. Name of the Architect of Record.

f. Name and address of the Inspector of Record.

g. Name and address of the Owner's Representative.

h. Date of submission.

2. Arrange Schedule of Values consistent with format of AIA Document G703.

3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

a. Related Specification Section or Division.

b. Description of the Work.

c. Name of Subcontractor.

d. Name of manufacturer or fabricator.

e. Name of supplier.

f. Change Orders that affect value.

g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

1) Labor.

2) Materials.

3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table

of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of Contract Sum.

a. Include separate line items under CONTRACTOR and principal subcontracts for project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.

5. Round amounts to nearest whole dollar wherever possible; total shall equal the Contract Sum.

6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

a. Differentiate between items stored onsite and items stored offsite. If required, include evidence of insurance.

7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

8. Allowances: Provide a separate line item in the Schedule of Values for each Allowance. Show line-item value of unit-cost Allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.

9. Purchase Contracts: Provide a separate line item in the Schedule of Values for each purchase contract. Show line-item value of purchase contract. Indicate OWNER payments or deposits, if any, and balance to be paid by Contractor.

10. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

11. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by OWNER.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between OWNER and CONTRACTOR. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

1. Contractor shall provide a draft of the Payment Application on the **twenty-fifth (25)** of the month proceeding the end of the period for review by OWNER'S REPRESENTATIVE, the

Inspector of Record and the Architect.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of CONTRACTOR. OWNER'S REPRESENTATIVE and Architect will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.

2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.

3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored onsite and items stored offsite.

1. Provide certificate of insurance, evidence of transfer of title to OWNER, and consent of surety to payment, for stored materials.

2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.

3. Provide summary documentation for stored materials indicating the following:

a. Materials previously stored and included in previous Applications for Payment.

b. Work completed for this Application utilizing previously stored materials.

c. Additional materials stored with this Application.

d. Total materials remaining stored, including materials with this Application.

F. Transmittal: Submit four signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from Subcontractors, sub-Subcontractors, and suppliers for construction period covered by the previous application.

1. Submit required waivers on each item for amount requested in previous application, after

deduction for retainage, on each item.

2. When an application shows completion of an item, submit conditional final or full waivers.

3. Owner reserves the right to designate which entities involved in the Work must submit waivers.

4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.

5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to OWNER.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of principal suppliers, fabricators, and Subcontractors.

2. Certified Schedule of Values.

3. Contractor's Schedule (preliminary if not final).

4. Products list (preliminary if not final).

5. Copies of building permits.

6. Certificates of insurance and insurance policies.

7. Performance and payment bonds.

8. Data needed to acquire OWNER'S insurance.

9. Construction Schedule

10. Submittal Schedule (Design Schedule)

11. Certified Payroll

12. Storm Water Pollution Prevention Plan (SWPPP)

I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

2. This application shall reflect Certificates of Partial Substantial Completion issued previously for OWNER occupancy of designated portions of the Work.

J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.

2. Occupancy permits and similar approvals by authorities having jurisdiction over Work.

3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.

4. Updated final statement, accounting for final changes to the Contract Sum.
5. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
6. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
7. AIA Document G707, "Consent of Surety to Final Payment."
8. Evidence that claims have been settled.
9. Removal of temporary facilities and services.
10. Testing, adjusting and balance records.
11. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when OWNER took possession of and assumed responsibility for corresponding elements of the Work.
12. Start-up performance reports.
13. District training and orientations.
14. Operating and maintenance instruction manuals.
15. Preliminary Warranties guarantees and maintenance agreements
16. Delivery of extra materials, products and/or stock.
17. Final liquidated damages settlement statement.
18. Retention Escrow Deposit Request Form (if applicable)
19. Consent of Surety to Final Payment
20. Conditional Waiver and Release Upon Final Payment (Contractor/Subcontractor)
21. Unconditional Waiver and Release Upon Final Payment (Contractor/Subcontractor)
22. Notice of Project Completion and Recommendation of Acceptance (w/required attachments)
23. Final Punch List
24. Certification Re Insurance
25. Certification Re Satisfaction of Indebtedness
26. Guarantee Form
27. Asbestos and Other Hazardous Materials Certification
28. SWPPP and NPDES District Requirements for Maintenance.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 2973

SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1. General Conditions – Article 9 for more information on Schedule of Values.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and submit Schedule of Values.

B. Related Sections:

1. Division 01 –Section 013210 "Construction Schedule" for reference to format listing component items in Schedule of Values.
2. Division 01 – Section 012900 “Payment Procedures” for more information on Schedule of Values.

1.3 DESCRIPTION

A. Submit to Inglewood Unified School District within **ten (10)** days after the Notice to Proceed, **one (1)** copy of an accurate and realistic Schedule of Values allocated to the various portions of the work.

B. The Schedule of Values, unless objected to by Inglewood Unified School District, shall become the basis for the Contractor’s application for payment.

1. Upon request by the OWNER’S REPRESENTATIVE, support values given with data that will substantiate their correctness.
2. Payment for materials stored shall be limited to those materials approved by the OWNER’S REPRESENTATIVE and is only at the OWNER’S discretion.

1.4 FORM OF SUBMITTAL

A. Identification: Include the following Project identification on the Schedule of Values:

1. Project title and location.
2. Project number

3. Specification number.
4. Name and address of Contractor.
5. Name of the Architect of Record.
6. Name and address of the Inspector of Record.
7. Name and address of the Owner's Representative.
8. Date of submission.
9. Arrange Schedule of Values consistent with format of AIA Document G703.

B. Component Items:
1. Section 013210 "Construction Schedule" shall be used as a basis for listing components.
2. Schedule of Values shall list the value of the component items of work in sufficient detail to serve as a basis for computing values for progress payments during construction.

C. List sub-values of major products or operations for each line item. Additional sub-values may be requested by the OWNER'S REPRESENTATIVE.

D. Costs for the various portions of the work:
1. Each item shall include a directly proportion amount of the Contractor's overhead and profit.
2. For items on which progress payments will be requested for stored products, list the total installed value, including Contractor's overhead and profit.

E. Round amounts to nearest whole dollar wherever possible; total shall equal the Contract Sum.

F. A similar, detailed Schedule of Values, itemizing costs and/or credits in a form satisfactory to the OWNER'S REPRESENTATIVE shall accompany all quotations for changes in the work or for extra work.

G. The sum of all values listed in the Schedule of Values shall equal the total Contract Sum.

1.5 REVIEW AND RESUBMITTAL

A. After review by the OWNER'S REPRESENTATIVE, revise and resubmit Schedule of Values as required if the OWNER'S REPRESENTATIVE determines that the costs are frontloaded, and/or the distribution of the costs is unreasonable. Resubmit revised Schedule in same manner within **five (5)** days for review.

B. Progress payments will not be made until Schedule of Values has been approved.

END OF SECTION

SECTION 01 2976

PROGRESS PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. This Section specifies administrative and procedural requirements for a certified Application for Payment.

1. Coordinate the certified Schedule of Values and certified Application for Payment with, but not limited to, the Construction Schedule, submittal log, and list of Subcontractors.

1.02 RELATED REQUIREMENTS:

A. Section 01 2973: Schedule of Values.

B. Section 01 3213: Construction Schedule.

C. Section 01 3229: Project Forms.

D. Section 01 7700: Contract Closeout.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 APPLICATION FOR PAYMENT

A. Each certified Application for Payment shall be consistent with previous applications and payments as reviewed by OAR, paid for by OWNER, and:

1. The initial Application for Payment and Final Application for Payment at time of Substantial Completion involve additional requirements.

B. Payment Application Times: The period of Work covered by each Application for Payment is payment date for each progress payment as specified in the General Conditions. The period covered by each Application for Payment is previous month.

C. Payment Application Forms: Use OWNER provided forms for the Application for Payment.

D. Application Preparation: Complete every entry on the form. Include execution by a person authorized to sign legal documents on behalf of CONTRACTOR. OAR will return incomplete applications without action.

E. Transmittal: Submit a minimum of four signed and original copies of each certified Application for Payment to OAR. All copies shall be complete, including releases and similar attachments.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application, in a manner acceptable to OAR.

F. Initial Application for Payment within 60 days of issuance of Notice to Proceed: Administrative actions and submittals, that must precede or coincide with submittal for first certified Application for Payment include, but are not limited to, the following:

1. Certified Schedule of Values.

2. Performance and payment bonds.

3. List of principal suppliers and fabricators.

4. Worker Compensation certificates, if applicable.

5. Auto Insurance, if applicable.

6. Hazardous Material Insurance Certificates, if applicable.

7. Construction Schedule.

8. Submittal Schedule.

9. Emergency Contact List.

10. Copies of authorizations and licenses from governing authorities for performance of Work.

11. Certified Payroll (Submitted directly to Labor Compliance in electronic format as specified by OWNER including hard copy).

12. Storm Water Pollution Prevention Plan (SWPPP).

13. Certification of Compliance with CEQA Mitigations.

G. Applications for Payment: Administrative actions and submittals that must precede or coincide with submittal of Progress Applications for Payment include, but are not limited to, the following:

1. Certified Payroll (submitted directly to Labor Compliance in electronic format as specified by OWNER including hard copy).

2. Updated and current Project Record Drawings (as-built).

3. Monthly Construction Schedule (updated, submitted and approved).

4. Approved Schedule of Values.

5. List of Subcontractors (Payments Summary).

6. Storm Water Pollution Prevention (SWPP) – Site Monitoring Report.

7. Certification of Compliance with CEQA Mitigations.

H. Final Application for Payment at Substantial Completion: Following OAR issuance of certificate of Substantial Completion, submit an Application for Payment:

1. Administrative actions, submittals and/or Work that shall precede or coincide with this application include:

a. Occupancy permits and similar approvals by authorities having legal jurisdiction over Work..

b. Removal of temporary facilities and services.

c. Testing, adjusting and balance records.

d. Removal of surplus materials, rubbish, and similar elements.

e. Meter readings.

f. Start-up performance reports.

g. OWNER training and orientations.

h. Operating and maintenance instruction manuals.

i. Preliminary Warranties, guarantees and maintenance agreements.

j. Delivery of extra materials, products and or stock.

k. Change over information related to OWNER occupancy, use, operation, and maintenance.

l. Final cleaning.

m. Ensure that Work is completed.

n. Advise on shifting insurance coverage.

o. List of defective Work, recognized as exceptions to certificate of Substantial Completion.

p. Change of door locks, including keys, to OWNER system.

q. Certified Payroll (submitted directly to Labor Compliance in electronic format as specified by the OWNER including hard copy).

r. Certification that all benefit contributions due and owing to appropriate union trusts has been paid by CONTRACTOR and Subcontractors, as specified by the Project Stabilization Agreement (PSA) and Article 6.49 of the General Conditions.

s. Storm Water Pollution Prevention – Site Monitoring Reports, SWPP revisions, compliance certifications, and Notice of Termination (NOT) (see Section 01 7416).

t. Certification of Compliance with CEQA Mitigations.

u. Waivers and releases for CONTRACTOR.

END OF SECTION

SECTION 01 3100

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General project coordination procedures.
2. Administrative and supervisory personnel.
3. Coordination drawings.
4. Requests for Information (RFIs).
5. Project meetings.

B. Related Sections:

1. Division 01 – Section 013210 “Construction Schedule” for preparing and submitting Contractor’s Construction Schedule.
2. Division 01 – Section 017000 "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Division 01 – Section 017700 “Closeout Procedures” for coordinating closeout of the Contract.

1.03 DEFINITIONS

A. RFI: Request from Owner, District Project Manager, Architect, or Contractor seeking information from each other during construction.

1.04 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate Contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.

2. Preparation of the Schedule of Values.

3. Installation and removal of temporary facilities and controls.

4. Delivery and processing of submittals.

5. Progress meetings.

6. Pre-installation conferences.

7. Project closeout activities.

8. Startup and adjustment of systems.

9. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.05 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Execution: The Mechanical Subcontractor shall prepare ductwork fabrication drawings and BIM model for review and coordination with the architect and other design consultants, the electrical, plumbing, sprinkler and other relative Subcontractors. Drawings shall be in sufficient detail to show overall ductwork dimensions, clearances, and relative locations of work in allotted spaces. Ductwork routing and sectional elevations shall be provided for congested areas. The Mechanical Subcontractor will disseminate the ductwork drawings

and will direct and expedite review by the various trades. Each trade shall indicate where conflicts or clearance problems exist for their work and subsequently seek resolution from the Architect/Engineer via General Contractor. Final coordinated drawings shall be produced by the Mechanical Subcontractor, who shall obtain approval for any changes to duct or pipe sizes and significant changes in routing. Electrical, sprinkler, and other relative Subcontractors are required to participate in and cooperate fully with the coordination process.

a. The Mechanical Subcontractor to include the General Contractor, Owner and Architect in BIM coordination meetings.

2. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.

b. Coordinate the addition of trade-specific information to the coordination drawings by multiple Contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.

c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.

d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.

e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.

f. Indicate required installation sequences.

g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to District Project Manager and the Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire protection, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.

2. Plenum Space: Indicate sub-framing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.

3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire alarm, and electrical equipment.

4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.

5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.

6. Mechanical and Plumbing Work: Show the following:

    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.

    b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.

    c. Fire-rated enclosures around ductwork.

7. Electrical Work: Show the following:

    a. Runs of vertical and horizontal conduit 1-1/4 inch diameter and larger.

    b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire alarm locations.

    c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.

    d. Location of pull boxes and junction boxes dimensioned from column center lines.

8. Fire Protection System: Show the following:

    a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

9. Review:

    a. District Project Manager and Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility. If the District Project Manager and Architect determines that the coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the District Project Manager and Architect will so inform the Contractor, who shall make changes as directed and resubmit.

10. Coordination Drawing Prints: Prepare coordination drawing prints in accordance with requirements of Division 01 - Section 013300 "Submittal Procedures."

1.06 KEY PERSONNEL

A. Key Personnel Names: Within fifteen (15) days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project

Site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.07 REQUESTS FOR INFORMATION OR INTERPRETATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of Subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of District Project Manager
6. Name of Architect.
7. RFI number, numbered sequentially.
8. RFI subject.
9. Specification Section number and title and related paragraphs, as appropriate.
10. Drawing number and detail references, as appropriate.
11. Field dimensions and conditions, as appropriate.
12. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
13. Contractor's signature.
14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: AIA Document G716, CSI Form 13.2A, or Contractor's comparable form. The Contractor is to use Primavera Contract Manager for all RFI coordination, see General Conditions.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

    a. Requests for approval of submittals.

    b. Requests for approval of substitutions.

    c. Requests for coordination information already indicated in the Contract Documents.

    d. Requests for adjustments in the Contract Time or the Contract Sum.

    e. Requests for interpretation of Architect's actions on submittals.

    f. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.

3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 - Section 012600 "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify the District Project Manager and Architect within seven days if Contractor disagrees with response.

F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly. Use CSI Log Form 13.2B or Contractor’s comparable form. Include the following:

1. Project name.

2. Name and address of Contractor.

3. Name and address of Architect.

4. RFI number including RFIs that were dropped and not submitted.

5. RFI description.

6. Date the RFI was submitted.

7. Date Architect's response was received.

8. Identification of related Field Order, Change Directive, and Proposal Request, as appropriate.

1.08 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project Site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify the District Project Manager and Architect of scheduled meeting dates and times.

2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: The District Project Manager will record significant conference discussions, agreements, and disagreements, including required corrective measures and actions. Distribute the meeting minutes to each party present, to parties who should have been present, and to other parties requiring information within three days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner, District Project Manager and Architect.

1. Conduct the conference to review responsibilities and personnel assignments.

2. Attendees: Authorized representatives of Owner, District Project Manager, Architect, and their consultants; Contractor and its superintendent; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Discuss items of significance that could affect progress, including the following:

a. Tentative construction schedule.

b. Phasing.

c. Critical work sequencing and long-lead items.

d. Designation of key personnel and their duties.

e. Lines of communications.

f. Procedures for processing field decisions and Change Orders.

g. Procedures for RFIs.

h. Procedures for testing and inspecting.

i. Procedures for processing Applications for Payment.

j. Distribution of the Contract Documents.

k. Submittal procedures.

l. Preparation of record documents.

m. Use of the premises and existing building(s).

n. Work restrictions.

o. Working hours.

p. Owner's occupancy requirements.

q. Responsibility for temporary facilities and controls.

r. Procedures for moisture and mold control.

s. Procedures for disruptions and shutdowns.

t. Construction waste management and recycling.

u. Parking availability.

v. Office, work, and storage areas.

w. Equipment deliveries and priorities.

x. First aid.

y. Security.

z. Progress cleaning.

4. Minutes: The District Project Manager will record significant conference discussions, agreements, and disagreements, including required corrective measures and actions. Distribute the meeting minutes to each party present, to parties who should have been present, and to other parties requiring information of the meeting.

C. Pre-installation Conferences: The Contractor shall conduct a pre-installation conference at Project Site before each construction activity that requires coordination with other construction, or prior to a new Subcontractor is about to start onsite, so their scope can be understood by all parties.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.

b. Options.

c. Related RFIs.

d. Related Change Orders.

e. Purchases.

f. Deliveries.

g. Submittals.

h. Review of mockups.

i. Possible conflicts.

j. Compatibility problems.

k. Time schedules.

l. Weather limitations.

m. Manufacturer's written recommendations.

n. Warranty requirements.

o. Compatibility of materials.

p. Acceptability of substrates.

q. Temporary facilities and controls.

r. Space and access limitations.

s. Regulations of authorities having jurisdiction.

t. Testing and inspecting requirements.

u. Installation procedures.

v. Coordination with other work.

w. Required performance results.

x. Protection of adjacent work.

y. Protection of construction and personnel.

3. Minutes: The Contractor is responsible for conducting meeting will record significant conference discussions, agreements, and disagreements, including required corrective measures and actions. Distribute the meeting minutes to each party present, to parties who should have been present, and to other parties requiring information within three days of the meeting.

4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Schedule and conduct a Project closeout conference, at a time convenient to Owner, District Project Manager, Inspector of Record and Architect, but no later than ninety (90) days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.

2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major Subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

a. Preparation of record documents.

b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.

c. Submittal of written warranties.

d. Requirements for preparing operations and maintenance data.

e. Requirements for demonstration and training.

f. Preparation of Contractor's punch list.

g. Procedures for processing Applications for Payment at Substantial Completion and for final payment.

h. Submittal procedures.

i. Owner's partial occupancy requirements.

j. Installation of Owner's furniture, fixtures, and equipment.

k. Responsibility for removing temporary facilities and controls.

4. Minutes: The District Project Manager will record significant conference discussions, agreements, and disagreements, including required corrective measures and actions. Distribute the meeting minutes to each party present, to parties who should have been present, and to other parties requiring information.

E. Progress Meetings: The District Project Manager will conduct progress meetings at weekly intervals or at intervals approved by Owner.

1. Contractor shall coordinate dates of meetings with preparation of payment requests.

2. Attendees: In addition to representatives of Owner, District Project Manager, Project Inspector and Architect, each Contractor, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.

2) Sequence of operations.

3) Status of submittals.

4) Deliveries.

5) Off-site fabrication.

6) Access.

7) Site utilization.

8) Temporary facilities and controls.

9) Progress cleaning.

10) Quality and work standards.

11) Status of correction of deficient items.

12) Field observations.

13) Status of RFIs.

14) Status of proposal requests.

15) Pending changes.

16) Status of Change Orders.

17) Pending claims and disputes.

18) Documentation of information for payment requests.

4. Minutes: The District Project Manager will record significant conference discussions, agreements, and disagreements, including required corrective measures and actions. Distribute the meeting minutes to each party present, to parties who should have been present, and to other parties requiring information of the meeting.

   a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting. If special meetings such as site mobilization conferences, special inspections conferences, or LEED coordination conferences are required, insert articles here specifying meeting requirements.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 3113

PROJECT COORDINATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies administrative and procedural requirements necessary for coordinating Work operations including, but not limited to, the following:

1. General coordination procedures.

2. Coordination drawings.

1.02. RELATED REQUIREMENTS

A. Section 01 1216: Phasing of the Work.

B. Section 01 3213: Construction Schedule.

C. Section 01 3300: Submittal Procedures.

D. Section 01 4523: Test and Inspection.

E. Section 01 7700: Contract Closeout.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 COORDINATION

A. CONTRACTOR shall coordinate operations included in various sections of Contract Documents to assure efficient and orderly installation of each part of Work. Coordinate Work operations included under related sections of Contract Documents that depend on each other for proper installation, connection, and operation of Work, including but not limited to:

1. Schedule construction operations in sequence required where installation of one part of Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.

3. Provide provisions to accommodate items scheduled for later installation.

4. Prepare and administer provisions for coordination drawings.

B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required in notices, reports, attendance at meetings, and:

1. Prepare similar memoranda for OAR and Separate Work Contract where coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of Work. Such administrative activities include, but are not limited to, following:

1. Preparation of schedules.

2. Installation, relocation, and removal of temporary facilities.

3. Delivery and processing of submittals.

4. Progress meetings.

5. Project closeout activities.

D. Conservation: Coordinate Work operations to assure operations are carried out with consideration given to conservation of energy, water, materials, and:

1. Salvage materials and equipment involved in performance of, but not actually incorporated into Work.

3.02 SUBMITTALS

A. Coordination Drawings: CONTRACTOR shall prepare coordination drawings to coordinate the installation of products and materials fabricated, furnished and installed by separate entities, under different parts of the Contract. CONTRACTOR shall notify OAR and ARCHITECT of all major conflicts in writing in a timely manner so that the design team can respond without construction delays. Coordination drawings shall address the following at a minimum:

1. Limitations in available space for installation or service. CONTRACTOR shall overlay plans of each trade and verify space requirements and conflicts between trades. Minor changes and adjustments that do not affect design intent shall be made by CONTRACTOR and shall be highlighted for ARCHITECT'S review.

2. Incompatibility between items provided under different trades (such as difference in voltage between equipment specified under Divisions 22 and 23 and electrical power provided under Division 26.)

3. Inconsistencies between drawings, specifications and codes (between trades and within each trade).

4. Additional items required for existing facilities construction projects shall be designed and prepared from available as-built drawings that are verified through non-invasive and non-destructive, visual observation only. CONTRACTOR shall field verify actual existing conditions during and upon completion of demolition work and incorporate findings into preparation of co-ordination drawings. Minor changes and adjustments that do not affect design intent shall be made by Sub-Contractor and shall be highlighted for OAR and ARCHITECT'S reviews.

B. Prepare coordination drawings in CAD with each trade on a separate layer, in specified color and scale. CONTRACTOR and each Subcontractor shall provide and forward reproducible copies and CAD drawing files in the order described here:

1. Structural shop drawings shall indicate location and sizes of columns, beams and other structural members, as well as wall, roof and slab penetrations, and will be provided to mechanical, electrical, low voltage and plumbing Sub-contractors for co-ordination. Structural items shall be indicated using black lines.

2. HVAC Subcontractor will indicate all ductwork, piping and equipment complete with installation and dimensioned service clearances, duct and pipe sizes, fitting types and sizes, top or bottom of duct and pipe elevations, distances of ducts, pipes and equipment from building reference points and hanger and support locations. Minor changes and adjustments that do not affect design intent shall be made by Subcontractor and shall be highlighted for OAR and ARCHITECT'S reviews. Forward drawings to plumbing Subcontractor for further co-ordination. HVAC items shall be indicated using orange lines.

3. Plumbing Subcontractor will indicate all plumbing lines, and equipment complete with installation and dimensioned service clearances, pipe sizes, fitting types and sizes, top or bottom of pipe elevations, distances of pipes and equipment from building reference points and hanger/support locations Co-ordinate with HVAC Subcontractor. Minor changes and adjustments that do not affect design intent shall be made by Sub-contractor and shall be highlighted for OAR and ARCHITECT'S reviews Upon completion drawings shall be forwarded to Fire Sprinkler Subcontractor for further co-ordination. All Plumbing items shall be indicated using blue lines.

4. Fire sprinkler Subcontractor will indicate fire sprinkler piping and equipment complete with installation and dimensioned service clearances, pipe sizes, fitting types and sizes, top or bottom of pipe elevations, distances of pipes and equipment from building reference points and hanger or support locations. Co-ordinate with Plumbing and HVAC Subcontractors. Minor changes and adjustments that do not affect design intent shall be made by sub-contractors and shall be highlighted for OAR and ARCHITECT'S reviews. Upon completion drawings shall be forwarded to Electrical CONTRACTOR for further co-ordination. Fire sprinkler equipment shall be indicated using red lines.

5. Electrical and Low Voltage Subcontractors will indicate service and feeder conduit runs and other electrical equipment complete, including low voltage with installation and dimensioned service clearances, sizes, top or bottom of conduit and rack elevations, distances of conduits and equipment from building reference points and hanger and support locations. Co-ordinate with Fire Sprinkler, Plumbing and HVAC Subcontractors. Minor changes and adjustments that do not affect design intent shall be made by sub-contractors and shall be highlighted for OAR and ARCHITECT'S reviews. Upon completion drawings shall be forwarded to CONTRACTOR for further co-ordination. Electrical work shall be indicated in dark green lines. Low voltage work shall be indicated in light green lines.

6. CONTRACTOR will be responsible for the overall coordination review. As each coordination drawing is completed, CONTRACTOR will meet with OAR to review and resolve all conflicts on coordination drawings.

7. Coordination meetings will be held in Project field office of CONTRACTOR. CONTRACTOR is required to distribute Shop Drawings, cut sheets and submittals to Subcontractors where appropriate. Reviewed coordination drawings will be maintained in Project field office of CONTRACTOR. Meeting minutes shall be developed by CONTRACTOR and submitted to OAR within 5 days.

END OF SECTION

SECTION 01 3119

PROGRESS MEETINGS

PART 1 - PART 1 - GENERAL

1.01 DESCRIPTION

A. Scheduling and administration of progress meetings.

1.02 RELATED REQUIREMENTS

A. Instructions to Bidders

B. Project General Requirements

C. Construction Schedules

D. Shop Drawings, Product Data and Samples

E. Quality Control

F. Temporary Facilities

1.03 PROGRESS MEETINGS

A. The Contractor will schedule Construction Progress Meetings, coordination meetings and pre-installation conferences throughout the progress of work. The District Project Manager will be responsible for the administrating and distributing Project meeting minutes from the weekly meetings with the Contractor, but the Contractor is responsible to minute and distribute all other weekly Subcontractor coordination and pre-installation meeting minutes.

B. The District Project Manager will set dates and times, make physical arrangements, prepare agenda and distribute notice of each meeting to Contractor, Architect, and Inspector of Record in advance of or at meetings.

C. The District Project Manager will preside at the weekly construction meeting with the Contractor; record minutes and distribute copies to participants.

D. Location of meetings: Project's field office, Project Site, or District Project Manager’s office.

E. Attendance: District Project Manager, Inspector of Record, Contractor or his authorized representative, and job superintendent, Contractor Architect. Subcontractors, suppliers and others shall attend as appropriate to agenda; Design Engineers and others shall attend when appropriate.

F. Minimum Agenda:

1. Approval of minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems and decisions.
4. Identification of problems which impede planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-Site fabrication and delivery schedules.
7. Review, maintenance, and adjustment of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to Work.
14. Site safety.

END OF SECTION

SECTION 01 3210

CONSTRUCTION SCHEDULE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. A.Required procedures, preparation, submittals, reviews, updates, and revisions to the cost/schedule integrated Construction Schedule. The purpose of this section is to:

1. Ensure adequate planning and execution of the Work by Contractor.
2. Establish a standard against which satisfactory completion of the Project can be measured by Owner.
3. Assist Contractor and the District Project Manager in monitoring progress.
4. Aid in assessing the impact of any changes to the Contract.
5. Provide justification for progress payments.

1.02 RELATED SECTIONS

A. General and Special Conditions

B. Division 01 – 012900 “Payment Procedures”

C. Division 01 – 013100 “Project Management and Coordination”

D. Division 01 – 013300 “Submittal Procedures”

E. Division 01 – 012973 “Schedule of Values”

F. Division 01 – 014523 “Testing and Inspection”

G. Division 01 – 015000 ”Construction Facilities And Temporary Controls”

H. Division 01 – 017700 ”Closeout Procedures”

PART 2 - PRODUCTS

2.01 SCHEDULING SOFTWARE

A. Contractor shall utilize Primavera Project Planner™ for Windows® (P6) software (latest version) by Primavera Systems, Inc., or equivalent scheduling software to employ the Critical Path Method (CPM) in the development and maintenance of the construction schedule network using the Precedence Diagram Mode (PDM). The scheduling software shall be capable of being resource

loaded with manpower, costs and materials. It shall also be capable of generating time-scaled logic diagrams, resource histograms and profiles, bar charts, layouts and reports with any and/or all activity detail.

B. All schedule calculation rules, auto cost rules and resource calculation rules shall be in a format acceptable to District Project Manager. When schedule calculations are performed, the "Retained Logic" setting shall be used. Contractor shall use the zero (0) "Decimal Places" setting.

PART 3 - EXECUTION

3.01 SUBMITTALS

A. Contractor shall retain a Construction Scheduler to work in enough capacity to perform all of the requirements outlined in this Section. Contractor shall submit a resume of the proposed Scheduler for review and acceptance prior to the preparation of any Schedule. The resume shall demonstrate the proposed scheduler's capability to plan, coordinate, execute, and monitor a cost/resource loaded CPM schedule as required for this Project and have a minimum of five (5) years direct experience using Primavera Project Planner. Scheduler will cooperate with District Project Manager and shall be available onsite for monitoring, maintaining and updating schedules in a timely manner. District Project Manager has the right to refuse to accept the Scheduler based upon a lack of experience as required by this or based on lack of performance and timeliness of schedule submittals/fragments on past projects. If the District Project Manager does not accept the proposed Scheduler, Contractor shall within one (1) week of disapproval, propose another scheduler who meets the experience requirements stated above.

B. Contractor shall submit two (2) compact discs with all schedule submittals. Flash drives may be submitted in lieu of compact discs if approved by the District Project Manager.

C. Contractor shall submit the Preliminary Construction Schedule within ten (10) days after Notice to Proceed.

D. Contractor shall submit the Proposed Baseline Schedule as required within thirty (30) days after of the Notice to Proceed.

E. Contractor shall submit the Monthly Schedule Updates, Four-Week Rolling Schedules, and Recovery Schedules as required.

3.02 PRELIMINARY CONSTRUCTION SCHEDULE

A. The purpose of the cost-loaded Preliminary Construction Schedule is to provide a mechanism in which to measure performance on individual activities and to validate the Contractor's monthly Application for Payment on work performed (starting with month 1) during the first three months of the job until the complete Baseline Schedule is approved by the District Project Manager.

B. Contractor shall develop and submit a cost loaded Preliminary Construction Schedule as required by this Section. It shall be submitted in computer generated network format and shall be organized by Activity Codes representing the Contractor's intended sequencing of the Work. The Preliminary Construction Schedule shall include activities for the first 90 calendar days following the Notice To Proceed such as mobilization, preparation of submittals, specified review periods, procurement items, fabrication items, milestones, and detailed construction activities.

C. Upon District Project Manager's acceptance of the Preliminary Construction Schedule, Contractor shall update the accepted Preliminary Construction Schedule each month (beginning with month 1) and submit these updates until Contractor's Baseline Schedule is fully developed and accepted. Since updates to Preliminary Construction Schedule are the basis for payment to Contractor during the first three-month period, submittal and acceptance of such updates shall be a condition precedent to making of monthly payment, as referenced in General Conditions.

D. Provide a written narrative describing Contractor's approach to mobilization, procurement, and construction during the first 90 calendar days including crew sizes, equipment and material delivery, Project Site access, submittals, and permits.

E. Submit Bar Charts, Tabular Reports, a Cost Flow Histogram, Electronic Data, and Plots in accordance with 013210 "Construction Schedule".

3.03 SCHEDULE OF VALUES

A. Contractor shall cost load activities in the Preliminary Construction Schedule and allocate costs to the cost accounts of all activities. The cost accounts shall match the CSI subsections listed in the Table of Contents of the Specifications. The format shall be coordinated with Article 8.3 (Progress Payment).

B. Submit a computer generated tabular report from the Preliminary Construction Schedule using the P6 scheduling software. The report shall contain the following data for each activity: Cost Account Number (by CSI subsection), Cost Account Description, Cost Account Budget, Cost to Date, Cost this Period, and Cost to complete. Total costs shall be organized and totaled by CSI subsection. This tabular report shall be the source of the data Contractor reports on the Schedule of Values.

C. The cost loading associated with the activities shall be based on Contractor estimates of costs that Contractor will incur performing the specific activities.

3.04 PROPOSED BASELINE SCHEDULE

A. Within thirty (30) days after of the Notice to Proceed, Contractor shall submit a detailed Proposed Baseline Schedule that covers the entire duration of the Project. This schedule shall convey Contractor's plan for organizing, managing, and executing the Work.

B. The Proposed Baseline Schedule shall include activity descriptions, sequencing, logic relationships, duration estimates, cost loading by CSI subsection, resource loading, and other information as set forth in this Section.

1. The Proposed Baseline Schedule shall include all Milestones stipulated in General Conditions, as well as all activities required to achieve timely completion of the Milestones.

2. The Proposed Baseline Schedule shall include activities for: all construction activities, the Notice To Proceed, Milestones, submittals, coordination drawings, re-submittals, procurement of materials and equipment, manufacturing, fabrication and delivery, OFCI (Owner-Furnished, Contractor-Installed) items, access restrictions, work restrictions, phased occupancy, testing, start-up, and contract closeout activities. The Proposed Baseline Schedule shall allow a period for District Project Manager and Architect to review each submittal, as required by General Conditions Article 7.3 and other sections which require additional time for Owner reviews and deferred submittal reviews by Division of State Architects (DSA).

3. The Proposed Baseline Schedule shall include start and completion dates for: temporary facilities, construction of mock-ups, prototypes, samples, punch list, Owner interfaces and furnishing of items, separate work contracts, regulatory agency approvals, and permits required for performance of the Work.

4. The Proposed Baseline Schedule shall allow for all foreseeable factors and risks which affect performance of the Work. Include Allowances for weather conditions, applicable laws, transportation, traffic, air quality, noise, or any other applicable regulatory requirements, regulations or collective bargaining agreements pertaining to labor.

5. Contractor shall not use any float suppression techniques such as preferential sequencing or logic, special lead/lag constraints or unjustifiable over-estimating of activity durations in preparing the Proposed Baseline Schedule except that Finish No Later Than constraints are permitted for Milestones. No “Zero Free Float” constraints, No “Early” Constraints, and No “Mandatory Finish” constraints shall be utilized.

6. The Proposed Baseline Schedule shall include activity durations based on the crew sizes and equipment utilization that Contractor will maintain during the Project. No activity durations shall exceed twenty (20) working days unless approved by the District Project Manager. Non-construction activities such as procurement, fabrication, delivery, or submittal activities are exempted.

7. Contractor shall include with the Proposed Baseline Schedule a written narrative report sufficiently comprehensive to explain the rationale behind Contractor’s approach to the Work including but not limited to: activity durations, manpower flow, average crew sizes, equipment requirements, production rates, constraints, holidays and other non-work days, potential problem areas, permits, coordination with regulatory authorities, utilities, separate work contracts and other parties, and long lead delivery items requiring more than thirty (30) days from the date of order to delivery to the Project Site.

C. At the District Project Manager request, furnish a detailed written explanation of Contractor’s basis for specific durations, logic, phasing, or other information. Such an explanation shall include Contractor’s rationale for selecting the number of crews, crew composition, number of shifts per day, number of hours in a shift, number of work days per week, construction equipment, and/or similar factors.

D. The Proposed Baseline Schedule activities shall contain the following data:

1. Activity ID numbers shall consist of no more than eight (8) alphanumeric characters. Following District Project Manager acceptance of the Baseline Schedule, Activity ID numbers shall not be changed.

2. Activity Descriptions shall provide adequate information that readily identifies each activity, work scope, and location.

3. Activity codes specified in Section 013210 "Construction Schedule" – 3.04G shall be applied to each activity.

4. Cost accounts (in CSI subsection format) and Resource accounts shall be applied to each activity. They shall include lump sum costs, and man-hours/man-days (where applicable).

E. At District Project Manager's request, furnish a written explanation for each lead or lag relationship and each constrained date. Unjustifiable leads, lags, and constraints will result in District Project Manager rejection of the Proposed Baseline Schedule.

F. Calendar Identification: In the scheduling software, identify all activities that will require overtime shifts, double shifts, and work on weekends or holidays. Identify non-work days and holidays in the schedule calendar. All milestones stipulated in General Conditions shall be placed on a calendar with seven (7) days per week. No holiday or non-work day restrictions are permitted on this calendar.

G. Activity Codes: As a minimum, the Activity Codes shown in the Table 1 below shall be assigned to each activity.

1. Table 1

Name	Length	Description
TYPE	2	Type of activity (mobilization, submittals, procurement/fabrication, construction, milestones, etc.)
AREA	2	Area and/or building (General Conditions, Project Site, Bldg "A")
STAG	2	Stage (foundations, superstructure, exterior, interior, roof, floor #, etc.)
SBST	2	Sub-stage (a specific area within a stage such as main electrical room, #, etc.)
RESP	7	Responsible Party (Subcontractor and/or trade)
SPEC	5	CSI sub section number

2. The District Project Manager may require additional coding of activities. The mandatory activity code requirements listed in Table 1 are not to be construed as setting limits on Contractor's management and coordination responsibilities but are intended to guide Contractor in the administration of its contractual responsibilities.

H. Milestones are designated dates as set forth in General Conditions in which Work, or portions thereof, are required to start and/or complete in accordance with the Contract Documents.

1. Where the term completion or similar terms are used in regard to a Milestone, it shall be construed to mean all portions of the Work in the indicated phase, area, and/or zone are complete and acceptable to District Project Manager. Where the terms start, or similar terms are used in the designation of a Milestone, it shall be construed to mean a portion of the Work in the indicated phase, area, and/or zone is required to be commenced.

2. A Proposed Baseline Schedule extending beyond the Milestones and/or Contract Time will not be acceptable.

3. Finish Milestones shall be constrained with Late Finish (Finish No Later Than) type constraints in accordance with the dates stipulated in General Conditions.

4. In the scheduling software, in the "Project Overview" menu, assign the "Project Must Finish By" date to match the Substantial Completion and Contract Completion Milestone dates stipulated in General Conditions.

5. A Proposed Baseline Schedule indicating Work completed in less time than the Milestones and/or Contract Time will not be acceptable. Rather, Contractor shall show any unused contract time as float.

6. Milestones shall be placed on a calendar with seven (7) days per week No Holiday or non-workday restrictions are permitted on this calendar.

I. The Critical Path shall be clearly indicated on all schedules submitted. An activity is defined as critical when its Total Float is less than or equal to zero (0) days. The critical path is defined as the longest path.

J. Contractor shall allow for inclement weather in the Proposed Baseline Schedule by incorporating an activity titled "Rain Day Impact Allowance" as the last activity prior to the Substantial Completion Milestone. No other activities may be concurrent with it. The duration of the Rain Day Impact Allowance activity will be based on Table #2 below and will be calculated from the Notice to Proceed until the original date of Substantial Completion.

1. Cumulative Calendar Days "Rain Day Impact Allowance": This Project will have a total of X (X) Rain days for the duration of the Construction.

2. When inclement weather at the Project Site impacts Critical Path activities, Contractor may provide the District Project Manager with a written request for a weather impact day describing the inclement weather delay on the Critical Path activities. The inclement weather delay must be clearly indicated by a 70% decrease in the field labor workforce hours on Critical Path activities on the day in question as indicated by Contractor's Daily Reports from the day in question and the scheduled work days prior to the day in question. Upon the District Project Manager's independent confirmation of the amount of rainfall and impact, District Project Manager will authorize Contractor to reduce the duration of the Rain Day Impact Allowance by one (1) day.

3. Inclement weather on non-scheduled workdays shall not be granted as weather impact days. If Contractor asks to work a specific weekend or holiday and gives District Project

Manager advanced, written notification of critical path work to be performed and a substantial amount of precipitation occurs that prevents the work from being performed, then that day can be claimed as a weather impact day. If the effects of inclement weather from a non-scheduled work day carry forward to a scheduled work day and impacts the Critical Path as noted above, then the scheduled work day will be considered impacted by weather. Any unused rain day Allowance at the end of the project will be shown as available float to the Substantial Completion Milestone. Excusable, non-compensable time extensions will be granted for inclement weather to Substantial Completion milestone only after the weather impact area affecting the critical path work has exhausted the allotted cumulative Rain Day Impact Allowance.

K. Cost loaded Activities:

1. Each activity included in the Proposed Baseline Schedule shall be assigned the cost Contractor estimates it will incur performing that activity. Each activity's assigned cost will be inclusive of overhead and profit, so Contractor's total overhead and profit is distributed over all activities on a pro rata basis. The sum of the costs assigned to activities shall equal the total contract value. No activity costs shall be assigned to manufacturing or delivery activities unless approved by District Project Manager. If the District Project Manager finds that the costs are frontloaded, and the distribution of costs is unreasonable, Contractor shall re-distribute the costs and resubmit the revised Schedule of Values within five (5) days for The District Project Manager back check.

2. Contractor shall cost load activities in the Proposed Baseline Schedule and allocate costs to related resource/cost accounts associated with each activity. The cost accounts shall match the CSI subsections listed in the Table of Contents of the Specifications. All cost-loaded activities shall roll-up to their designated CSI subsections and shall be the basis for the data reported in the Schedule of Values.

3. Submit computer generated tabular reports using the scheduling software which will be the basis for the approved Schedule of Values. The reports shall contain the following data for each activity: Cost/Resource Account Number (by CSI subsection), Cost/Resource Account Description, Cost/Resource Account Budget, Material Quantities and Unit Costs, Cumulative Quantities and Cost to Date, Material Quantities and Cost this Period, and Estimated Material Quantities and Cost at Completion. Total Material Quantities and Total Costs shall be organized and totaled by CSI subsection.

4. Submit a Cost Flow Histogram in accordance with specification Section 01321 "Construction Schedule – 3.04-L-3.

L. Contractor shall submit computer generated reports and plots with the Proposed Baseline Schedule submittal package. Format shall display the following columns: Activity ID, Activity Description, Original Duration, Remaining Duration, Percent Complete, Early Start, Early Finish, Late Start, Late Finish, and Total Float.

1. Bar charts shall be generated separately for:

a. Milestones only.

b. All activities sorted by Early Start date and organized by Project, Area, Stage, and Sub-stage. (The network shall show continuous flow of all activities from left to right).

c. All activities sorted by Responsibility.

d. Summary level of all activities sorted by craft/trade and area.

2. Tabular Reports:

a. Total Float sorted low to high

b. Predecessors and Successors sorted by Activity ID.

3. Cost Flow Histogram

a. Using the costs assigned to each activity, develop a Histogram that projects the estimated invoice amounts by month for the Project duration. The histogram shall be produced from the scheduling software on 11x17 size paper (landscape mode). It shall contain both a monthly bar histogram and a cumulative cost curve on the same graph. The Total Costs shall be based on the Early Dates option.

4. Manpower Histogram

a. Submit a planned manpower graphic bar histogram produced from the scheduling software on 11x17 size paper (landscape mode) that displays total man-hours based on Early Dates. Show both a weekly bar histogram and a cumulative curve on same graph. Upon the Construction Manger request, provide manpower broken down by trade.

5. Provide a written narrative as required by Section 013210 “Construction Schedule” – 3.04-B-7.

6. Electronic data: Provide two compact discs that contain a back-up of the Proposed Baseline Schedule data on it. Flash drives may be submitted in lieu of compact discs if approved by the District Project Manager. The electronic P6 files shall be saved in “.XER” type format.

M. District Project Manager will notify Contractor of any adjustments that are required for the Proposed Baseline Schedule to be accepted. Contractor shall perform any required adjustments to the Proposed Baseline Schedule and resubmit it for acceptance certifying in writing that all information contained therein complies with the Contract Documents. The District Project Manager will review the Proposed Baseline Schedule for accuracy, reasonableness, and conformance with the Contract Documents and shall provide comments within ten (10) days of receipt. Within five (5) days after receiving District Project Manager comments, Contractor shall both incorporate changes to address District Project Manager concerns and resubmit the Proposed Baseline Schedule for District Project Manager back-check. This process will continue until the Proposed Baseline Schedule is accepted as the Baseline Schedule. Once accepted by District Project Manager, the Baseline Schedule will be the basis upon which Contractor shall prepare updates that record and report actual performance and progress. The accepted Baseline Schedule and subsequent Monthly Updates (reference Section 013210 “Construction Schedule” – 3.04 and 3.05 respectively) shall be the

basis for consideration and analysis of requests for time extensions and Contractor progress payments.

N. District Project Manager acceptance of the Baseline Schedule or Contractor's failure to identify and/or include any element of the Contract, shall not release Contractor's obligation to complete all required Work in accordance with the Contract Documents.

3.05 REQUIREMENTS FOR MONTHLY/WEEKLY SCHEDULE UPDATING

A. Once the Baseline Schedule is accepted by District Project Manager, Contractor shall submit Monthly Schedule Updates beginning with month No. 1. The current month's schedule update cannot be accepted until the previous Monthly Schedule Update has been accepted by District Project Manager.

B. Monthly Schedule Update Format

1. Initially, the Contractor shall status a current Monthly Schedule Update with actual Work progress only. No logic ties shall be modified. Status all Actual Start and Finish dates, adjust Remaining Durations where needed, and update Percent Completion of cost and resource loaded activities. No activity Original Durations or Logic shall be changed unless authorized by District Project Manager. No new activities shall be added unless authorized by the District Project Manager.

2. Once the schedule is status in accordance with Section 013210 "Construction Schedule" – 3.05-B1, Contractor shall print (and submit with Monthly Schedule Update) a report of "out-of-sequence" logic that results from the updating process. Contractor shall then correct all "out-of-sequence" logic to reflect Contractor's actual Work sequence. If Contractor chooses to modify logic or add activities (other than out-of-sequence corrections), it shall be done in accordance with Section 013210 "Construction Schedule" – 3.07 (Fragnets and Time Extensions Request).

3. During construction, Contractor may desire to break down specific activities into greater detail. If greater detail is necessary, then Contractor shall identify expanded activities such that the Baseline Schedule activities that the expanded activities originated from are readily apparent. Contractor shall not allow the aggregate duration of the expanded activities to exceed the duration assigned to the Baseline Schedule activity unless permitted by District Project Manager in writing.

4. Autocost rules shall link Remaining Duration and Percent Complete.

5. The Data Date for the Monthly Schedule Updates shall be the last day of the month. At a minimum, three (3) days prior to the submission of the Monthly Schedule Update, Contractor shall meet in person with District Project Manager to present the proposed Percentages of Completion and Actual Start and Actual Finish dates. Once percentages of completion and actual dates have been agreed to, they shall be the basis of the Monthly Schedule Update.

6. Contractor shall submit a Manpower Histogram that overlays a planned curve from the Baseline Schedule and a planned curve from the current Monthly Schedule Update.

7. Written Narrative Report: Contractor shall include a written report to explain the Monthly Schedule Update. The narrative shall, at a minimum include the following headings with appropriate discussions of each topic:

    a. Introduction

    b. A Summary of Work which was on-going This Pay Period

    c. Problem Areas and Proposed Solutions

    d. Critical Path

    e. Current and Anticipated Delays

    f. Coordination of Work with Others

    g. Milestone Status

8. In updating the Schedule, Contractor shall not modify Activity ID numbers, schedule calculation rules/criteria, or the Activity Coding Structure required.

9. Submit bar charts, tabular reports, a cost flow histogram, man-power histogram, written narrative, electronic data, and plots in accordance with Specification Section 013210 “Construction Schedule” – 3.04L.

10. Submit a cost-loaded report (progressed monthly) produced from the scheduling software that displays all of the activities organized by the CSI subsection cost/resource accounts. This report shall be in compliance with Section 013210 “Construction Schedule” – 3.04K, Section 012973 “Schedule of Values” and Section 012900 “Payment Procedures”.

C. Three-Week Look Ahead Schedule: At each Weekly Progress Meeting, Contractor shall present a Three-Week Schedule in Bar Chart format. It shall show one (1) week of actual and two (2) weeks of forecasted progress. The Three-Week Rolling Schedule shall be used as a basis for discussing progress and work planned during the three (3) weeks.

1. The Three-Week Look Ahead Schedule shall be based on the most recent District Project Manager Accepted Monthly Schedule Update. It shall include weekly updates to all construction, submittal, fabrication/procurement, and separate work contract activities. Contractor shall ensure that it accurately reflects the current progress of the Work.

2. Contractor shall discuss actual dates and any variances to critical or near critical activities.

3. Upon request by District Project Manager, Contractor shall provide the Three-Week Look Ahead Schedule in electronic format.

4. If the Three-Week Look Ahead Schedule indicates activities are behind schedule, Contractor shall provide a Recovery Schedule in accordance with Section 013210 “Construction Schedule” – 3.06.

3.06 RECOVERY SCHEDULES

A. If a Monthly Schedule Update indicates negative float greater than ten (10) days on a critical path as result of events not predicated by Articles 17.3 and 17.4 of the General Conditions Contractor shall prepare a Proposed Recovery Schedule demonstrating Contractor’s plan to regain the time

lost. The Recovery Schedule shall be submitted either in advance of or concurrent with the Monthly Schedule Update and Contractor progress request. Both the Monthly Schedule Update and the Proposed Recovery Schedule shall be based on the same percentages of completion and actual dates accepted by District Project Manager under Section 013210 "Construction Schedule: – 3.05B (Monthly Schedule Update Format).

B. The Proposed Recovery Schedule shall be based on a copy of the Monthly Schedule Update for the calendar month during which the negative float first appears.

C. The Proposed Recovery Schedule shall include a narrative that identifies the causes of the negative float on the critical path and provides Contractor's proposed corrective action to ensure timely completion of all Milestones and the Substantial Completion Date. Contractor's corrective actions shall include but are not limited to increasing concurrent operations, increasing labor, adding multiple shifts in a 24-hour period, and adding overtime.

D. During any period of time when Contractor is found to be behind schedule by District Project Manager, the Monthly Schedule Update described in Section 013210 "Construction Schedule – 3.05 shall become a weekly requirement to provide a greater degree of focus on the timely completion of the Work. These Monthly Schedule Updates shall be submitted to District Project Manager every Monday morning. When Contractor is deemed by the District Project Manager to be back on schedule, Contractor may revert to submitting the Schedule monthly.

E. Contractor's progress payment may not be processed until the District Project Manager accepts the Proposed Recovery Schedule. Following such an acceptance, the Proposed Recovery Schedule will be known as the Recovery Schedule and future Work will be performed by Contractor in accordance with it.

3.07 FRAGNETS AND TIME EXTENSION REQUESTS

A. Float is not for exclusive use or benefit of either Owner or Contractor but is an expiring resource available to both parties on a non-discriminatory basis. If required to meet specified Milestones, either party may utilize float. Adjustments to Milestones and/or Contract Time will only be authorized by Change Order and only to the extent the claimed adjustments exceed total float along the most critical path of the current Monthly Schedule Update in effect at the time of the claimed adjustments. The claimed adjustments to the Milestones and/or Contract Time must also cause the Substantial Completion Date to exceed that currently indicated in the Monthly Schedule Update. Contractor claimed adjustments to an existing negative float path will not receive consideration until the activity with the highest negative float is driven even further negative.

   1. Claimed adjustments to the Milestones and/or Contract Time will be administered in conjunction with those set forth in the General Conditions.

B. Pursuant to the float sharing requirements of this Section, the use of float suppression techniques such as preferential sequencing or logic, special lead / lag logic restraints, and extended activity times or durations are prohibited. The use of float time disclosed or implied by the use of alternate float suppression techniques shall be proportionally shared to benefit Owner and Contractor. The

use of any technique solely for the purpose of suppressing float will result in Owner rejection of the submitted Monthly Schedule Update.

C. In the event Contractor believes the Project has suffered an adverse impact arising from events predicated by Articles 17.3 and 17.4 of the General Conditions, Contractor may prepare a Time Extension Request by submitting a Schedule Fragnet and a written narrative outlining the detail of the impact. A Schedule Fragnet must demonstrate a critical path delay. Such a delay must adversely impact the Substantial Completion Date for Contractor to receive a time extension. To demonstrate such an impact successfully, Contractor shall prepare a Schedule Fragnet based on a copy of Owner accepted Monthly Schedule Update for the calendar month during which the adverse impact occurred. This "copy" of the Owner accepted Monthly Schedule Update shall however first be updated (by Owner and Contractor jointly) with both Percentages of Completion and Actual Dates up to the day the delay commenced. This process will provide the "pre-delay" project status. Once Owner and Contractor have agreed to the "pre-delay" project status, Contractor should make a copy of this "pre-delay" schedule and this copy is to be the starting point for Contractor's Schedule Fragnet development. Owner will evaluate the activities, logic, durations, etc.… in the Schedule Fragnet and will evaluate if the adverse impact arose from events described by Articles 17.3 and 17.4 of the General Conditions. The Fragnet shall also include Contractor-caused delays that affect the critical or near critical path in the network and should be accounted for in the Time Impact Analysis if overlapped at any point in time with Owner-caused delay. If rain impact days were granted between the Start and Finish of Owner-caused delay period, they should be accounted for in the Time Impact Analysis as well. Provided Owner determines such an impact occurred, Contractor may be due a time extension equal to the number of proportioned days of variance/delay that resulted to the Substantial Completion Date.

D. All activities added into a Schedule Fragnet to demonstrate the impact of adverse event shall be assigned a unique activity code. The Schedule shall be organized by this unique activity code.

E. The Schedule Fragnet shall incorporate logic that accurately ties reflective of the adverse event to pre-event predecessor activities and post event successor activities.

F. The format and components of a Schedule Fragnet submittal shall be in accordance with Section 013210 "Construction Schedule" and Articles 17.3 and 17.4 of the General Conditions. It is crucial for the Fragnet to be submitted within the same month of discovery so it can be resolved during the monthly schedule update review. The notice shall be transmitted to District Project Manager within the stipulations outlined in Article 9 of the General Conditions.

G. If Owner accepts Contractor's Schedule Fragnet and an extension is granted, a Change Order will be prepared. Owner will advise what Change Order number the time extension will become. When Contractor receives this Change Order number, all the activities added to the Schedule Fragnet shall be given Activity Identification Numbers that corresponds with the Change Order number. Contractor shall cost load and resource-load the activities if required by Owner. If resource loading is required, the resource loading shall include a breakdown of labor, material, and equipment quantities.

H. If Owner rejects Contractor's Schedule Fragnet in part based on improper forecast logic or activity tasks, then it shall be revised accordingly to conform to the Owner's review comments and resubmitted. If the forecast logic and activity tasks cannot be agreed to then the pre-delay schedule outlined in Section 013210 "Construction Schedule" – 3.07C shall be compared to the actual as-built data in the succeeding month of the encountering issue, event, condition, circumstance, and/or cause. The variance to the project between the pre-delay and post delay schedules shall be discussed in Contractor's written narrative and proportioned between the different parties involved in the delay.

I. If Owner rejects Contractor's Schedule Fragnet in whole, then Contractor may follow the procedures set forth in Article 16 of the General Conditions.

3.08 PAYMENT FOR SCHEDULING

A. The Work in Section 013210 "Construction Schedule" will be included as part of the bid price.

B. Preparation, revising, maintenance, and compliance with Section 013210 "Construction Schedule" is an integral part of the Contract Documents and is specified to have a minimum value equal to 2% of the original Contract Amount or $150,000, whichever is less. This amount shall be cost loaded into an activity titled "Construction Schedule" in both the Proposed Baseline Schedule and the Schedule of Values described in Section 012973 "Schedule of Values".

1. Contractor may bill twenty percent (20%) of the amount cost- loaded in the "Construction Schedule" activity when the District Project Manager accepts the Proposed Baseline Schedule as the Baseline Schedule.

2. The remaining eighty percent (80%) may be billed in equal monthly increments. The amount of those increments is determined by dividing the remainder of the amount cost-loaded in the "Construction Schedule" activity divided by the total number of months in the Contract Time. Payment of these incremental amounts is contingent upon District Project Manager acceptance of Contractor Monthly Schedule Updates, Recovery Schedules, Three-Week Look Ahead Schedule and the updated Log of Required Submittals.

3.09 FAILURE TO COMPLY WITH REQUIREMENTS

A. At any time during the project if Contractor fails to comply with the specified requirements, Owner reserves the right to engage independent estimating and/or scheduling consultants to fulfill these requirements. Upon notice to Contractor, Owner shall assess against Contractor, all incurred costs for these additional services.

B. In such an event, Owner will require, and Contractor shall participate and provide all requested and/or required information to ensure the resulting Milestones Schedule accurately reflects Contractor plan to execute the Work in compliance with the Contract Documents. If it becomes necessary for Owner to recommend logic and/or duration revisions as a result of Contractor failure to furnish acceptable data, and if Contractor has objections to the recommendations, Contractor shall provide notice to Owner within three (3) days and Contractor shall provide an acceptable

alternate plan. If Contractor fails to so note any objections and provide an acceptable alternate plan, or if Contractor implements the recommendations of Owner without so noting any objections, Contractor will be deemed to have waived all objections and concurred with the recommended logic/duration revisions provided by Architect and/or Owner.

C. Submittal of any Monthly Schedule Updates is subject to review and acceptance by Owner. Owner retains the right, including, but not limited to Article 8 of the General Conditions, to withhold progress payments in whole or part until Contractor submits a Monthly Schedule Update acceptable to Owner.

3.10 CONTRACTOR RESPONSIBILITY

A. Nothing in this Section shall be construed to be a usurpation of Contractor authority, responsibility, and obligation to plan and schedule Work as Contractor deems necessary, subject to all other requirements of the Contract Documents.

B. Contractor shall involve the Subcontractors, manufacturers, and suppliers in the development and periodic updating of the schedule.

3.11 RECORD DOCUMENTS

A. Prior to Contract Completion of the Work, Contractor shall submit an as-built time-scaled network diagram reflecting the actual dates of all activities.

END OF SECTION

SECTION 01 3229

PROJECT FORMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The following, but not limited to, administrative forms and documents listed in this Section are to be utilized in the administration of the Work. Upon CONTRACTOR request, OAR may approve the use of alternate forms. Electronic versions of these forms are available on the LAUSD website.

B. From time to time, OWNER may release new revisions and new Project Forms. At any time during the Project, if requested by OAR, CONTRACTOR shall use the newly released Project Forms.

1.02 RELATED REQUIREMENTS

A. Division 01: General Requirements.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 FORMS

A. The following examples of forms are contained within this Section:

1. Allowance Disbursement Authorization.

2. Application for Payment (2 pages)[1].

3. Certification of Compliance with Project Stabilization Agreement and Labor Compliance.

4. Certification of Compliance with CEQA Mitigations.

5. Certificate of Substantial Completion.

6. Change Order.

7. Change Order Proposal.

8. Change Order Proposal – Compensable Delay Costs.

9. Change Order Proposal Detail Sheet.

10. Change Order Proposal Guidelines.

11. Change Order Proposal – Labor Rate Calculation Form (Request for Rate Higher Than Fully burdened Labor Rates).

12. Conditional Waiver and Release – Final Payment.

13. Construction Directive.

14. Correction Notice.

15. Daily Construction Report.

16. Daily Time and Material Record.

17. Initial Notice of start of Issue. Event, Condition, Circumstance, or Cause of Perceived or Actual Delay, Disruption, Interference, Condition, Circumstance, or Cause of Perceived Delay, Disruption, Interference, Hindrance, Acceleration.

18. Final Notice of End of Issue, Event, Condition, Circumstance, or Cause of Perceived or Actual Delay, Disruption, Interference, Condition, Circumstance, or Cause of Perceived Delay, Disruption, Interference, Hindrance, Acceleration.

19. Five Day Notice.

20. List of Subcontractors.

21. Notice of Completion.

22. Notice of Partial Use or Occupancy.

23. Notice of Termination.

24. Notice to Proceed.

25. "Or Equal" Request.

26. OWNER Assessment Summary.

27. Property Inventory.

28. Request for Certification of Substantial Completion.

29. Request for Clarification.

30. Request for Proposal.

31. Request for Reduction of Retention.

32. Schedule of Values.

33. Storm Water Pollution Prevention – Site Monitoring Report.

34. Submittal Log.

35. Substitution Request.

36. Survey of Existing Site Conditions.

37. Transmittal.

3.02 PROCEDURES

A. Allowance Disbursement Authorization: This form is used for the request and approval of Contract allowances.

B. Application for Payment: This form is used in requesting a progress payment.

C. Application for Payment (Multiple Projects): Alternate progress payment request form for contracts comprising more then one project.

D. Certification of Compliance with Project Stabilization Agreement and Labor Compliance Code Section 1776: This form is used to certify that all contributions due and owing to appropriate trust funds have been paid by CONTRACTOR and all Subcontractors, as specified by the Project Stabilization Agreement (PSA) and General Conditions Article 6.49. This form is also used to certify that CONTRACTOR has submitted all certified payroll records mandated by Labor Code 1776, and General Conditions Article 6.49.

E. Certification of Compliance with CEQA Mitigations: This form is used to certify that all CEQA requirements were complied with by CONTRACTOR.

F. Certificate of Substantial Completion: This form is used according to Article 14 of the General Conditions.

G. Change Order: This form is used to adjust the Contract Amount, Milestones or Contract Time.

H. Change Order Proposal: This form is used to communicate proposed adjustments to the Contract Amount, Milestones or Contract Time.

I. Construction Directive: This form is used to issue a Construction Directive.

J. Correction Notice: This form is used to provide notice of defective Work.

K. Daily Construction Report: This form is used to report daily Work activities and manpower levels of CONTRACTOR or Subcontractor.

L. Daily Time and Material Record: This form is used to provide daily records as set forth in Article 11.11 of the General Conditions.

M. Initial Notice of Start of Issue, Event, Condition, Circumstance, or Cause of Perceived Delay, Disruption, Interference, Hindrance, Acceleration: This form is used to provide notice as set forth in Article 12.2.1 of the General Conditions.

N. Final Notice of End of Issue, Event, Condition, Circumstance, or Cause of Perceived Delay, Disruption, Interference, Hindrance, Acceleration: This form is used to provide notice as set forth in Article 12.2.2 of the General Conditions.

O. Five Day Notice: This notice is used according to Article 15.3.2 of the General Conditions.

P. List of Subcontractors: This form is used according to Article 14.2 of the General Conditions.

Q. Notice of Completion: This form is used according to Article 14.17 of the General Conditions.

R. Notice of Partial Use or Occupancy: This form is used according to Article 14.15 of General Conditions.

S. Notice of Termination: Contractor shall submit a Notice of Termination (NOT) to the Los Angeles Regional Water Quality Control Board, LARWQCB. Provide a copy of NOT to OAR (See Section 01 7416).

T. Notice To Proceed: This form is used to establish the date of Contract Time commencement and the date Contractor is authorized to commence performance of Contractor obligations.

U. "Or Equal" Request: This form is used to submit a list of proposed "or equal" substitutions.

V. Owner Assessment Summary: This form is used for all assessments or withholds by the Owner, permitted under the Contract or required by law, including without limitation, stop notices, prevailing wage violations, liquidated damages, additional consultant services, OCIP premiums, etc.

W. Property Inventory: This form is used to establish Owner property in a space.

X. "Request for Certification of Substantial Completion": This form is used according to Article 14 of the General Conditions

Y. Request for Clarification: This form is to be used for clarification of the intent of the Contract Documents.

Z. Request for Proposal: This form is used to request a proposed adjustment in the Contract Amount, Milestones or Contract Time in response to the Work contained within the Request for Proposal.

AA. Request of Reduction of Retention: This form is used according to Article 14.8 of the General Conditions.

BB. Schedule of Values: This form is used to establish the basis of the certified Application for Payment.

CC. Storm Water Pollution Prevention Plan (SWPPP): Site Monitoring Reports: These forms are used to certify that construction activities are in compliance with SWPPP (see Section 01 7416).

DD. Submittal Log: This form is a format for the listing of the required submittals.

EE. Substitution Request: This form is used to submit proposed substitutions of materials or equipment no longer manufactured or which cannot be acquired from existing inventories.

FF. Transmittal: This form is used for transmission of items related to the Contract.

END OF SECTION

SECTION 01 3233

PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Periodic construction photographs.
3. Preconstruction videos.
4. Periodic construction videos.

B. Related Sections include the following:

1. Division 01 - Section 013300 "Submittal Procedures" for submitting photographic documentation.
2. Division XX Section XXXXXX "Selective Demolition" for photographic documentation before selective demolition operations commence.
3. Division 01 - Section 017900 "Demonstration and Training" for submitting videos of demonstration of equipment and training of Owner's personnel.

1.03 SUBMITTALS

A. Construction Photographs: Submit two prints of each photographic view within seven days of taking photographs.

1. Format: Submit a complete set of digital image electronic files with each submittal of prints on CD-ROM. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as the sensor, un-cropped. Pictures within the CD-ROM should have reference to the following information.

a. Name of Project.
b. Name of District Project Manager.
c. Name of Architect.
d. Name of Contractor.

e. Date photograph was taken if not date stamped by camera.

f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

g. Unique sequential identifier.

B. Digital Video: Submit two copies of each digital video with protective sleeve or case within seven days of recording. Remove safety tab to prevent accidental re-recording.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.

b. Name and address of Photographer.

c. Name of District Project Manager.

d. Name of Architect.

e. Name of Contractor.

f. Date video was recorded.

g. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

h. Weather conditions at time of recording.

PART 2 - PRODUCTS

2.01 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in uncompressed TIFF format, produced by a digital camera with minimum sensor size of 4.0 megapixels, and at an image resolution of not less than 1024 by 768 pixels.

B. Digital Video Format: Provide high-quality, high definition color digital video at an image resolution of not less than 1920 x 1080 pixels.

1. Video quality shall be adequate to create photographic prints to be made from individual frames.

PART 3 - EXECUTION

3.01 GENERAL

A. Contractor shall document preconstruction conditions using photographs or video, including condition of underground utilities, as required.

B. Contractor may use photographs or video.

3.02 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in filename for each image.

2. Field Office Images: Maintain one set of images on CD-ROM in the field office at Project Site, available at all times for reference. Identify images same as for those submitted to Architect.

C. Preconstruction Photographs: Before commencement of excavation, commencement of demolition, and starting construction, take color, digital photographs of Project Site and surrounding properties, including existing items to remain during construction, from different vantage points, as necessary to document existing conditions.

1. Flag excavation areas and construction limits before taking construction photographs.

2. Take photographs to show existing conditions adjacent to property before starting the Work.

3. Take photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of Work.

4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

5. Show protection efforts by Contractor.

D. Monthly Construction Photographs: Take color, digital photographs to show existing conditions uncovered as work progresses. Select vantage points to show status of construction and progress since last photographs were taken.

3.03 CONSTRUCTION VIDEOS

A. Narration: Describe scenes on video by audio narration by microphone while video is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.

1. Confirm date and time at beginning and end of recording.

2. Begin each video with name of Project, Contractor's name, videographer's name, and Project location.

B. Preconstruction Video: Before commencement of excavation, commencement of demolition, and starting construction, record video of Project Site and surrounding properties, including existing items to remain during construction, from different vantage points, as necessary to document existing conditions.

1. Flag excavation areas and construction limits before recording construction videos.
2. Show existing conditions adjacent to Project Site before starting the Work.
3. Show existing buildings either on or adjoining Project Site to accurately record physical conditions at the start of Work.
4. Record additional video as required to record settlement or cracking of adjacent structures, pavements, and improvements.
5. Show protection efforts by Contractor.

C. Monthly Construction Videos: Record video to show existing conditions uncovered as work progresses. Select vantage points to show existing construction or condition, status of construction and progress since last video was taken. If needed, insert requirements for "live" feed to Project-specific website.

END OF SECTION

SECTION 01 3300

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1. General Conditions: Article 3 for more information on submittals

1.02 RELATED SECTIONS

A. Other Division 01 Specification Sections.

1.03 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require District's Project Manager's responsive action.

B. Informational Submittals: Written and graphic information and physical samples that do not require District Project Manager's responsive action. Submittals may be rejected for not complying with requirements.

1.04 QUALITY ASSURANCE

A. Perform no portion of Work requiring an Action Submittal and review of Shop Drawings, Product Data, Samples, or similar submittals until respective Action Submittal has been approved by Architect/Engineers of Record and reviewed by District Project Manager. All Work shall be in accordance with Accepted/Accepted As Noted Submittals.

B. Contractor shall not be relieved of its sole responsibility for deviations from requirements of Contract Documents by review or acceptance by District Project Manager of Shop Drawings, Product Data, Samples or similar Submittals.

C. Contractor shall not be relieved of its sole responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar Submittals by District Project Manager's review thereof.

D. Direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar Submittals, to revisions (other than those requested by District Project Manager on previous Submittals).

E. Informational Submittals upon which District Project Manager is not expected to take responsible action may be so identified in Contract Documents.

F. When professional calculations or certification of performance criteria of materials, systems or equipment is required by Contract Documents, District and District Project Manager shall be entitled to rely upon accuracy and completeness of such calculations and certifications.

G. Submittals may be rejected for not complying with requirements of Contract Documents.

1.05 SUBMITTAL SCHEDULE

A. Submittal Schedule. Ten (10) days prior to starting construction at the Project Site, the Contractor shall prepare and submit, in accordance with the Contract Documents, a Submittal Schedule. The Submittal Schedule shall be coordinated with the Contractor's Construction Schedule and allow the District Project Manager such time for review of Submittals as may be required by the Contract Documents, or if none is required, an average time of twenty-one (21) days for such review. The Contractor shall keep the Submittal Schedule current and updated in accordance with the requirements of the Contract Documents.

1. Coordinate Submittal Schedule with Work of Sub-Contractors, Schedule of Values and list of products, as well as Contractors Construction Schedule.

B. Include scheduled activities for all Fabrication, BIM Models, Shop Drawings, Product Data, Samples and similar Submittals, including without limitation, coordination drawings, and certificates of compliance, manufacturer's certificates, warranties, operations and maintenance manuals, attic stock (extra Material), demonstration and training (including video documentation), as-built plans, transfer of keys, and all other types of documents that are required to be submitted by Contractor under the Contract Documents.

C. Coordinate preparation of Submittal Schedule with District Project Manager, allowing more than twenty-one (21) days of review time for complicated or lengthy Submittals and less time than twenty-one (21) days for those less complicated and less lengthy Submittals. Allow time for separate review by Architect/Engineer of Record prior to submittal to review by District Project Manager.

D. Schedule Submittals to avoid concurrent Submittals to maximum extent possible.

E. Where Submittal is concurrent with or overlaps Submittals currently being reviewed, indicate priority of each outstanding Submittals.

F. Prepare schedule in chronological order. Provide following information:

1. Schedule date for first Submittal.
2. Related Section number.
3. Submittal category.
4. Name of Sub-Contractor.
5. Description of part of Work covered.
6. Scheduled date for re-submittal.

7. Number of Contractor's shop drawings, coordination drawings or other drawings anticipated within each submittal.

8. Review time by Contractor's team, prior to submission to District Project Manager.

G. Distribution of Submittal Schedule: Following comments resulting from District Project Manager's response to initial submission, print and distribute copies to District Project Manager, Contractor's team, Sub-Contractors, and other parties required to comply with Submittal dates indicated.

1. Post copies in Project meeting room and temporary field office.

2. When additional revisions are made, distribute to same parties and post in same locations. Delete parties from distribution when they have completed their assigned part of Work and are no longer involved in construction activities.

3. Adhere to accepted schedule except when specifically otherwise permitted.

H. Schedule Updating: Revise Submittal Schedule every month and after each meeting or other activity where revisions have been recognized or made. Issue updated Submittal Schedule concurrently with report of each meeting.

1.06 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Digital Data Files: Electronic copies of digital files of the Contract Drawings will be provided and/or produced by Contractor and Sub-Contractors for use as background only in preparing submittals.

1. Contractor shall use Digital CAD files and drawings for submission of shop drawings.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. District Project Manager reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for reviews by District Project Manager and applicable District's Manager's receipt of submittal. No extension of the Contract time will be authorized because of failure to transmit submittals enough in advance of the Work to permit reasonable processing, including re-submittals.

1. Initial Review: Allow an average review time of twenty-one (21) days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. District Project Manager will advise Contractor when a submittal is being processed must be delayed for coordination.

2. Intermediate Review: If intermediate review is necessary, process it in the same manner as initial submittal.

3. Re-submittal Review: allow an average review time of fourteen (14) days for review of each re-submittal.

D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.

2. Provide a space approximately 6 by 8 inches (150) by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect/Engineers of Record, and by District Project Manager.

3. Include the following information for processing and recording action taken:

   a. Project name.

   b. DSA Approval Number.

   c. Date.

   d. Name of Architect/Engineers of Record.

   e. Name of District Project Manager.

   f. Name of Contractor.

   g. Name of Sub-Contractor.

   h. Name of supplier.

   i. Name of manufacturer.

   j. Submittal number or other unique identifier, including revision identifier.

   k. Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g. 06100.01). Re-submittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01A).

   l. Number and title of appropriate Specification Section.

   m. Drawing number and detail references, as appropriate.

   n. Location(s) where product is to be installed, as appropriate.

   o. Other necessary identification.

4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless District Project Manager observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

   a. a.If, in addition to review by District Project Manager, the Submittal is being reviewed concurrently by other District Consultants, submit one copy of submittal to each concurrent reviewer in addition to specified number of copies to District Project Manager.

5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. District Project Manager will return without review submittals from sources other than Contractor.

   a. On attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by District Project Manager on previous Submittals, and deviations from requirements of Contract Documents, including minor variations and limitations. Include same label information as related Submittal.

   b. Include Contractor's certification stating that information submitted complies with requirements of Contract Documents.

   c. Transmittal Form: Use sample form provided by District Project Manager.

   d. Transmittal form for Paper Submittals: Provide locations on form for the following information:

      1) Project name.

      2) DSA Approval Number.

      3) Date.

      4) Destination (To:).

      5) Source (From:).

      6) Name and address of Architect/Engineers of Record.

      7) Name of District Project Manager.

      8) Name of Contractor.

      9) Name of firm or entity that prepared submittal.

      10) Names of Sub-Contractor, manufacturer, and supplier.

      11) Category and type of submittal.

      12) Submittal purpose and description.

      13) Specification Section number and title.

      14) Specification paragraph number or drawing designation and generic name for each of multiple items.

      15) Drawing number and detail references, as appropriate.

      16) Indication of full or partial submittal.

      17) Transmittal number numbered consecutively.

      18) Submittal and transmittal distribution record.

      19) Remarks.

      20) Signature of transmitter.

E. Electronic Submittals: Where required per paragraph 1.6.A above. Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.

2. Name file with submittal number or other unique identifier, including revision identifier.

    a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Re-submittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect/Engineers of Record, and by District Project Manager.

4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to District Project Manager, containing the following information:

    a. Project name.

    b. DSA Approval Number.

    c. Date.

    d. Name and address of Architect/Engineers of Record.

    e. Name of District Project Manager.

    f. Name of Contractor.

    g. Name of firm or entity that prepared submittal.

    h. Names of Sub-Contractor, manufacturer, and supplier.

    i. Category and type of submittal.

    j. Submittal purpose and description.

    k. Specification Section number and title.

    l. Specification paragraph number or drawing designation and generic name for each of multiple items.

    m. Drawing number and detail references, as appropriate.

    n. Location(s) where product is to be installed, as appropriate.

    o. Related physical samples submitted directly.

    p. Indication of full or partial submittal.

    q. Transmittal number numbered consecutively.

    r. Submittal and transmittal distribution record.

    s. Other necessary identification.

t. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:

a. Project name.

b. Number and title of appropriate Specification Section.

c. Manufacturer name.

d. Product name.

F. Deviations: Highlight, encircle, or otherwise identify deviations from Contract Documents on Submittals clearly designating those portions as deviating from the Contract Documents and include separate written notification.

G. Re-submittals: Make re-submittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.

2. Note date and content of revision in label or title block and clearly indicate extent of revision.

3. Resubmissions are subject to same terms and conditions as original Submittal.

4. Should more than 1 resubmission be required, Contractor may, at the sole discretion of the District, reimburse District for time spent by District Project Manager, District Consultants or other reviewers in processing additional resubmissions at either the agreed rates as established by contract, or if none is established, at the rate of 2.5 times the reviewer's Direct Personnel Expense (DPE). For purposes of this Paragraph, "Direct Personnel Expense: is defined as direct salaries of the reviewer's personnel engaged on Project and portion of costs of mandatory, and customary contributions and benefits related thereto, including employment taxes and other statutory employee benefits, insurance, sick leave, holidays, vacations, pensions and similar contributions and benefits.

5. Resubmit submittals until they are marked with approval notation from Architect/Engineers of Record's and District Project Manager's action stamp.

H. Distribution: Furnish copies of final submittals to manufacturers, Sub-Contractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Retain complete copies of submittals on Project Site. Use only final action submittals that are marked with approval notation from Architect/Engineers of Record's and "Accepted or Accepted As Noted" from District Project Manager.

1. Fabrication Models shall be visually presented to District Project Manager demonstrating full coordination with other systems prior to use for fabrication and installation.

PART 2 - PRODUCTS

2.01 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements:

1. General Contractor to submit all submittals electronically and store all submittals in a cloud based storage system for the duration of the project.

2. District Project Manager will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

3. Markups and screen captures shall be included within the provided fabrication models, where appropriate.

B. Action Submittals: For Product Data, Shop Drawings and Samples, and other actions requiring review by the District Project Manager. Submit seven copies of each submittal unless otherwise indicated.

1. If additional copies are needed for distribution to District Consultants or others not listed below, they shall be provided as required by the Contract Documents or as requested by District Project Manager.

2. District Project Manager will, upon initial receipt of a submission or resubmission of a Submittal, retain 5 copies and forward 1 copy to the Program Manager.

3. District Project Manager will, following review and action by reviewers on a submission or resubmission of a Submittal, distribute signed and stamped copies as follows: 1 to CPM, 1 to Program Manager, 1 to Inspector of Record and 2 to Contractor.

4. Contractor shall retain returned copy as Record Document and using it prepare copies for distribution to Sub-Contractor.

C. Informational Submittals: for submittals not requiring responsive action by the District Project Manager and other action required by Specifications. Submit three paper copies of each submittal unless otherwise indicated. District Project Manager will not return copies.

D. Certificates and Certifications Submittals: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

1. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.

2. Provide a notarized statement on original paper copy certificates and certifications where indicated.

E. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.

3. Include the following information, as applicable:

   a. Manufacturer's catalog cuts.

   b. Manufacturer's product Specifications.

   c. Manufacturer's installation instructions.

   d. Mill reports.

   e. Standard product operating and maintenance manuals.

   f. Manufacturer's written recommendations.

   g. Manufacturer's standard product warranty.

   h. Standard color charts.

   i. Statement of compliance with specified referenced standards, and recognized trade association standards.

   j. Testing by recognized testing agency.

   k. Application of testing agency labels and seals.

   l. Approval numbers of organizations or agencies as required by Governmental authorities having jurisdiction.

   m. Notation of dimensions verified by field measurement.

   n. Notation of coordination requirements.

   o. Availability and delivery time information.

   p. Complete training demonstration video: Prepare electronic version in a format satisfactory to the District of all training demonstrations.

   q. Inventory Listing: Inventory of tools, spare parts, extra material, keys, and similar items.

   r. Manuals: Operations and Maintenance (O&M) manual, Warranties manual, Extended Warranties manual (if applicable), other demonstration and training documents including demonstration and training video documentation.

4. For equipment, include the following in addition to the above, as applicable:

   a. Wiring diagrams showing factory-installed wiring.

   b. Printed performance curves.

   c. Operational range diagrams.

   d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.

F. Shop Drawings: Prepare Project-specific information, drawn or modeled accurately to scale. Use reproductions of the contract Documents or standard printed data as background only for insertion of specific data and design required by each trade.

1. Preparation: Fully illustrate requirements in the Contract documents. Include the following information, as applicable:

   a. Identification of Products.

   b. Dimensions.

   c. Fabrication and installation drawings.

   d. Roughing-in and setting diagrams.

   e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.

   f. Shopwork manufacturing instructions.

   g. Templates and patterns.

   h. Design calculations.

   i. Schedules.

   j. Compliance with specified standards.

   k. Notation of coordination requirements.

   l. Notation of dimensions established by field measurement.

   m. Notation of as-built conditions.

   n. Relationship and attachment to adjoining construction clearly indicated.

   o. Seal and signature of Professional Engineer if specified.

2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).

G. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

2. Identification: Attach label on unexposed side of Samples that include the following:

   a. Generic description of Sample.

   b. Product name and name of manufacturer.

   c. Sample source.

   d. Number and title of applicable Specification Section.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.

4. Disposition: Maintain sets of approved Samples at Project Site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples that may be incorporated into work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.

    b. Samples not incorporated into the work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

7. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect of Record's exemplar where so indicated. Attach label on unexposed side that includes the following:

    a. Generic description of Sample.

    b. Product name or name of manufacturer.

    c. Sample source.

8. Additional Information: On attached separate sheet, prepared on Contractor's letterhead, provide the following:

    a. Size limitations.

    b. Compliance with recognized standards.

    c. Availability.

    d. Compliance with Applicable Laws.

    e. Statement of acceptable uses or statement indicating suitability of product specified for proposed use.

    f. Delivery time.

9. Submit Samples for review of kind, color, pattern, and texture for final check of these characteristics with other elements and for comparison of these characteristics between final Submittal and actual component as delivered and installed.

    a. If variation in color, pattern, texture, or other characteristic is inherent in product represented by Sample, submit at least 3 sets of paired units that show approximate limits of variations.

    b. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

10. Disposition: Maintain sets of approved Samples at Project Site, available for quality-control comparisons throughout course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples that may be incorporated into Work are indicated in individual Specification Sections. Such Samples must be in undamaged condition at time of use.

    b. Samples not incorporated into Work, or otherwise designated as District's property, are property of Contractor.

H. Product List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product.
2. Number and name of room or space.
3. Location within room or space.

I. Coordination Drawings Submittals: Comply with requirements specified in General Conditions.

J. Contractor's Construction Schedule: Comply with requirements specified in General Conditions.

K. Application for Payment and Schedule of Values: Comply with requirements specified in General Conditions.

L. Subcontract List: Prepare written summary identifying individuals or firms proposed for each portion of work, including those who are to furnish products or equipment fabricated to special design. Use CSI Form 1.5A or other form acceptable to District Project Manager. Include following information in tabular form:

1. Name, address, and telephone number of entities performing subcontract or supplying products.
2. Number and title of related Specification Sections covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

M. Test and Inspection and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 “Quality Requirements.”

N. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 “Closeout Procedures.”

O. Maintenance Data: Comply with requirements specified in Section 017823 “Operation and Maintenance Data”.

P. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Design Consultants and Owners, and other information specified.

Q. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

R. Installer Certificates: Submit written statements on manufacturer’s letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

S. Manufacturer Certificates: Submit written statements on manufacturer’s letterhead certifying that manufacturer complies with requirements in the contract documents. Include evidence of manufacturing experience where required.

T. Product Certificates: Submit written statements on manufacturer’s letterhead certifying that product complies with requirements in the Contract Documents.

U. Material Certificates: Submit written statements on manufacturer’s letterhead certifying that material complies with requirements in the Contract Documents.

V. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency’s standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

W. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluations of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

X. Research/Evaluation Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.

4. Product and manufacturers' names.

5. Description of product.

6. Test procedures and results.

7. Limitations of use.

Y. Schedule of Tests and Inspections: Comply with requirements specified in Section 014000 "Quality Requirements."

Z. Preconstruction Test Reports: Submit reports written by a qualified agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

AA. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

BB. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

CC. Design Data: Prepare and submit written and graphic information, including, but not limited to performance and design criteria, list of applicable codes and regulations and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

DD. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Section 017823 "Operation and Maintenance Data".

EE. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating product or equipment. Include name of product and name, address, and telephone number of product manufacturer. Include following, as applicable:

1. Preparation of substrates.

2. Required substrate tolerances.

3. Sequence of installation or erection.

4. Required installation tolerances.

5. Required adjustments.

6. Recommendations for cleaning and protection.

FF. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project Site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

2.02 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to District Project Manager.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.01 CONTRACTOR' REVIEW

A. Action and Informational Submittals: Review and approve each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Obtain Architect/Engineers of Record's approval and mark with approval stamp prior to submission to District Project Manager.

1. Submittals that do not bear Contractor's approval stamp and Architect/Engineers of Record's approval stamp as required herein will be returned without actions.

B. Architect/Engineers of Record's Action: Approval is for purpose of checking for conformance with the Contract Documents.

1. Where action and return of Submittals is required, Architect of Record will review each Submittal, mark to indicate action taken, and return.

2. Compliance with Contract Documents is Contractor's responsibility.

3. Review of separate item shall not indicate acceptance of assembly of which item is part.

C. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

D. Approval Stamp: Stamp each submittal with a uniform, approval stamp that has been reviewed and approved by Contractor. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval.

3.02 DISTRICT PROJECT MANAGER'S ACTION

A. General: District Project Manager nor Architect/Engineer of Record will not review submittals that do not bear Contractor's approval stamp will return them without action.

B. District Project Manager review is for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

1. Purpose of Submittal is to demonstrate for those portions of Work for which submittals are required, manner in which Contractor proposes to conform to information given and design concept expressed on Contract Documents.

2. Review is not conducted for purpose of determining accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain responsibility of Contractor.

C. Except for Submittals for record or for information, where action and return of Submittals is not required, District Project manager will review each Submittal, mark to indicate action taken, and return.

1. Compliance with specified characteristics is Contractor's responsibility and is not considered part of District Project Manager's review.

2. Acceptance of Submittals with deviations from the Contract Documents that have been noted in the manner required by the Contract Documents shall not relieve Contractor from its sole responsibility for additional costs and delays associated with changes required to accommodate such deviations. Deviations included in Submittals, including those that have been noted as such by Contractor, are deemed rejected and exempt from any review of Submittal by District Project Manager.

3. Review of separate item shall not indicate acceptance of assembly of which item is part.

4. Make those revisions required by District Project Manager.

5. Notations by District Project Manager which, if implemented, would require Contractor to perform extra work and cause delay shall be brought to District Project Manager's attention, in writing in the manner required by the General Conditions, before proceeding with Work.

6. When professional certification of performance criteria of materials, systems or equipment is required by Contract Documents, District Project Manager shall be entitled to rely upon accuracy and completeness of such calculations and certifications.

D. Action Submittals: Architect or Engineer of Record will review each submittal, make marks to indicate acceptance, corrections or revisions required, and return it. District Project Manager will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action as follows:

1. Accepted: Means fabrication, manufacturer, or construction may proceed provided that the Submittal complies with Contract Documents.

2. Accepted as Noted: Means fabrication, manufacture, or construction may proceed provided that Submittal complies with the Contract Documents and incorporates reviewer's notations. If Contractor cannot comply with such notations, Contractor shall make revisions and resubmit.

3. Revise and Resubmit: Means fabrication, manufacture, or construction may NOT proceed. In resubmitting, Contractor shall limit corrections to items marked.

4. Rejected: Means Submittal does not comply with expressed design intent of Contract Documents. Do not reuse Submittals stamped "Rejected.". Prepare Submittal again and resubmit.

E. Informational Submittals: District Project Manager will review each submittal and will not return unless it does not comply with requirements. District Project Manager will forward each submittal to appropriate party.

F. Incomplete submittals are unacceptable, will be considered non responsive, and will be returned for re-submittal without review.

G. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 01 3300

SECTION 01 3527

SITE SAFETY

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements for compliance with OSHA, Cal-OSHA, and other safety requirements.

1.02 JOBSITE SAFETY

A. The Contractor shall be solely responsible for ensuring that all work performed under the Contract is performed in strict compliance with all applicable Federal, State and Local occupational safety regulations. The Contractor shall provide at its expense all safeguards, safety devices and protective equipment, and shall take any and all actions appropriate to providing a safe jobsite.

B. A multi-employment worksite, as defined by Cal-OSHA, is one in which many employers occupy the same site. The Inglewood Unified School District (IUSD) considers the Contractor to be the "controlling authority" for all work site safety and health of the sub-Contractors.

1.03 PROJECT SAFETY OFFICIAL (PSO)

A. The Contractor shall designate in writing a Project Safety Official (PSO). The PSO must be a competent person capable of identifying existing and predictable hazards in the surroundings of working conditions which are unsanitary, hazardous, or dangerous to employees and must have previous experience on similar types of projects. The PSO shall be thoroughly familiar with the Contractor's Injury and Illness Prevention Program (IIPP). The PSO shall be available at the work site at all times work is in progress to promptly abate any potential safety hazards and shall have the authority and responsibility to shut down an operation, if necessary. Failure by the Contractor to provide the required PSO or grant the PSO due authority are grounds upon which the District Project Manager may direct the cessation of all work activities and operations at no cost to IUSD until such time as the Contractor supplies the required PSO.

B. The Contractor through the PSO shall oversee and be responsible for the provision and maintenance of, including but not limited to the following:

1. A log of safety inspections performed.
2. A proper and adequate First Aid kit shall be maintained onsite for one time treatment of minor cuts, scratches, burns, splinters and the like.
3. All applicable Material Safety Data Sheets shall be onsite prior to the use of said materials.

4. Display in clear view of the onsite personnel all applicable Federal, State and local regulations dealing with safety including a map denoting the route to the nearest emergency care facility with emergency phone numbers.

5. Maintain an adequate Fire Protection and Prevention plan.

    a. Firefighting equipment must be well maintained and freely accessible onsite in conspicuous locations at all times.

    b. Fire extinguishers must comply with all applicable Cal - OSHA specification.

    c. Work shall be carried out complying with the California Fire Code, latest edition as applicable to construction work.

6. Employee Safety Training including but not limited to:

    a. All equipment operators must be trained and certified as per Contractors Injury and Illness Prevention Program (IIPP):

    b. Training in the use of fire extinguishers.

    c. Flaggers must be trained.

    d. Safe Scaffolding usage.

7. Lock-out and block-out procedures for machinery, equipment, electrical and tool related hazards.

8. Heavy equipment procedures and standards.

9. Excavation and trenching hazards.

10. Project Site must be fenced adequately (see Section 015000 “Construction Facilities and Temporary Controls”) to protect Public, including gates to be kept secured at all times. In the rare cases when fences must be temporarily opened to public areas to facilitate construction or the work area cannot be effectively fenced, Flaggers must be provided. Project Site must be fully secured by the end of the workday with no remaining hazards or obstacles in the public areas.

    a. Flaggers must be placed in locations so as to give effective warning.

    b. Flaggers must wear orange or strong yellow-green warning garments, such as vests, jackets, shirts, or rainwear.

11. 11. Electrical hazards and safe procedures.

12. Musculoskeletal hazards.

13. Hazards causing chronic illness, such as exposure to lead, asbestos, and other cancer-causing products.

14. A severe weather plan including ceasing or modifying onsite operations during high temperature, lightning, or high wind velocities, etc.

15. No damaged or hazardous tools will be tolerated onsite including but not limited to frayed or damaged electric cords, any tools with missing or altered original safety devices or switches, ladders without proper slip-resistant feet, etc.

16. Any work done using ladders must conform to original proper use of said ladders and all OSHA guidelines. (i.e. including but not limited to top rung of a step ladder is not to be used as a step, extension ladders must extend three rungs above the proposed use height, etc.)

17. All employees must wear proper Personal Protective Equipment (PPE) and abide by safety work ethics included but not limited to hard hat, proper shoes, long pants, and clothing including gloves, protective eyewear and respirators, no loose clothing, long hair must be restrained, etc.

C. Provide a site specific written review of potential or predictable Fall Protection Hazards from heights of six (6) feet or greater. The review should address the need for Fall Protection Systems to mitigate hazards and include equipment and methods employed, responsibilities, training requirements, and monitoring methods. The erection and dismantling operations of scaffolds as well as the fall zones around scaffolds must be included as well.

1. All Fall Protection systems must be properly implemented and maintained.

2. Fall Protection Plan must be implemented when a Fall Protection System is required but cannot be used. A Fall Protection Plan must be written by a qualified person identified in the plan and actively responsible for the implementation.

D. Job site safety practices found by County representatives to be in violation of any of Contractors Injury and Illness Prevention Program (IIPP) or applicable Federal, State and local occupational safety regulations including any Cal-OSHA issued materials shall be grounds for IUSD to direct the cessation of all work activities and operations affected by this violation at no cost to IUSD until such time as the Contractor notifies IUSD in writing that the Contractor complies with all violated regulations.

E. Safety Indemnification. To the extent allowed by law, the Contractor agrees to defend, indemnify and hold harmless IUSD and its officers, employees and agents including PI, AOR, AOR's consultants, and District Project Manager from and against any and all investigations, complaints, citations, liability, expense (including defense costs and legal fees), claims and/or causes of action for damages of any nature whatsoever, including but not limited to injury or death to employees of the Contractor or its Subcontractors or Agency, attributable to any alleged act or omission of the Contractor or its Subcontractors which is in violation of any cal/OSHA regulation. The obligation to defend, indemnify and hold harmless includes all investigations and proceedings associated with purported violations of Section 336.10 of Title 8 of the California Code of Regulations pertaining to multi-employer work sites. The Agency may deduct from any payment otherwise due the Contractor any costs incurred or anticipated to be incurred by the Agency, including legal fees and staff costs, associated with any investigation or enforcement proceeding brought by Cal/OSHA arising out of the Project.

END OF SECTION

SECTION 01 4000

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.

3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections:

1. Division 01 - Section 013210 "Construction Schedule" for developing a schedule of required tests and inspections.

2. Division 01 – Section 014523 "Testing and Inspection" for required tests and inspections and testing and inspection criteria.

3. Divisions 02 through 33 for specific test and inspection requirements.

1.03 DEFINITIONS

A. DSA: State of California, Division of the State Architect.

B. AOR: Architect of Record

C. IOR: Inspector of Record.

D. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

E. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

F. Mockups: Full size physical assemblies that are constructed onsite. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size, physical assemblies constructed at testing facility to verify performance characteristics.

2. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on the Project Site, consisting of multiple products, assemblies and subassemblies.

3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.

G. Preconstruction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

H. Product Testing: Tests and inspections that are performed by a Nationally Recognized Testing Laboratory, a National Voluntary Laboratory Accreditation Program, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

I. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

J. Field Quality-Control Testing: Tests and inspections that are performed onsite for installation of the Work and for completed Work.

K. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

L. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or sub-Subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.

M. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.04 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to the District Project Manager and Architect for a decision before proceeding.

1.05 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A Professional Engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the

system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.

2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.

b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.

d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.

e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.

f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to DSA, Owner, District Project Manager, Architect, Inspector of Record, Structural Engineer and Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.

2. Notify Architect seven days in advance of dates and times when mockups will be constructed.

3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at the Project.

4. Demonstrate the proposed range of aesthetic effects and workmanship.

5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.

a. Allow seven days for initial review and each re-review of each mockup.

6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

7. Demolish and remove mockups when directed, unless otherwise indicated.

1.06 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or inspecting will be performed.

4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report of each quality-control service to DSA, Owner, District Project Manager, Architect, Inspector of Record, Structural Engineer, and Contractor.

5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 012500 "Submittal Procedures."

1. Submit written report to Owner, District Project Manager, and Architect.

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in pre-installation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

1. Submit written report to Owner, District Project Manager, Architect, and Contractor.

E. Retesting/Reinspection: Regardless of whether original tests or inspections were Owner's or Contractor's responsibility; Contractor shall provide quality-control services, including retesting and reinspection, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect, Inspector of Record, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify the District Project Manager, Architect, Inspector of Record, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.

3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

4. Submit a certified written report of each test, inspection, and similar quality-control service to DSA, Owner, District Project Manager, Architect, Inspector of Record, Structural Engineer, and Contractor.

5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.

6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project Site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's Construction Schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Owner, District Project Manager, Architect, Inspector of Record, Structural Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.07 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency and special inspectors to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

1. Verify that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notify Architect, Inspector of Record, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submit a certified written report of each test, inspection, and similar quality-control service to DSA, Owner, District Project Manager, Architect, Inspector of Record, Structural Engineer, and Contractor.
4. Submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.

5. Interpret tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.

6. Retest and re-inspect corrected work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 TEST AND INSPECTION LOG

A. Contractor to prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.

2. Description of the Work tested or inspected.

3. Date test or inspection results were transmitted to Architect.

4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project Site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's and Inspector of Record's reference during normal working hours.

3.02 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017000 "Execution Requirements."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 4000

SECTION 01 4200

REFERENCES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project Site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project Site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.03 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied

directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.04 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Websites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

1. For additional information refer to Thomson Gale's "Encyclopedia of Associations" and Columbia Books' "National Trade and Professional Associations of the U.S."

AA	Aluminum Association, Inc. (The) www.aluminum.org	(703) 358-2960
AAADM	American Association of Automatic Door Manufacturers www.aaadm.com	(216) 241-7333
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists www.aatcc.org	(919) 549-8141
ABAA	Air Barrier Association of America www.airbarrier.org	(866) 956-5888

ABMA	American Bearing Manufacturers Association www.abma-dc.org	(202) 367-1155
ACI	American Concrete Institute www.concrete.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205) 257-2530
AF&PA	American Forest and Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association www.aga.org	(202) 824-7000
AGC	Associated General Contractors of America (The) www.agc.org	(703) 548-3118
AHA	American Hardboard Association (Now part of CPA)	
AHAM	Association of Home Appliance Manufacturers www.aham.org	(202) 872-5955
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559

ALCA	Associated Landscape Contractors of America (Now PLANET - Professional Land care Network)	
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
AOSA	Association of Official Seed Analysts, Inc. www.aosaseed.com	(405) 780-7372
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
APA EWS	APA - The Engineered Wood Association; Engineered Wood Systems (See APA - The Engineered Wood Association)	
API	American Petroleum Institute www.api.org	(202) 682-8000
ARI	Air-Conditioning and Refrigeration Institute www.ari.org	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Association www.asphaltroofing.org	(202) 207-0917
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)	
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400

ASME	ASME International (American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (973) 882-1170
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9500
AWCI	Association of the Wall and Ceiling Industry www.awci.org	(703) 534-8300
AWCMA	American Window Covering Manufacturers Association (Now WCMA)	
AWI	Architectural Woodwork Institute www.awinet.org	(571) 323-3636
AWPA	American Wood Protection Association (Formerly: American Wood Preservers' Association) www.awpa.com	(205) 733-4077
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010
BICSI	BICSI, Inc. www.bicsi.org	(800) 242-7405 (813) 979-1991
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International) www.bifma.com	(616) 285-3963

BISSC	Baking Industry Sanitation Standards Committee www.bissc.org	(866) 342-4772
CCC	Carpet Cushion Council www.carpetcushion.org	(610) 527-3880
CDA	Copper Development Association www.copper.org	(800) 232-3282 (212) 251-7200
CEA	Canadian Electricity Association www.canelect.ca	(613) 230-9263
CEA	Consumer Electronics Association www.ce.org	(866) 858-1555 (703) 907-7600
CFFA	Chemical Fabrics and Film Association, Inc. www.chemicalfabricsandfilm.com	(216) 241-7333
CGA	Compressed Gas Association www.cganet.com	(703) 788-2700
CIMA	Cellulose Insulation Manufacturers Association www.cellulose.org	(888) 881-2462 (937) 222-2462
CISCA	Ceilings and Interior Systems Construction Association www.cisca.org	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583
CRRC	Cool Roof Rating Council www.coolroofs.org	(866) 465-2523 (510) 485-7175
CPA	Composite Panel Association www.pbmdf.com	(301) 670-0604
CPPA	Corrugated Polyethylene Pipe Association www.cppa-info.org	(800) 510-2772 (202) 462-9607

CRI	Carpet and Rug Institute (The) www.carpet-rug.com	(800) 882-8846 (706) 278-3176
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200
CSA	Canadian Standards Association	(800) 463-6727 (416) 747-4000
CSA	CSA International (Formerly: IAS - International Approval Services) www.csa-international.org	(866) 797-4272 (416) 747-4000
CSI	Cast Stone Institute www.caststone.org	(717) 272-3744
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
CSSB	Cedar Shake and Shingle Bureau www.cedarbureau.org	(604) 820-7700
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute) www.cti.org	(281) 583-4087
DBIA	Design Build Institute of America www.dbia.org	(866) 692-0110
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
EIA	Electronic Industries Alliance www.eia.org	(703) 907-7500
EIMA	EIFS Industry Members Association www.eima.com	(800) 294-3462 (770) 968-7945
EJCDC	Engineers Joint Contract Documents Committee www.ejdc.org	(703) 295-5000
EJMA	Expansion Joint Manufacturers Association, Inc.	(914) 332-0040

	www.ejma.org	
ESD	ESD Association (Electrostatic Discharge Association) www.esda.org	(315) 339-6937
ETL SEMCO	Intertek ETL SEMCO (Formerly: ITS - Intertek Testing Service NA) www.intertek.com	(800) 967-5352
FM Approvals	FM Approvals LLC www.fmglobal.com	(781) 762-4300
FM Global	FM Global (Formerly: FMG - FM Global) www.fmglobal.com	(401) 275-3000
FMRC	Factory Mutual Research (Now FM Global)	
FSA	Fluid Sealing Association www.fluidsealing.com	(610) 971-4850
FSC	Forest Stewardship Council www.fsc.org	49 228 367 66 0
GA	Gypsum Association www.gypsum.org	(202) 289-5440
GANA	Glass Association of North America www.glasswebsite.com	(785) 271-0208
GRI	(Part of GSI)	
GS	Green Seal www.greenseal.org	(202) 872-6400
GSI	Geosynthetic Institute www.geosynthetic-institute.org	(610) 522-8440
HI	Hydraulic Institute www.pumps.org	(973) 267-9700

HI	Hydronics Institute www.gamanet.org	(908) 464-8200
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)	
HPVA	Hardwood Plywood and Veneer Association www.hpva.org	(703) 435-2900
HPW	H. P. White Laboratory, Inc. www.hpwhite.com	(410) 838-6550
IAS	International Approval Services (Now CSA International)	
ICEA	Insulated Cable Engineers Association, Inc. www.icea.net	(770) 830-0369
ICRI	International Concrete Repair Institute, Inc. www.icri.org	(847) 827-0830
IEC	International Electrotechnical Commission www.iec.ch	41 22 919 02 11
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000
IEST	Institute of Environmental Sciences and Technology www.iest.org	(847) 255-1561
IGCC	Insulating Glass Certification Council www.igcc.org	(315) 646-2234
IGMA	Insulating Glass Manufacturers Alliance www.igmaonline.org	(613) 233-1510
ILI	Indiana Limestone Institute of America, Inc. www.iliai.com	(812) 275-4426

ISO	International Organization for Standardization www.iso.ch	41 22 749 01 11
ISSFA	International Solid Surface Fabricators Association www.issfa.net	(877) 464-7732 (702) 567-8150
ITS	Intertek Testing Service NA (Now ETL SEMCO)	
ITU	International Telecommunication Union www.itu.int/home	41 22 730 51 11
KCMA	Kitchen Cabinet Manufacturers Association www.kcma.org	(703) 264-1690
LMA	Laminating Materials Association (Now part of CPA)	
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864
MBMA	Metal Building Manufacturers Association www.mbma.com	(216) 241-7333
MFMA	Maple Flooring Manufacturers Association, Inc. www.maplefloor.org	(888) 480-9138
MFMA	Metal Framing Manufacturers Association, Inc. www.metalframingmfg.org	(312) 644-6610
MH	Material Handling (Now MHIA)	
MHIA	Material Handling Industry of America www.mhia.org	(800) 345-1815 (704) 676-1190
MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222
MPI	Master Painters Institute www.paintinfo.com	(888) 674-8937 (604) 298-7578

MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.com	(703) 281-6613
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(630) 942-6591
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(800) 797-6623 (281) 228-6200
NADCA	National Air Duct Cleaners Association www.nadca.com	(202) 737-2926
NAIMA	North American Insulation Manufacturers Association www.naima.org	(703) 684-0084
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NCPI	National Clay Pipe Institute www.ncpi.org	(262) 248-9094
NCTA	National Cable and Telecommunications Association www.ncta.com	(202) 775-2300
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200

NETA	InterNational Electrical Testing Association www.netaworld.org	(888) 300-6382 (269) 488-6382
NFHS	National Federation of State High School Associations www.nfhs.org	(317) 972-6900
NFPA	National Fire Protection Association www.nfpa.org	(800) 344-3555 (607) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-1776
NGA	National Glass Association www.glass.org	(866) 342-5642 (703) 442-4890
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933-0318 (901) 377-1818
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NOFMA	The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association) www.nofma.com	(901) 526-5016
NOMMA	National Ornamental and Miscellaneous Metals Association www.nomma.org	(888) 516-8585
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010
NSSGA	National Stone, Sand and Gravel Association www.nssga.org	(800) 342-1415 (703) 525-8788

NTMA	National Terrazzo and Mosaic Association, Inc. (The) www.ntma.com	(800) 323-9736 (540) 751-0930
NTRMA	National Tile Roofing Manufacturers Association (Now TRI)	(206) 209-5300
NWWDA	Window and Door Manufacturers Association www.wdma.com	(312) 321-6802
OPL	Omega Point Laboratories, Inc. (Now ITS)	
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDCA	Painting and Decorating Contractors of America www.pdca.com	(800) 332-7322 (314) 514-7322
PDI	Plumbing and Drainage Institute www.pdionline.org	(800) 589-8956 (978) 557-0720
PGI	PVC Geomembrane Institute http://pgi-tp.ce.uiuc.edu	(217) 333-3929
PLANET	Professional Landcare Network (Formerly: ACLA - Associated Landscape Contractors of America) www.landcarenetwork.org	(800) 395-2522 (703) 736-9666
PTI	Post-Tensioning Institute www.post-tensioning.org	(602) 870-7540
RCSC	Research Council on Structural Connections www.boltcouncil.org	
RFCI	Resilient Floor Covering Institute www.rfci.com	(301) 340-8580
RIS	Redwood Inspection Service www.redwoodinspection.com	(888) 225-7339 (415) 382-0662
SAE	SAE International www.sae.org	(877) 606-7323 (724) 776-4841

SDI	Steel Deck Institute www.sdi.org	(847) 458-4647
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SEFA	Scientific Equipment and Furniture Association www.sefalabs.com	(877) 294-5424 (516) 294-5424
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)	
SGCC	Safety Glazing Certification Council www.sgcc.org	(315) 646-2234
SIA	Security Industry Association www.siaonline.org	(866) 817-8888 (703) 683-2075
SIGMA	Sealed Insulating Glass Manufacturers Association (Now IGMA)	
SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995
SMA	Screen Manufacturers Association www.smacentral.org	(561) 533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SMPTE	Society of Motion Picture and Television Engineers www.smpte.org	(914) 761-1100
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division) www.sprayfoam.org	(800) 523-6154
SPIB	Southern Pine Inspection Bureau (The) www.spib.org	(850) 434-2611

SPRI	Single Ply Roofing Industry www.spri.org	(781) 647-7026
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331
STI	Steel Tank Institute www.steeltank.com	(847) 438-8265
SWI	Steel Window Institute www.steelwindows.com	(216) 241-7333
SWRI	Sealant, Waterproofing, and Restoration Institute www.swrionline.org	(816) 472-7974
TCA	Tile Council of America, Inc. (Now TCNA)	
TCNA	Tile Council of North America, Inc. www.tileusa.com	(864) 646-8453
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance www.tiaonline.org	(703) 907-7700
TMS	The Masonry Society www.masonrysociety.org	(303) 939-9700
TPI	Truss Plate Institute, Inc. www.tpinst.org	(703) 683-1010
TPI	Turfgrass Producers International www.turfgrasssod.org	(800) 405-8873 (847) 649-5555
TRI	Tile Roofing Institute www.tileroofing.org	(312) 670-4177
UL	Underwriters Laboratories Inc. www.ul.com	(877) 854-3577 (847) 272-8800

UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902
USGBC	U.S. Green Building Council www.usgbc.org	(800) 795-1747
USITT	United States Institute for Theatre Technology, Inc. www.usitt.org	(800) 938-7488 (315) 463-6463
WASTEC	Waste Equipment Technology Association www.wastec.org	(800) 424-2869 (202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association www.wcmanet.org	(212) 297-2122
WCSC	Window Covering Safety Council (Formerly: WCMA - Window Covering Manufacturers Association) www.windowcoverings.org	(800) 506-4636 (212) 297-2109
WDMA	Window and Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com	(800) 223-2301 (847) 299-5200
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California) www.wicnet.org	(916) 372-9943
WIC	Woodwork Institute of California (Now WI)	
WMMPA	Wood Moulding and Millwork Producers Association www.wmmpa.com	(800) 550-7889 (530) 661-9591
WSRCA	Western States Roofing Contractors Association www.wsrca.com	(800) 725-0333 (650) 570-5441

WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Websites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	(909) 472-4100
ICC	International Code Council www.iccsafe.org	(888) 422-7233
ICC-ES	ICC Evaluation Service, Inc. www.icc-es.org	(800) 423-6587 (562) 699-0543
UBC	Uniform Building Code (See ICC)	

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Websites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CE	Army Corps of Engineers www.usace.army.mil	(202) 761-0011
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-7923
DOC	Department of Commerce www.commerce.gov	(202) 482-2000
DOD	Department of Defense http://.dodssp.daps.dla.mil	(215) 697-6257
DOE	Department of Energy www.energy.gov	(202) 586-9220
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167

FAA	Federal Aviation Administration www.faa.gov	(866) 835-5322
FCC	Federal Communications Commission www.fcc.gov	(888) 225-5322
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(800) 488-3111
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
LBL	Lawrence Berkeley National Laboratory www.lbl.gov	(510) 486-4000
NCHRP	National Cooperative Highway Research Program (See TRB)	
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety and Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999
PBS	Public Buildings Service (See GSA)	
PHS	Office of Public Health and Science www.osophs.dhhs.gov/ophs	(202) 690-7694
RUS	Rural Utilities Service (See USDA)	(202) 720-9540
SD	State Department www.state.gov	(202) 647-4000
TRB	Transportation Research Board http://gulliver.trb.org	(202) 334-2934
USDA	Department of Agriculture	(202) 720-2791

	www.usda.gov	
USPS	Postal Service www.usps.com	(202) 268-2000

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Websites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from U.S. Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080
CFR	Code of Federal Regulations Available from Government Printing Office www.gpoaccess.gov/cfr/index.html	(866) 512-1800 (202) 512-1800
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
DSCC	Defense Supply Center Columbus (See FS)	
FED-STD	Federal Standard (See FS)	
FS	Federal Specification Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
	Available from Defense Standardization Program www.dps.dla.mil	
	Available from General Services Administration www.gsa.gov	(202) 619-8925
	Available from National Institute of Building Sciences www.wbdg.org/ccb	(202) 289-7800

FTMS	Federal Test Method Standard (See FS)	
MIL	(See MILSPEC)	
MIL-STD	(See MILSPEC)	
MILSPEC	Military Specification and Standards Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
UFAS	Uniform Federal Accessibility Standards Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Websites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CBHF	State of California, Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation www.dca.ca.gov/bhfti	(800) 952-5210 (916) 574-2041
CBSC	State of California, Building Standards Commission 2525 Natomas Park Drive, Suite 130 Sacramento, CA 95833 www.bsc.ca.gov	(916) 263-0916
CCR	California Code of Regulations www.calregs.com	(916) 323-6815
CPUC	California Public Utilities Commission www.cpuc.ca.gov	(415) 703-2782
DSA	State of California, Division of the State Architect DSA Headquarters Office Mr. David F. Thorman, AIA State Architect of California 1102 Q Street, Suite 5100 Sacramento, California 95811	(916) 445-8100
DSA	State of California, Division of the State Architect DSA San Francisco Bay Area Regional Office	(510) 622-3101

	1515 Clay Street, Suite 1201 Oakland, California 94612 www.dsa.dgs.ca.gov/default	
DSA	State of California, Division of the State Architect DSA Sacramento Regional Office 1102 Q Street, Suite 5200 Sacramento, California 95814 www.dsa.dgs.ca.gov/default	(916) 445-8730
DSA	State of California, Division of the State Architect DSA Los Angeles Basin Regional Office 700 N. Alameda Street, Suite 5-500 Los Angeles, California 90012 www.dsa.dgs.ca.gov/default	(213) 897-3995
DSA	State of California, Division of the State Architect DSA San Diego Regional Office 16680 West Bernardo Drive San Diego, California 92127 www.dsa.dgs.ca.gov/default	
TFS	Texas Forest Service Forest Resource Development http://txforestservice.tamu.edu	

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01 4200

SECTION 01 4213

ABBREVIATIONS, SYMBOLS AND ACRONYMS

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. List of abbreviations, units, symbols and acronyms used in these Specifications.

1.02 TITLE ABBREVIATIONS:

OAR	Owner's Authorized Representative, i.e., District Project Manager, District Representative, Owner, District Project Manager
AOR	Architect of Record
EOR	Engineer of Record
PM	Project Manager,
Inspector of Record	Inspector of Record, Owner's Inspector, Inspector

1.03 UNITS AND OTHER ABBREVIATIONS:

ac	Alternating current
BTU	British thermal unit
cfh	Cubic feet per hour
cfm	Cubic feet per minute
cm	Centimeter
Co.	Company
COP	Coefficient of performance
Corp.	Corporation
d	Penny
db.	Decibel
DB	Dry bulb
dc	Direct current
EER	Energy efficiency ratio
F	Degrees Fahrenheit
fpm	Feet per minute
gph	Gallons per hour
gpm	Gallons per minute
HP	Horsepower
HVAC	Heating, ventilating and air conditioning
Hz	Hertz
Inc.	Incorporated

KHz	Kilohertz
lb	Pound
LED	Light emitting dial
MBH	1000 BTUs per hour
mfr	Manufacturer
MHz	Mega hertz
mil	Thousandth of an inch
mm	Millimeter
mph	Miles per hour
oz.	Ounce
pH	Acidity-alkalinity balance
psf	Pounds per square foot
psi	Pounds per square inch
psig	Pounds per square inch, gage
RF	Radio frequency
rpm	Revolutions per minute
V	Volt
WB	Wet bulb

1.04 SYMBOLS

#	Number
'	Foot/Feet
"	Inch(es)
%	Percent

1.05 ACRONYMS

AE	Architect and engineer(s)
ABMA	American Boiler Manufacturers Association
ABMS	American Bureau of Metal Statistics
ABPA	American Board Products Association
ACI	American Concrete Institute
AGA	American Gas Association
AHAM	Association of Heating and Air Conditioning Manufacturers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association, Inc.
ANSI	American National Standards Institute
APA	American Plywood Association
AQMD	Air Quality Management District
ARI	Air-Conditioning and Refrigeration Institute

ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Institute of America
CCR	California Code of Regulations
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CQC	California Quality Control (CMA Standards)
CRA	California Redwood Association
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standards, U.S. Department of Commerce
CTI	Ceramic Tile Institute
CTI	Cooling Tower Institute
DHI	Door and Hardware Institute
DSA	Division of the State Architect, Office of Regulation Services
DBE	Design-Build Entity, Design-Builder
FCC	Federal Communication Commission
FGMA	Flat Glass Marketing Association
FM	Factory Mutual
FS	Federal Specifications
HPMA	Hardwood Plywood Manufacturers Association
IACS	International Annealed Copper Standards
IAMPO	International Association of Plumbing and Mechanical Officials
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronic Engineers, Inc.
IES	Illuminating Engineering Society
IMI	International Masonry Institute
IRI	Industrial Risk Insurers

MEP	Mechanical, electrical, and plumbing
MIA	Marble Institute of America
MIA	Masonry Institute of America
MLSFA	Metal Lath/Steel Framing Association
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry.
NAAMM	National Association of Architectural Metal Manufacturers
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NCMA	National Concrete Masonry Association
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NOFMA	National Oak Flooring Manufacturers Association
NPCA	National Paint and Coatings Association
NSF	National Sanitation Foundation
NTMA	National Terrazzo and Mosaic Association
NWMA	National Woodwork Manufacturers Association
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PDI	Plumbing and Drainage Institute
PEI	Porcelain Enamel Institute
PS	Product Standard, U.S. Department of Commerce
RIS	Redwood Inspection Service
RFCI	Resilient Floor Covering Institute
SCMA	Southern Cypress Manufacturers Association
SDI	Steel Deck Institute
SFPA	Southern Forest Products Association
SIGMA	Sealed Insulating Glass Manufacturers Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SPIB	Southern Pine Inspection Bureau
SSPC	Steel Structure Painting Council
SWI	Steel Window Institute
TCA	Tile Council of America

UBC	Uniform Building Code
UCI	Uniform Construction Index
UL	Underwriters' Laboratories, Inc.
UMC	Uniform Mechanical Code
UPC	Uniform Plumbing Code
WCLIB	West Coast Lumber Inspection Bureau
WI (WIC)	Woodwork Institute
WWPA	Western Wood Products Association

END OF SECTION

SECTION 01 4523

TESTING AND INSPECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. This Section includes the following:

1. Testing and inspection services to meet requirements of the California Building Code (CBC), Title 24, Parts 1 and 2, as indicated in Contract Documents.

a. One or more DSA certified inspectors employed by the Owner in accordance with the requirements of California Building Standards Administrative Code will be assigned to the Work with their duties as specifically defined in Sections 4-333(b), 4-333(c), and 4-342.

2. Test of materials are required by a DSA certified testing agency as set forth in Section 4-335 of the California Building Standards Administrative Code.

B. Related Sections include the following:

1. Division 01 – Section 013210 "Construction Schedule".
2. Division 01 – Section 012500 "Submittal Procedures".
3. Division 01 – Section 018620 “Test and Balance”.
4. Division 01 – Section 015000 "Construction Facilities and Temporary Controls ".
5. Division 01 – Section 017000 "Execution Requirements".
6. Division 02 – Section 024116 "Demolition".
7. Division 01 – Section 017700 "Closeout Procedures".

1.03 DEFINITIONS

A. CBC: California Building Code.

B. DSA: State of California, Division of the State Architect.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 TESTS

A. Owner will select and provide an independent testing agency to conduct tests, sampling, and testing of materials. Selection of material to be tested shall be by the agency or the District Project Manager and not by Contractor.

1. Procedural and acceptance criteria shall be as set forth in Section 4-335 of the California Building Standards Administrative Code.

2. As set forth in CBC Section 1705A.1.

B. Owner will directly reimburse testing agency all costs for all DSA required tests and inspections, but may be reimbursed by Contractor for such costs as noted in related sections of the Contract Documents.

1. Contractor will reimburse Owner or directly reimburse testing agency all costs for retesting required by failed tests as set forth in Sections 4-333(c) and 4-335(c) of the California Building Standards Administrative Code.

C. Independent testing agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.

D. Independent testing agency shall not perform any duties of Contractor.

E. Contractor shall notify the District Project Manager a sufficient time in advance of the manufacture of material to be supplied by him under the Contract Documents, which must by terms of the Contract Documents be tested, in order that the Owner may arrange for the testing of same at the source of supply.

F. Any material shipped by Contractor from source of supply prior to having satisfactorily passed such required testing and inspection or prior to receipt of notice from Inspector of Record such testing and inspection is not required shall not be incorporated into the Work.

G. Contractor shall provide an insulated curing box with capacity for not less than twenty (20) concrete cylinders and relocate said box and cylinders as rapidly as required in order to provide for progress of the Work.

3.02 TEST REPORTS

A. One copy of each test report shall be forwarded directly to DSA by the testing agency. Additional copies of each test report shall be forwarded directly to Owner, Architect, Contractor, Project Inspector, District Project Manager, and Structural Engineer by the testing agency. Such reports

shall include all tests made, regardless of whether such tests indicate that the material is satisfactory or unsatisfactory. Samples taken but not tested shall also be reported. Records of special sampling operations as required shall also be reported. The reports shall show that the material or materials were sampled and tested in accordance with the requirements of CBC, Title 24, Parts 1 and 2, and with the approved Contract Documents. Test reports shall show the specified design strength. Test reports shall also definitely state whether or not material or materials tested comply with the specified requirements.

1. As set forth in Section 4-335(d) of the California Building Standards Administrative Code.

3.03 VERIFICATION OF TEST REPORTS

A. Testing agency shall submit to DSA a verified report, in duplicate, covering tests that were performed by that agency during the progress of the Work. Additional copies of each test report shall be forwarded directly to Owner, Architect, Contractor, Project Inspector, District Project Manager, and Structural Engineer by the testing agency. Such report shall be furnished each time construction on the Work is suspended, covering tests up to that time, and prior to Final Completion of the Work, covering all tests.

1. As set forth in Sections 4-335(e) and 4-336 of the California Building Standards Administrative Code.

3.04 INSPECTION BY Owner

A. Owner, and District Project Manager shall at all times have access, for purpose of inspection, to all parts of the Work and to all shops wherein the Work is in preparation. Contractor shall at all times maintain proper facilities and provide safe access for such inspection.

B. Owner, and District Project Manager shall have the right to reject materials and workmanship deemed defective Work, and to require their correction. Rejected workmanship shall be corrected in a satisfactory manner and rejected materials shall be removed from the premises and legally disposed of, all without charge to Owner. If Contractor does not correct such rejected Work within a reasonable time, fixed by written notice and in accordance with the terms and conditions of the Contract Documents, Owner may correct such rejected Work and proceed in accordance with related Articles of the Contract Documents.

C. Should it be considered necessary or advisable by the Owner and District Project Manager at any time prior to Final Acceptance of the entire Work to make an examination of the Work already completed by removing or tearing out the same, the Contractor shall, on request, promptly furnish all necessary facilities, labor, and materials. If such work is found to be defective in any respect due to the fault of the Contractor or any of his Subcontractors, he shall defray all expenses of such examinations and of satisfactory reconstruction. If, however, such work is found to meet the requirements of Contract Documents, the additional cost of labor and material necessarily involved in the examination and replacement shall be allowed the Contractor.

D. Contractor is responsible for compliance with all applicable local, state, and federal codes, regulations, ordinances, restrictions, and requirements.

3.05 PROJECT INSPECTOR

A. Project inspector, employed by the Owner in accordance with requirements of California Code of Regulations, Title 24, will be assigned to the work.

1. Project inspector shall be approved by Architect, Structural Engineer, and DSA.
2. As set forth in Section 4-333(b) of the California Building Standards Administrative Code.
3. Duties of Project Inspector are specifically defined in Section 4-342 of the California Building Standards Administrative Code.

B. The work of construction in all stages of progress shall be subject to the personal continuous observation of the Project Inspector. He shall have free access to any or all parts of the Work at any time. The Contractor shall furnish the Project Inspector reasonable facilities for obtaining such information as may be necessary to keep him fully informed respecting the progress and manner of the Work and the character of the materials.

C. Inspection of Work shall not relieve Contractor from any obligation to fulfill all of the terms and conditions of the Contract Documents.

D. Contractor shall be responsible for scheduling times of inspection, tests, sample taking, and similar activities of the Work.

1. Contractor shall perform quality control inspection of work prior to filling out an inspection request to the inspector of record.

3.06 SPECIAL INSPECTOR

A. Special Inspector:

1. As set forth in Section 4-333(c) of the California Building Standards Administrative Code.
2. As set forth in CBC Section 1701A.5, 1704A.1.

3.07 TESTS AND INSPECTIONS

A. The following tests and inspection requirements are based on the 2013 California Building Code, Part 2 of the California Code of Regulations, Title 24, California Building Standards Code, (latest version of the International Building Code (IBC) with California Amendments).

B. Required tests and inspections include but are not limited to the following.

1. All required inspections, as applicable, shown in the California Building Code.
2. All tests required per DSA 103 - Statement of Structural Tests and Special Inspections card.

3. Inspections listed within project Specifications located within divisions 1 through 48.

C. Concrete: CBC, Chapter 19A.

1. Materials:

a. Concrete Materials: 1705A.3, 1904A.2.

b. Concrete Aggregate: 1903A.6.

c. Reinforcing Bars: 1903A.

d. Fly Ash: 1903A.5.

2. Quality:

a. Concrete Proportions: 1903A, 1904A.2.

b. Concrete Testing: 1903A.

c. Mixing and Placing: 1903A.

d. Cold Weather Requirements: ACI 318-11, SECTION 5.12.

e. Hot Weather Requirements: ACI 318-11, SECTION 5.13.

f. Gypsum Concrete Strength Tests: 1911A, 1913A.6.

g. Post-Installed Anchors in Concrete: 1913A.7.

3. Inspection:

a. Project Site Inspection: 1903A.

b. Batch Plant Inspection: 1705A.3.2.

D. Steel: CBC, Chapter 22A.

1. Materials:

a. Material Identification: 2203A.1.

2. Inspection:

a. Shop Fabrication Inspection: 1704A.2.5.

b. Welding Inspection: 1705A.2.2.1.

c. Post-Installed Anchors in Concrete: 1913A.7.

END OF SECTION 01 4523

SECTION 01 4525

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 – GENERAL

1.01 SUMMARY

A. SECTION INCLUDES

1. This Section specifies the requirements for test and balance of HVAC and related systems.

B. RELATED REQUIREMENTS

1. Section 01 1100: Summary of Work.

2. Section 01 3113: Project Coordination.

3. Section 01 3213: Construction Schedule.

4. Section 01 3300: Submittal Procedures.

5. Section 01 7700: Contract Closeout.

6. Section 23 0500: Common Work Results for HVAC.

7. Section 23 0513: Basic HVAC Materials and Methods.

8. Section 23 0548: HVAC Sound, Vibration and Seismic Control.

9. Section 23 0900: HVAC Instrumentation and Controls.

10. Section 23 0923: Environmental Control and Energy Management Systems (Only include when DDC Energy Management and Control Systems are provided).

11. Section 23 3000: Air Distribution.

12. Section 23 3813: Kitchen Ventilation System.

13. Section 23 8000: Heating, Ventilating and Air Conditioning Equipment.

PART 2 – PRODUCTS (Not used)

PART 3 – EXECUTION

3.01 DEFINITIONS AND APPLICABLE PUBLICATIONS

A. For the purposes of this Section definitions are as indicated in applicable publications of AABC, NEBB, TABB, ASHRAE, ANSI and SMACNA.

1. TAB: Testing, Adjusting and Balancing.

2. TABB: Testing, Adjusting and Balancing Bureau.

3. AABC: Associated Air Balance Council.

4. NEBB: National Environmental Balancing Bureau.

5. ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers.

6. ANSI: American National Standards Institute.

7. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

8. OAR: OWNER'S Authorized Representative

3.02 QUALITY ASSURANCE

A. The General Contractor shall contract directly with the test and balance agency. Tests performed by testing agencies contracted with the system's subcontractor will not be accepted. The qualifications of the agency shall comply with Article 3.02, Quality Assurance. The agency shall be responsible for furnishing labor, instruments, and tools required to test, adjust, and balance the heating, ventilating, and air conditioning (HVAC) systems and related plumbing systems, as described and/or as indicated in the Contract Documents.

B. CONTRACTOR shall obtain services of an independent, qualified testing agency acceptable to Architect to perform testing and balancing Work as specified and as follows:

1. Agency shall be currently certified by either the Associated Air Balance Council (AABC), the National Environmental Balancing Bureau (NEBB), or the Testing, Adjusting and Balancing Bureau (TABB). NEBB or TABB certification shall be for Air and Hydronic Testing, Adjusting and Balancing and Sound and Vibration Measurement.

2. Work shall be in accordance with the latest edition of the AABC, NEBB, or TABB National Standards. Where the requirements of the two standards are different, the more stringent requirements shall prevail. Also, if the Contract Documents impose a more stringent standard, then the Contract Documents shall prevail.

C. Performance Criteria: Work of this Section shall be performed in accordance with approved Testing, Adjusting, and Balancing agenda.

D. Test Equipment Criteria: Basic instrumentation requirements and accuracy/calibration required by Section Two of the AABC, Section II of the NEBB, or TABB Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems.

E. Verification: The Test and Balance Agency shall recheck 10 percent (minimum 10) of the measurements listed in the report. The locations shall be selected by PROJECT INSPECTOR or OAR. The recheck will be witnessed by PROJECT INSPECTOR or OAR. If 20 percent of the measurements that are retested differ from the report and are also out of the specified range, an additional 10 percent will be tested. If 20 percent fall outside the specified range, the report will be considered invalid and all test and balance work shall be repeated.

F. Due to more stringent acoustical requirements in the educational environment, the Test and Balance Agency shall recheck the air systems where the sound level is higher than the specified requirements and demonstrate compliance with the methodology specified in this document with emphasis on fan speed adjustment and balancing for optimum acoustical performance. The recheck will be witnessed by PROJECT INSPECTOR or OAR. When there are multiple air systems, a system selected by PROJECT INSPECTOR or OAR shall be rechecked. If this system is found to be not in compliance, a second system shall be checked. If the second system if also found to be not in compliance, the report will be considered invalid, and all test and balance work shall be repeated.

3.03 SUBMITTALS

A. Submit name of agency to perform the Work. Include in the submittal the certified qualifications of all persons responsible for supervising and performing actual Work of this Section. Agency shall submit a minimum of five commercial or industrial HVAC system TAB projects of similar type, size, and degree of difficulty completed within the last two years. Agency shall provide name and telephone number of contact person for each listed project.

B. Submit, for approval, 6 copies of the Agenda as indicated in Article 3.06 to test and balance all mechanical and relevant plumbing systems.

C. Preliminary Report: Review the Contract Documents, examine Work installations and submit a written report to ARCHITECT, PROJECT INSPECTOR and OAR indicating deficiencies in Work precluding proper testing and balancing of the Work.

D. Final TAB Report: Submit the final TAB report for review by ARCHITECT, PROJECT INSPECTOR, and OAR outlining the conditions and Work completed on each HVAC system. All outlets, devices, HVAC equipment, etc. shall be identified, along with a numbering system corresponding to report unit identification.

E. Submit an AABC “National Project Performance Guaranty” or “NEBB Quality Assurance Certification”, assuring the Project systems were tested, adjusted, and balanced in accordance with the Specifications and AABC, NEBB, or TABB National Standards.

F. CAD drawings: Submit single line, multi-color CAD drawings indicating outside return and supply air, volume control boxes, each outlet and inlet, room numbers, duct sizes at traverse locations, temperatures and pressures, systems balanced, components changed, and CONTRACTOR installed access points. In addition, drawings shall identify controls, equipment settings, including manual damper quadrant positions, manual valve indicators, fan speed control levers, and similar controls, and devices shall be marked on the drawings to show final settings. CAD files shall be submitted on CD-ROM upon final submittal of TAB report. Reports shall identify discrepancies between completed

Work and the Contract Documents affecting the performance and longevity of the system.

3.04 GENERAL SCOPE OF WORK

A. The general scope of Work shall include but not be limited to the following:

1. Measure airflow rates of HVAC systems and make adjustments to achieve design airflow rates, tabulate results, and submit reports.

2. Measure water-flow rates of HVAC systems and make adjustments to achieve design water flow rates, tabulate results, and submit reports.

3. Measure flow velocities, temperatures, static pressures or head, rotational speed, and electrical power demand of fans, pumps, and other related HVAC system components, tabulate results, and submit reports.

4. Measure sound levels in each conditioned space, tabulate results, and submit reports.

5. Measure ambient sound levels of outdoor HVAC units and system components such as chillers and cooling towers, tabulate results, and submit reports.

6. Reports shall contain sufficient data for the system designer to evaluate system performance and solve installation problems such as system pressure profiles and pressure drops across system components

3.05 SPECIFIC SCOPE OF WORK

A. The specific scope of Work shall include the following HVAC system components as indicated on the Drawings:

1. Air Conditioning Units.

2. Heating and Ventilating Units.

3. Heating and Cooling Coils.

4. Supply, Return, Relief and Exhaust Fans.

5. Outside Air and Return Air Plenums.

6. Outside Air Intakes.

7. All Supply and Return Ductwork.

8. All associated Air Terminal Devices, i.e. Supply Diffusers, Return Registers, etc.

9. Exhaust Duct Systems.

10. Fire and Fire/Smoke Dampers.

11. Kitchen Hoods.

12. Laboratory Hoods.

3.06 TESTING, ADJUSTING, AND BALANCING AGENDA

A. Provide proposed materials, methods, procedures, forms, diagrams, and reports for test and balance Work.

B. Agenda to be completed by the test and balance agency and submitted to ARCHITECT, PROJECT INSPECTOR, and OAR for review and approval.

C. Agenda shall include one complete set of AABC, NEBB, or TABB publications listed in Sub-paragraph 3.02.B.2, applicable publications, or, in case of other test and balance agencies and or organizations, comparable publications to establish an approved, systematic, and uniform set of procedures.

D. Agenda shall also include the following detailed narrative procedures, system diagrams, and forms for test results:

1. Specific standard procedures required and proposed for each system of the Work.

2. Specified test forms for recording each procedure and for recording sound and vibration measurements.

3. Systems diagrams for each air, water, and steam system. Diagrams may be single line.

E. In addition to information recorded for standard AABC, NEBB, or TABB procedures, the following information is required:

1. Fan data.

2. System number, location, manufacturer, model, and serial number.

3. Fan wheel type and size.

4. Motor horse power, type, and rpm.

5. Sheave size, type, number of grooves, and open turns on Variable Pitch Sheave.

6. Number and size of belts, motor and fan shaft sizes, center-to-center of shafts in inches, and adjustment available motor data, including nameplate data, actual amps, rated, and actual motor rpm, volts, phase, hp, kW, starter heater size, and capacity.

7. Fan design airflow and service (supply, return, outdoor air or exhaust).

8. Fan static pressure, suction/discharge, static profile, and static control point.

F. The following traverse data is required:

1. Traverse location, size of duct (inside dimensions), and area of duct in square feet.

2. Column for each hole traversed/lines for each reading.

3. Barometric pressure.

4. Temperature/Static pressure in the duct.

5. Actual CFM corrected to SCFM.

6. Notes.

G. The following air distribution data is required:

1. Room identification.

2. Outlet or intake balance sequence number.

3. Size of outlet or inlet.

4. AK Factor.

5. Design and Actual FPM and CFM.

6. Notes.

H. The following hydronic coil data is required:

1. Air flow through the coil in CFM.

2. Dry bulb and wet bulb temperatures entering/leaving coil.

3. Enthalpy or total heat differences in BTU/pound.

4. Capacity in BTU/hour at time of test.

5. Water temperature and pressure entering/leaving coil.

6. Flow (in GPM) through coil.

7. Air pressure drop across coil.

8. Water head drop across coil.

9. Notes.

I. The following DX coil data is required:

1. Air flow through the coil in CFM.

2. Dry and wet bulb temperatures entering/leaving coil.

3. Enthalpy or total heat difference across coil in BTU/ pound.

4. Capacity in BTU/hour at time of test.

5. Air pressure drop across coil.

6. Notes.

J. The following domestic water heater data is required:

1. Performance test results for rated capacity.

2. Boiler identification number.

3. Nameplate data; manufacturer, model, and serial number.

4. Water temperature entering/leaving the boiler.

5. Outside conditions: temperature, humidity, general cloud cover.

6. Barometric pressure.

K. The following air-cooled split system condensing unit data is required:

1. Performance test results for rated capacity.

2. Unit identification number.

3. Nameplate data, manufacturer, model, and serial number.

4. Compressor nameplate and actual amps, volts, phase, and hertz.

5. RPM of motors, where applicable.

6. Refrigerant type.

7. Suction/Discharge pressure when gage installed.

8. Number of stages.

9. Low-pressure/High-pressure control setting.

10. Condenser fan sequence stages.

11. Crankcase heater watts (nameplate).

12. Hot gas bypass installed - yes/no.

13. SCFM Air Flow Measurement vs. Design CFM.

L. The following air-cooled split system heat pump data is required:

1. Performance test results for rated heating and cooling capacities.

2. Unit identification number.

3. Nameplate data, manufacturer, model, and serial number.

4. Compressor nameplate and actual amps, volts, phase, and hertz.

5. RPM of motors, where applicable.

6. Refrigerant type.

7. Suction/Discharge pressure for both heating and cooling modes when gage installed.

8. Number of stages.

9. Low-pressure/High-pressure control setting.

10. Condenser fan sequence stages.

11. Crankcase heater watts (nameplate).

12. Hot gas bypass installed - yes/no.

13. SCFM Air Flow Measurement vs. Design CFM.

M. The following sound test data is required:

1. Area or location.

2. Sound level in dB(A) as specified in Article 3.19.

3. Sound level at the center band frequencies of eight non-weighted octaves with equipment on and off for 5 rooms selected by the OAR/PROJECT INSPECTOR.

4. Plot of corrected sound-level reading on Noise Criteria (NC) curve for the measurements in Q 3 above.

N. The following vibration test data is required:

1. Equipment identification number.

2. Vibration levels at all accessible bearings, motors, fans, pumps, casings, and isolators.

3. Measurements in mils defection and velocity in inches per second.

4. Each measurement taken in horizontal, vertical, and axial planes as accessible.

O. The following mixing damper leakage test data is required:

1. Equipment identification number (unit, box, zone, etc.).

2. Dry bulb temperature in the cold/hot (or bypass) deck.

3. Dry bulb temperature in the mixed air stream.

4. Calculated percent leakage.

5. Data above taken in the full cool and full heat (or bypass) mode.

6. Notes.

P. The following airflow station data is required:

1. Station identification number.

2. Nameplate data including effective area.

3. Differential test pressure or velocity.

4. Calculated CFM.

5. Actual CFM (from Pitot-tube traverse form).

6. Read out CFM.

7. Notes

Q. The following fan coil and unit ventilator data is required:

1. Equipment identification number.

2. Nameplate data; manufacturer, model, and serial number.

3. Tested supply CFM or manufacturer rated CFM if not ducted.

4. Tested outside air in CFM.

5. Motor data and actual amps and volts.

6. Cooling/Heating test data.

7. Static pressure.

8. Notes.

R. The following kitchen hood data is required:

1. Hood identification number.

2. Nameplate data; manufacturer, model, and serial number.

3. Pitot-tube traverse total air flow.

4. Exhaust and supply (when part of hood) CFM.

5. Exhaust and supply (when part of hood) test velocities shown on hood face diagram.

6. Face velocities.

7. Hood opening dimensions.

8. Notes (turbulence and flow patterns at the face and inside the hood).

S. The following laboratory hood data is required:

1. Hood identification number.

2. Nameplate data; manufacturer, model, and serial number.

3. Pitot-tube traverse total air flow.

4. Exhaust and supply (when part of hood) CFM.

5. Exhaust and supply (when part of hood) test velocities shown on hood face diagram.

6. Face velocities.

7. Hood opening dimensions.

8. Notes (turbulence and flow patterns at the face and inside the hood).

Z. The following pump data, including but not limited to, domestic hot water booster, domestic hot water circulation is required:

1. Pump number.

2. Nameplate data; manufacturer, model, and serial number.

3. Motor data including nameplate data, actual amps, volts, RPM, horsepower, starter heater size, and capacity.

4. Pump discharge and suction pressure along with total dynamic head in the following modes.

5. Shut-off head FT, Wide open Head FT, and Final operating Head FT.

6. Final GPM Test plotted on a pump curve.

7. Notes.

AA. The following water flow station data is required:

1. Station identification number.

2. Nameplate data; manufacturer, model, and serial number.

3. Design and actual GPM.

4. Differential test pressure.

5. Setting (open turns, degree, etc.) if required GPM.

6. Notes.

3.07 PROCEDURES

A. Schedule the Work of this Section in order for test and balance activities to be completed prior to the date of Substantial Completion. CONTRACTOR shall place all heating, ventilating, and air conditioning equipment into operation during each day and until all HVAC adjusting, balancing, testing, demonstrations, and instructions on systems are completed. Agency shall prepare and submit reports within ten (10) days from completion of the Work of this Section to allow sufficient time for corrective measures to be completed before Substantial Completion of the Work. When an individual building or portion thereof is ready for occupancy, all equipment relative to such portion of Work shall be put into service, tested, and balanced.

B. Prior to the date of Substantial Completion, and upon completion of test and balance Work, place all exhaust fans in operation, force all air handling units, and air conditioning units into a 100 percent outdoor air economizer mode with heating and cooling locked out and flush the building continuously for a period of fourteen (14) days.

C. Coordinate test and balance procedures with any phased Project requirements so test and balance procedures on each phased portion of the Work will be completed prior to completion of said designated phase.

3.08 FIELD EXAMINATION

A. Before the commencement of test and balance Work, CONTRACTOR shall ascertain that following conditions are fulfilled:

1. Ensure that all water heating and water cooling systems have been flushed, cleaned, and filled and high points vented.

2. Boilers (steam and hot water) are filled.

3. Refrigerant systems are fully charged with specified refrigerant.

4. Over-voltage and current protection have been provided for motors.

5. Equipment has been labeled as required.

6. Curves and descriptive data on each piece of equipment to be tested and adjusted are available as required.

7. Operations and maintenance manuals have been supplied.

8. Controls manufacturer and boiler-burner representatives shall be available for consultation and supervision of adjustments during tests.

9. Verify that heating and cooling coil fins are cleaned, combed and air filters clean, and installed.

10. Verify that duct systems are clean of debris and leakage is minimized, access doors are closed and duct end caps are in place, and fire and volume dampers are in place and open.

11. Automatic control systems are completed and operating.

12. Start up and initial commissioning of all HVAC equipment except fans shall be by the manufacturer.

B. In addition to the above, CONTRACTOR shall establish a specific, coordinated plan which details how each area of existing building will be balanced during the various phases of the Work. The evaluation shall address, at a minimum, the following concerns:

1. OWNER operations.

2. Building safety and security policies. Prior to any fire safety or security systems shutdown at any time during the Work, CONTRACTOR shall first advise and coordinate with OWNER to ensure all concerned parties are notified.

3. Protecting furniture, computers, photocopiers, and other office equipment.

4. Protecting classroom fixtures and equipment.

5. Concerns specific and unique to building related issues.

6. Downtime required for each Air Handling Unit including projected time to return each portion of the building back to its normal occupancy temperature and humidity.

7. Shutdown and reactivation of the fire alarm system to avoid accidental alarms during test and balance and related Work.

3.09 TEST AND BALANCE

A. For each heating, ventilating, or air conditioning system the following shall be performed, recorded, and submitted in an approved format for review. Make, type, and model of unit, and location of each piece of equipment shall be included in the report. Readings shall include but not be limited to following:

1. Air Systems**:**

a. General

1) Verify all ductwork, dampers, grilles, registers, and diffusers have been installed per design and set in the full open position. Agency shall perform the following TAB procedures in accordance with AABC or NEBB National Standards. Where the requirements of the two standards are different, the more stringent requirements shall prevail. Also, if the Contract

Documents impose a more stringent standard then the Contract Documents shall prevail.

b. Zone, Branch, and Main Ducts:

1) Adjust ducts to within design CFM requirements by means of Pitot-tube duct traverse.

c. Supply Fans:

1) Fan Speeds: Test and adjust fan RPM to achieve maximum or design CFM. CONTRACTOR shall provide new belt pulleys when required.

2) Current and Voltage: Test and record motor voltage and amperage, and compare data with the nameplate limits. Ensure fan motor is not in or above the service factor as published by the motor manufacturer.

3) Pitot-Tube Traverse: Perform a Pitot-tube traverse of main supply and return ducts, record total CFM.

4) Outside Air: Test and adjust the outside air using Pitot-tube traverse.

5) Static Pressure: Test and record system static profile of each supply fan.

6) Current and Voltage: Test and record motor voltage and amperage, and compare data with the nameplate limits. Ensure fan motor is not in or above the service factor as published by the motor manufacturer.

d. Return, Relief, and Exhaust Fans:

1) Fan Speeds: Test and adjust fan RPM to achieve maximum or design CFM. CONTRACTOR shall provide new belt pulleys where required.

2) Pitot-Tube Traverse: Perform a Pitot-tube traverse of the main return ducts to obtain total CFM.

3. Static Pressure: Test and record system static profile of each fan.

e. Diffusers, Registers and Grilles:

1) Tolerances: Test and balance each diffuser, grille, and register to within 5 percent of design requirements.

2) Identification: Identify the type, location, and size of each grille, diffuser, and register. This information shall be recorded on air outlet data sheets.

f. Coils: Air Temperature: Once airflow is set to acceptable limits, agency shall take wet bulb and dry bulb air temperatures on the entering and leaving side of each cooling coil. Dry-bulb temperature shall be taken on the entering and leaving side of each heating coil.

g. Duct Leakage Testing:

1) On existing ductwork, agency shall calculate duct leakage by traversing the unit and reading associated diffusers.

2) On new installations each and every section of the entire air distribution system (all supply, return, exhaust, and relief ductwork) shall be tested at 1.5 times design static pressure. All ducts shall demonstrate 5 percent leakage maximum (per CBC).

h. System Pressure Profiles:

1) Prepare pressure profiles from fan (supply, return, and exhaust) or air handling unit to extremities of system.

2) As a minimum, show pressure at each floor, main branch, and airflow measuring device.

3) Make pitot-tube traverses of all trunk lines and major branch lines where required for analysis of distribution system. Airflow measuring devices installed in ductwork, if available, may be utilized.

4) Record residual pressures at inlets of volume controlled terminals at ends of system.

5) Show actual pressures at all static pressure control points utilized for constant or variable flow systems.

i. Fan speed adjustments and balancing for optimum acoustical performance:

1) As the very first step, the speed of all fans (supply, return, and exhaust inside packaged equipment) shall be adjusted to deliver the required fan total air quantity with all volume dampers and other flow rate control devices fully open. Adjustments shall be made with the outdoor air intake dampers, return air dampers, and relief air dampers in the minimum outdoor air position. The adjustments shall be made again in the 100 percent outdoor air position in systems with 100 percent outdoor air economizers.

2) The above adjustment shall be done with wet cooling coils, where cooling coils are provided.

3) The airflow rates at each branch duct shall be adjusted as the second step with air with all volume dampers and other flow rate control devices fully open.

4) The airflow rates at each air inlet and outlet shall be adjusted as the final step. The volume damper in the branch duct shall be used for balancing. Opposed blade dampers at air inlets and outlets where provided shall only be used for fine adjustments and shall not be closed beyond 60 percent open or when the dampers start to generate audible noise.

5) CONTRACTOR shall provide the labor and materials for all dampers, pulleys, and belt changes required for balancing. The design documents indicate the worst-case scenario with safety factors in fan static pressures for contingency. Properly coordinated and installed air systems may require a lower static pressure and a reduction in fan speed.

B. Pumps:

1. Test and adjust chilled water, hot water, and condenser water pumps to achieve maximum or design GPM.

2. Measure and record suction and discharge pressures.

3. Check pumps for proper operation. Pumps shall be free of vibration and cavitation.

4. Current and Voltage: Agency shall test and record motor voltage and amperage and compare data with the nameplate limits. Ensure pump motor is not in or above the service factor as published by the motor manufacturer.

5. Adjust pump flow by adjusting and setting balancing valves to obtain amperage reading on a clamp-on ammeter that corresponds to amperage indicated on pump's curves for required flow.

6. Verify that the motor is not drawing more current than indicated on motor plate rating. When actual flows of primary pumps are found by test to vary more than 5 percent from specified amount, system shall be re-balanced to regulate flow within this tolerance. When a flow indicating device(s) is in circuit, it shall be used to verify pump flows.

7. When testing is completed, a pump capacity chart with pump number and location indicated shall be marked indicating operating point of pump on the curve. Chart shall then be included in the report.

C. Coils:

1. Tolerances: Test and balance all chilled-water and hot-water coils within 5 percent of design requirements.

2. Verify the type, location, final pressure drop, and GPM of each coil.

D. System Mains and Branches including domestic hot water and domestic cold water:

1. Balance water flow in pipes to achieve maximum or design GPM.

3.10 VERIFICATION OF HVAC CONTROLS

A. Agency shall verify in conjunction with CONTRACTOR all control components are installed in accordance with the intent of the Contract Documents and are functioning according to the design intent, including all electrical interlocks, damper sequences, air and water resets, fire stats, and other safety devices.

B. CONTRACTOR shall verify all control components are calibrated and set for design operating conditions and intent.

3.11 TEMPERATURE TESTING

A. To verify system control and operation, agency shall perform a series of three temperature tests taken at approximately two hour intervals in each separately controlled zone. The resulting temperatures shall not vary more than two degrees Fahrenheit from the thermostat or control set point during the tests. Outside temperature and humidity shall also be recorded during the testing periods.

3.12 KITCHEN HOOD TESTING

A. Agency shall test and adjust hood total airflow by duct Pitot-tube traverse. If a Pitot-tube traverse is not practical, an explanation of why a traverse was not made must be made in writing to Architect and subsequently appear on the appropriate data sheet. Face velocities shall be tested under design operating conditions using a maximum of a one square foot grid pattern across the entire open face. CONTRACTOR shall set sash height on hoods to obtain face velocities within 20 percent of 100 feet per minute unless specified otherwise. Agency shall test and adjust exhaust airflows and make-up air flows to maintain design hood pressures and face velocities and design room pressurization. Agency shall test for turbulence and proper air flow patterns at the face and inside the hoods using a hand-held smoke puffer or other approved smoke-emitting device.

3.13 FUME HOOD TESTING

A. Agency shall test and adjust fume hood total airflow by duct Pitot-tube traverse. If a Pitot-tube traverse is not practical, an explanation of why a traverse was not made must be made in writing to Architect and subsequently appear on the appropriate data sheet. Face velocities shall be tested under design operating conditions using a maximum of a one square foot grid pattern across the entire open face. CONTRACTOR shall set sash height on hoods to obtain face velocities within 20 percent of 100 feet per minute unless specified otherwise. Agency shall test and adjust VAV controllers to obtain design exhaust airflows and make-up air flows to maintain design hood pressures and face velocities and design room pressurization. Agency shall test for turbulence and proper air flow patterns at the face and inside the hoods using a hand-held smoke puffer or other approved smoke-emitting device.

3.14 BUILDING/ZONE PRESSURIZATION

A. Agency shall test and adjust building/zone pressurization by setting the design flows to meet the required flow direction and pressure differentials. Positive/Negative area(s) supply air shall be set to design flow and exhaust air rates adjusted to obtain the required pressure differential(s).

3.15 FIRE AND SMOKE DAMPER TESTING

A. This work is to be performed by OWNER and State Fire Marshall. Do not include in agency scope of work.

3.16 LIFE SAFETY CONTROLS TESTING

A. This work is to be performed by OWNER and State Fire Marshall. Do not include in agency scope of Work.

3.17 FINAL TABULATION

A. After heating, ventilating, and air conditioning components are satisfactorily tested and balanced, entire system shall be put into operation and all pressures, temperatures, gpm, cfm, velocities, etc., shall be recorded and checked against design schedules. Design requirements shall be listed on reports and final tabulation shall be within a tolerance of plus or minus five percent of design requirements.

B. Readings at various locations as described herein will be made every hour for four (4) hours, during normal working hours for three (3) days. Boilers, forced air furnaces, and chillers shall be started up far enough in advance to meet design conditions during period of testing.

3.18 VIBRATION TESTING

A. Furnish instruments and perform vibration measurements if specified in Division 23. Provide measurements for all rotating HVAC equipment half horsepower and larger, including reciprocating/centrifugal/screw/scroll compressors, pumps, fans, and motors.

B. Record initial and final measurements for each unit of equipment on test forms. Where vibration readings exceed allowable tolerance and efforts to make corrections have proved unsuccessful, forward a separate report to ARCHITECT.

3.19 SOUND TESTING

A. Perform and record sound measurements as specified in this Section and in Section 23 0548: HVAC Sound, Vibration and Seismic Control. Take additional readings if required by ARCHITECT.

B. Measuring equipment and methods shall comply with the current requirements of the AABC, NEBB, TABB and ANSI S12.60. Take measurements with a calibrated Type 1 sound level meter and octave band analyzer.

C. Sound reference levels, formulae, and coefficients shall be according to ASHRAE Handbook: HVAC Applications, Chapter on Sound and Vibration Control.

D. Where sound pressure levels are specified as noise criteria or room criteria in Section 23 0548: HVAC Sound, Vibration and Seismic Control determine compliance with the Contract Documents as follows:

1. Reduce background noise as much as possible by shutting off unrelated audible equipment.

2. Measure octave band sound pressure levels with specified equipment "off".

3. Measure octave band sound pressure levels with specified equipment "on".

4. Use difference in corresponding readings to determine sound pressure due to equipment. Sound pressure level, due to equipment equals sound pressure level with equipment "on" minus factor.

DIFF.:	0	1	2	3	4	5	9-10 or More
FACTOR:	10	7	4	3	2	1	0

5. Plot octave bands of sound pressure level due to equipment for typical rooms, on a graph, which also shows, noise criteria (NC) curves.

E. Where sound levels are required in dbA, measure sound levels using the A-frequency-weighting of meter. Single value readings will be used instead of octave band analysis.

F. Measure sound levels at each octave band as NC or RC (room criteria) if indicated in the Drawings or other Spec Sections. Where measured sound levels exceed specified level, CONTRACTOR shall take all remedial action and necessary sound tests shall be repeated. Sound tests after remedial action shall be in octave band in NC or RC for the room and also at each diffuser, grille, or register in occupied areas. Sound levels shall be measured approximately five feet above floor on a line approximately 45 degrees to center of opening, on the A- and C-frequency-weighting of the measuring instrument.

G. Measure and record sound levels in decibels for each room per current ANSI S12.60.

H. Report shall include ambient sound levels, taken without air-handling equipment operating, of rooms in which above openings are located. A report shall also be made of any noise caused by mechanical vibration.

END OF SECTION

SECTION 01 5000

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities, construction facilities and controls to be provided, maintained, relocated, and removed by Contractor

1.02 RELATED SECTIONS AND DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

B. Division 01 – Section 011000 “Summary”

C. Division 01 – Section 012973 “Schedule of Values”

D. Division 01 – Section 015723 “Storm Water Pollution Control Measures”

E. Division 01 – Section 01321 “Construction Schedule”

F. Division 01 – Section 014523 “Testing and Inspection”

G. Division 01 – Section 018620 “Test and Balance”

H. Division 01 – Section 017700 “Closeout Procedures”

I. General Conditions – Article 10.2.6 for more information on barricades.

1.03 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Pay sewer service use charges for sewer usage by all entities for construction operations.

C. Water Service: Pay water service use charges for water used by all entities for construction operations.

D. Electric Power Service: Pay electric power service use charges for electricity used by all entities for construction operations. If needed, insert use-charge requirements for other utilities needed for construction operations.

1.04 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

1.05 QUALITY ASSURANCE

A. Contractor shall comply with applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:

1. Building Code requirements
2. Division of State Architect
3. Health and safety regulations
4. Utility company regulations
5. Police, fire department and rescue squad requirements
6. Environmental protection regulations

B. Contractor shall arrange for the inspection and testing of each temporary utility prior to use. Obtain required certifications and permits and transmit to District Project Manager.

C. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with California Electrical Code (CEC).

D. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

E. Accessible Temporary Egress: Comply with applicable provisions in the California Building Code (CBC), the U.S. Architectural and Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines, and ICC/ANSI A117.1.

1.06 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 QUALITY ASSURANCE

A. Contractor provided facilities are to be in place and available for Owner use and occupancy within ten (10) calendar days following the date of issue of the Notice to Proceed and shall remain in place and available for Owner use and occupancy throughout the full term of the Contract.

B. Interior Air Quality (IAQ) During Construction:

1. Referenced Standards include:

   a. ASHRAE 62.1 – 2004.

   b. ASHRAE 52.2 – 1999.

   c. CHPS Best Practices Manual – Volume III (2006 Edition).

2. Interior Air Quality (IAQ) During Construction Plan: Contractor is required to develop and submit to the Owner for review and approval a Construction Indoor Air Quality (IAQ) Plan using the blank form provided as Appendix A of this Specification. Plan shall be submitted within 120 days of Notice To Proceed. Implementation of the approved (IAQ) Plan will be included in the project Construction Schedule.

3. Construction Photos Requirement: Contractor shall submit photographs that demonstrate the Construction Ventilation, Preconditioning, Sequencing, and Protection measures taken during the project for complying with the IAQ plan, applicable Specifications and referenced standards.

3.02 TEMPORARY UTILITIES

A. Contractor shall submit to District Project Manager reports of tests, inspections, meter readings and similar procedures performed on temporary utilities.

B. Contractor shall coordinate with the appropriate utility company to install temporary services. Where the utility company provides only partial service, Contractor shall provide and install the remainder with matching compatible materials and equipment.

C. Temporary Water:

1. Contractor shall furnish, install and pay for all necessary permits, inspections, move ins/out, temporary water lines, connections and fees, extensions and distribution, metering devices and use charges, deliveries/pick-ups, rentals, storage, transportation, taxes, labor, insurance, bonds, material, equipment and all other miscellaneous items for the temporary water system, and upon Substantial Completion of the Work, removal of all such temporary water system devices and appurtenances.

2. Contractor shall provide and maintain temporary water service, including water distribution piping and outlet devices of the size and required flow rates in order to provide service to all areas of the Project Site.

3. Contractor shall provide and pay for all potable water needed for construction and all other uses associated with the Work.

4. Contractor shall at their expense and without limitation, remove, extend and/or relocate temporary water systems as rapidly as required in order to provide for progress of the Work.

D. Temporary Electric:

1. Contractor shall furnish, install, maintain and pay for all necessary permits, inspections, temporary wiring, metering devices and use charges, move ins/outs, connections and fees, service, extension and distribution, deliveries/pickups, rentals, storage, transportation, taxes, labor, insurance, bonds, materials, equipment and all other required miscellaneous items for the temporary electric systems and upon Substantial Completion of Work, removal of all such temporary electric systems and appurtenances.

2. Contractor shall furnish, install, maintain, extend and distribute temporary electric area distribution boxes, so located that individual trades can obtain adequate power and artificial lighting, at all points required for the Work, for inspection and for safety.

3. Contractor shall provide temporary electric for construction, temporary facilities, and connections for construction equipment requiring power or lighting, at all points required for the Work, for inspection and safety.

4. Contractor shall provide 20 foot candles minimum lighting levels inside building(s) and 5 foot candles outside for safety and security.

5. Contractor shall ensure welding equipment is supplied by electrical generators.

6. Contractor shall at their expense and without limitation remove, extend and/or relocate temporary electric systems as rapidly as required in order to provide for progress of the Work.

E. Temporary Gas:

1. Contractor shall furnish, install, maintain and pay for all necessary permits, inspections, metering devices and use charges, move ins/out, extension and distribution, deliveries/pickups, rentals, storage, transportation, equipment and piping, rentals, taxes, labor, material, insurance, bonds, and all other required miscellaneous items for the temporary gas systems necessary to perform the Work, and upon Substantial Completion of the Work, removal of all such temporary gas system devices and appurtenances.

2. Contractor shall at their expense and without limitation remove, extend and/or relocate temporary gas systems as rapidly as required in order to provide for progress of the Work.

F. Temporary Heating, Ventilation and Air Conditioning:

1. Contractor shall furnish, install, maintain, and pay for all necessary permits, inspections, move ins/out, extensions and distribution, connections and fees, use charges, metering devices and use charges, equipment, rentals, deliveries/pick-ups, storage, transportation, taxes, labor, insurance, bonds, material, equipment and all other required miscellaneous items for temporary heat and ventilation needed for proper installation of the Work and to protect materials and finishes from damage due to weather. Upon Substantial Completion of the Work, Contractor shall remove all such temporary heating and ventilating system devices and appurtenances.

2. Contractor shall provide, maintain and pay for all temporary ventilation of enclosed Work areas to cure materials, disperse humidity, remove fumes, and to prevent accumulation of dust, irritants, or gases.

3. Owner will not accept utilization of the permanent HVAC system for temporary HVAC until Substantial Completion.

4. Contractor shall maintain manufacturer required levels of room and/or space temperature, humidity and ventilation necessary to install products, materials and/or systems of the Work.

5. Contractor shall at their expense and without limitation, remove, extend and/or relocate temporary heating and ventilating systems as rapidly as required in order to provide for progress of the Work.

G. Temporary Telephone and Data:

1. Contractor shall furnish, install, maintain and pay for all necessary permits, inspections, move ins/outs, extensions and distribution, devices, connections and fees, use charges, rentals, deliveries/pickups, storage, transportation, taxes, labor, insurance, bonds, material, equipment and all other required miscellaneous items for temporary phone, data service and distribution to Project Site temporary offices as required by this Section and Section 015000 “Construction Facilities and Temporary Controls” – 3.03.

2. Contractor shall at their expense and without limitation, remove, extend and/or relocate temporary phone service and distribution as rapidly as required in order to provide for progress of the Work.

3. Upon Substantial Completion of the Work, Contractor shall remove all such temporary phone service, distribution, devices and appurtenances.

3.03 CONTRACTOR PROVIDED FACILITIES

A. Contractor shall provide temporary offices, utilities, storage units, fencing, barricades, chutes, elevators, hoists, scaffolds, railings and other facilities or services as required. Contractor shall be responsible for providing, installation, maintenance, supplying, and all use charges for the items provided under Section 015000 “Construction Facilities and Temporary Controls” – 3.03.

B. INSTALLATION, GENERAL

1. Prepare a plan showing location or relocation of temporary facilities for the Owner's review. Owner shall approve location of all temporary facilities prior to installation.

2. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

3. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

4. Restore all areas to condition prior to start of construction.

C. Temporary Offices:

1. Field Office for Contractor: Prefabricated or mobile trailer unit(s) with serviceable finishes, temperature controls, and foundations adequate for normal loading. Furnish and equip office as necessary for Contractor's field staff, including the DBE architect and as follows:

   a. This office shall be of substantial waterproof construction with adequate natural light and ventilation by means of stock windows.

   b. The Contractor shall provide and pay for adequate electric lights, private local telephone services with a loud exterior bell, and an adequate heating and cooling system. For the duration of the Project and coordination with the Owner.

   c. Provide a dedicated DSL line-multiple jacks or dedicated wireless internet connection, phone line, desk, office chair, plan rack, Two (2) power surge protectors, a conference room with table and chairs for 12 people. Security pad for the trailer system, mini blinds for the windows, A/C and Heating and a Clock.

   d. Contractor to provide all entry locks keyed alike, an exterior locking bar device each office to have lockable doors. Offices to be at each end of the trailer with Conference area in the center

   e. Install a plan reviewing table secured to the wall.

   f. Provide a plan rolling plan rack and drawing sticks to hold 12 sets of plans on 42" drawing sticks.

2. Temporary Offices: Contractor acknowledges that the building footprint may occupy/occupies the majority of the Project Site and that the Contractor may have to secure additional areas offsite for the location of temporary office facilities for Contractor parking, lay-down and storage areas.

3. Field office for District Project Manager and Inspector of Record: Prefabricated or mobile trailer unit(s) with serviceable finishes, temperature controls, and foundations adequate for normal loading. Furnish and equip as necessary to provide for one (1) District Project Manager office, one (1) Inspector of Record office and two (2) field staff workstations.

   a. Provide dedicated individual office space for Inspector of Record and District Project Manager, to include their own desks and chairs and internet connections.

b. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.

c. Conference room of sufficient size to accommodate meetings of 12 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4 foot square tack and marker boards.

d. Drinking water and private toilet.

e. The Contractor to provide 8 ½x11 Paper and toner for the use by the Inspector of Record for the copy machine and fax machine on an as needed monthly basis.

f. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 degree F.

g. Lighting fixtures capable of maintaining average illumination of 20 foot candles at desk height.

h. Install a plan reviewing table secured to the wall.

i. Provide a plan rolling plan rack and drawing sticks to hold 12 sets of plans on 42" drawing sticks.

j. Contractor to provide dedicated toilet facilities for the Inspector of Record use and weekly cleaning service.

4. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

a. Store combustible materials apart from building.

D. At Contractor's expense and without limitation remove and/or relocate temporary office(s) and related facilities as rapidly as required in order to provide for progress of the Work.

E. Temporary Storage Units:

1. Contractor shall provide secure and waterproof storage units for the temporary storage of equipment and other items requiring protection.

2. Contractor shall be responsible for all delivery charges and will install the storage unit in an appropriate area.

3. Contractor shall remove the storage unit from the Project Site when the storage unit is no longer required for the Work or upon Substantial Completion of the Work.

4. Contractor shall at their expense and without limitation remove and/ or relocate storage units as rapidly as required in order to provide for progress of the Work.

F. Temporary Sanitary Facilities:

1. Contractor shall provide portable chemical toilet facilities. Quantity of portable chemical toilet facilities shall be based on total number of workers and shall be in accordance with CAL/OSHA standards.

2. Portable chemical toilet facilities shall be maintained with adequate supplies and in a clean and sanitary condition and shall be removed from the Project Site upon Substantial Completion of the Work. Contractor shall keep both Owner chemical toilet facilities and Owner trailer restroom clean and operational at all times.

3. Contractor employees shall not use District's toilet facilities.

4. At Contractor's expense and without limitation remove and/or relocate portable chemical toilet facilities as rapidly as required in order to provide for progress of the Work.

5. Contractor will contain their breaks and lunch periods to the areas designated by District Project Manager or any public area outside the Project Site. Contractor shall provide a suitable container within the break/lunch area for the placement of trash. Areas used for break/lunch must be maintained clean and orderly. Once finish flooring has been installed in a particular area, no food or beverages will be permitted in that area.

G. Temporary Security Fence/Barricade:

1. Contractor is responsible for providing Site enclosure, other fences, and barricades prior to starting construction operations. Install portable chain-link enclosure fence with lockable entrance gates. Locate as required or enclose entire Project Site or portion determined sufficient by the District Project Manager to accommodate construction operations. Install in a manner that will prevent people, dogs and other animals from easily entering Project Site except by entrance gates.

2. Where the District has currently or previously installed a perimeter fence to this project, but if the Contractor needs to relocate or temporarily move any of these fence panels, then it is the Contractors responsibility for this work and any subsequent cost. Security of Project Site and contents is a continuous obligation of Contractor.

3. The Contractor is responsible for maintaining the wind screen to the fence Windscreen, all rips, tears, missing sections shall be corrected by the Contractor upon notification by District Project Manager.

4. At Contractor's expense and without limitation remove and/or relocate fencing, fabric and barricades or other security and protection facilities as rapidly as required in order to provide for progress of the Work.

H. Other Temporary Enclosures and Barricades:

1. Provide lockable, temporary weather-tight enclosures at openings in exterior walls to create acceptable working conditions, to allow for temporary heating and for security.

2. Provide protective barriers around trees, plants and other improvements designated to remain. Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

3. Temporary partitions shall be installed at all openings where additions connect to existing buildings, and where to protect areas, spaces, property, personnel, students and faculty and to separate and control dust, debris, noise, access, sight, fire areas, safety and

security. Temporary partitions shall be as designated on the Drawings or as specified by Architect. At Contractor's expense and without limitation remove and/or relocate enclosures, barriers and temporary partitions as rapidly as required in order to provide for progress of the Work.

4. Since the Work of this Project may be immediately adjacent to existing occupied structures and vehicular and pedestrian right of ways, Contractor shall, in his sole judgment and in accordance with applicable safety standards, provide all temporary facilities, additional barricades, protection and care to protect existing structures, occupants, property, pedestrians and vehicular traffic. Contractor is responsible for any damage, which may occur to the property and occupants of the property of Owner or adjacent private or public properties which in any way results from the acts or neglect of Contractor.

5. Contractor shall be responsible for cleaning up all areas adjacent to the construction Project Site which have been affected by the construction; and for restoring them to at least their original condition - including landscaping; planting of trees, sod, and shrubs damaged by construction; and raking and disposal of debris such as roofing shingles, paper, nails, glass sheet metal, bricks, and waste concrete. Construction debris shall be removed and properly disposed of. Culverts and drainage ditches with sediment from the construction area shall be cleared routinely to maintain proper drainage and re-cleaned prior to completion of the contract.

6. Contractor shall ensure sediment does not block storm drains. Contractor shall be responsible for cleaning storm drains blocked due to erosion or sediment from the work area.

7. Contractor to ensure all Project Site drive entrances have rumble plates to remove dirt from construction vehicles before leaving the Project Site.

I. Temporary Storage Yards:

1. Contractor shall fence and maintain storage yards in an orderly manner.

2. Provide storage units for materials that cannot be stored outside.

3. At Contractor's expense and without limitation remove and/or relocate storage yards and units as rapidly as required in order to provide for progress of the Work.

J. Temporary De-watering Facilities and Drainage:

1. For temporary drainage and de-watering facilities and operations not directly associated with construction activities included under individual sections, comply with de-watering requirements of applicable Division 01 sections and requirements of authorities having jurisdiction. Contractor shall maintain the Work, Project Site, excavations, construction and related areas free of water.

2. For temporary drainage and de-watering facilities and operations directly associated with new buildings, additions or other construction activities, comply with Division 01 and 02 Sections. Contractor shall be responsible for, but not limited to, de-watering of excavations, trenches and below grade areas of buildings, structures, the Project Site and related areas.

3. Dispose of rainwater in a lawful manner and will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.

K. Temporary Protection Facilities Installation:

1. Contractor shall not change over from using temporary facilities and controls to permanent facilities until Substantial Completion, except as permitted by District Project Manager.

2. Until permanent fire protection needs are supplied and approved by authorities having jurisdiction, Contractor shall provide, install and maintain temporary fire protection facilities of the types needed in order to adequately protect against fire loss. Comply with NFPA 241.

   a. Contractor shall prohibit smoking in construction areas.

   b. Contractor shall supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.

   c. Contractor shall develop and supervise an overall fire-prevention and -protection program for personnel at Project Site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

   d. When required, provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

   e. If fire-suppression sprinkler systems or other permanent fire-protection systems are used, insert specific requirements.

3. Contractor shall provide, install and maintain substantial temporary enclosures of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security. Where materials, tools and equipment are stored within the Work area, Contractor shall provide secure lock up to protect against vandalism, theft and similar violations of security. Owner accepts no financial responsibility for loss, damage, vandalism or theft.

4. Contractor operations shall not block, hinder, impede or otherwise inhibit the use of required exits and/or emergency exits to the public way, except as approved by District Project Manager. CONTACTOR shall maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for firefighting equipment and/or personnel.

5. With approval of District Project Manager and at the earliest feasible date in each area of the Work, complete installation of the permanent fire protection facilities including connected services and place into operation and use. Instruct Owner personnel in use of permanent fire protection facilities.

6. In the event of an emergency drill or an actual emergency, designated by the sounding of the fire alarm and/or other sounding device, all construction activities must cease.

Contractor shall evacuate the Work area and remain outside the Work area until permitted to return. No Work shall be conducted during the evacuation of a building or during an emergency.

L. Temporary Security and Safety Measures:

1. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

   a. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

   b. Install lighting for Project identification sign.

2. During performance of the Work, Contractor shall provide, install and maintain substantial temporary barriers and/or partitions separating all Work areas from areas occupied by students, faculty and/or administrative staff.

3. Contractor shall employ and maintain sufficient security and safety measures to effectively prevent vandalism, vagrancy, theft, arson, and all other such negative impacts to the Work. Any impacts to the progress of the Work of Contractor, Owner, or Owner's forces, due to loss from inadequate security, will be the responsibility of Contractor.

4. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

   a. Truck cranes and similar devices for hoisting materials and considered "tools and equipment" and not temporary facilities.

5. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

6. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

7. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project Site where hazardous operations may occur overhead. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction and requirements indicated on Drawings.

   a. Construct covered walkways using scaffold or shoring framing.

   b. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.

   c. Paint and maintain appearance of walkway for duration of the Work.

M. Temporary Access Roads and Staging Areas:

1. Traffic Controls: Comply with requirements of authorities having jurisdiction.

   a. Protect existing Project Site improvements to remain including curbs, pavement, and utilities.

b. Maintain access for fire-fighting equipment and access to fire hydrants.

c. Provide a minimum of two (2) flagmen on each side of vehicles entering or exiting Site through adjacent drives or parking lots at all times.

1) In no case shall vehicles be allowed to pass through adjacent driveways, walkways, or parking lots unescorted by marked flagmen.

2. Due to the limited amount of on and off Project Site space for the parking of staff and school visitor's vehicles there will be no parking of Contractor vehicles in areas designated for school use only. Contractor shall provide legal access to and maintain Contractor designated areas for the legal parking, loading, off-loading and delivery of all vehicles associated with the Work. Contractor shall be solely responsible for providing and maintaining these requirements whether on or off the Project Site. Contractor shall provide and maintain ample onsite parking spaces designated for the exclusive use of Owner. Contractor shall erect signs as required by Owner each of these spaces and prevent all unauthorized vehicles from parking in the Owner-reserved spaces.

3. Temporary access roads are to be installed and maintained by Contractor to all areas of the Project Site.

4. Contractor will be permitted to utilize existing facility campus roads as designated by District Project Manager. Contractor shall only utilize those entrances and exits as designated by District Project Manager and Contractor shall observe all traffic regulations of Owner.

5. Contractor shall maintain roads and walkways in a clean condition including removal of debris and/or other deleterious material on a daily basis.

N. Moisture and Mold Control

1. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

2. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

a. Protect porous materials from water damage.

b. Protect stored and installed material from flowing or standing water.

c. Keep porous and organic materials from coming into prolonged contact with concrete.

d. Remove standing water from decks.

e. Keep deck openings covered or dammed.

3. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

a. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.

b. Keep interior spaces reasonably clean and protected from water damage.

c. Periodically collect and remove waste containing cellulose or other organic matter.

d. Discard or replace water-damaged material.

e. Do not install material that is wet.

f. Discard, replace, or clean stored or installed material that begins to grow mold.

g. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

4. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

a. Control moisture and humidity inside building by maintaining effective dry-in conditions.

b. Use permanent HVAC system to control humidity.

c. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

1) Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.

2) Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record daily readings over a forty-eight hour period. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.

3) Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.04 PROJECT SIGNAGE

A. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs.

2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

3. Maintain and touchup signs so they are legible at all times.

B. No other signs shall be displayed without approval of District Project Manager. At Contractor’s expense and without limitation, remove and/or relocate Project signage and related facilities as rapidly as required in order to provide for progress of the Work.

C. Contractor shall remove Project signage at Substantial Completion of the Work.

D. Until Substantial Completion of the Work, Contractor shall employ appropriate means to remove all graffiti from buildings, equipment, fences and all other temporary and/or permanent improvements on the Project Site within twenty-four (24) hours from the date of report or forty-eight (48) hours of each occurrence.

E. Contractor shall provide and install signage to provide directional, identification, and contact information to construction personnel and visitors as follows and as reviewed by District Project Manager.

1. For construction traffic control/flow at entrances/exits, and as designated by District Project Manager.
2. To direct visitors.
3. For construction parking.
4. To direct deliveries.
5. For Warning Signs as required.
6. In accordance with CAL/OSHA standards as necessary.
7. For trailer identification and Project Site address.
8. For “No Smoking” safe work site at designated locations.
9. Emergency contact information and phone number of Contractor.
10. Emergency contact information and phone number of local police, fire, and emergency personnel.
11. For Labor Compliance Program (LCP) as required under the General Conditions (Prevailing wage rates and Notice of LCP)
12. Employee benefits payments paid to trust funds are required under the General Conditions.

3.05 TRENCHES

A. Open trenches for installation of utility lines (water, gas, electrical and similar utilities) and open pits outside barricaded working areas shall be barricaded at all times in a legal manner determined by Contractor. Trenches shall be backfilled and patch-paved within twenty-four (24) hours after approval of installation by authorities having jurisdiction or shall have "trench plates" installed. Required access to buildings shall be provided and maintained. Contractor shall comply with all applicable statutes, codes and regulations regarding trenching and trenching operations. Open trenches deeper than 3'-6", and not located within a public street access, shall be enclosed within an 8'-0" high chain-link fence.

3.06 DUST CONTROL

A. Contractor is responsible for dust control on and off the Project Site. When Work operations produce dust the Project Site and/or streets shall be sprinkled with water to minimize the generation of dust. Contractor shall clean all soils and debris from construction vehicles and cover both earth

and debris loads prior to leaving the Project Site. Contractor shall, on a daily basis, clean all streets and/or public improvements within the right of way of any and all debris, dirt, mud and/or other materials attributable to operations of Contractor.

3.07 WASH OUT

A. Contractor shall provide and maintain a minimum of four (4) wash out boxes of sufficient size and strength to provide for concrete mixer wash out. Contractor shall locate and relocate both the wash out boxes and wash out areas in order to accommodate the progression of the Work. The wash out area shall be located as to minimize the amount of potential run off onto adjacent private and/or public property. Contractor shall legally dispose of the contents of the wash out boxes and area on an as needed basis or as required by District Project Manager.

3.08 WASTE DISPOSAL

A. Comply with requirements specified in Division 01 - Section 017419 “Construction Waste Management”.

B. Contractor shall provide and maintain trash bins on the Project Site. Trash bins shall be serviced on an as needed basis and Contractor is responsible for the transportation of and the legal disposal of all contents.

3.09 ADVERSE WEATHER CONDITIONS

A. Should warnings of adverse weather conditions such as heavy rain and/or high winds be forecasted, Contractor shall provide every practical precaution to prevent damage to the Work, Project Site and adjacent property. Contractor precautions shall include, but not be limited to, enclosing all openings, removing and/or securing loose materials, tools, equipment and scaffolding.

B. Contractor shall provide and maintain drainage away from buildings and structures.

C. Contractor shall implement all required storm water mitigation measures as required under related Division 01 - Sections.

3.10 DAILY AND MONTHLY REPORTS

A. Contractor shall provide and maintain in the Project Site office of Contractor, a daily sign in sheet for use by all employees of Contractor and all Subcontractors at whatever tier. At the beginning of each work day, the foreman, project manager, superintendent of Contractor and/or Subcontractors shall visit the Project Site office of Contractor and shall enter onto the daily sign in sheet: all employee names; trade classification; and represented company. The completed sign in sheet shall serve as the basis of and shall be submitted with the Daily Construction Report as set forth in Section 015000 “Construction Facilities and Temporary Controls” – 3.10B.

B. By the end of each workday, Contractor shall submit to District Project Manager and Inspector of Record a Daily Construction Report denoting the daily manpower counts and a brief description/location of the workday activities. Manpower shall be broken down by trade classification such as foreman, journeyman or apprentice. The report shall also note the date, day of the week, weather conditions, deliveries, equipment on the Project Site whether active and/or idle, visitors, inspections, accidents and unusual events, meetings, stoppages, losses, delays, shortages, strikes, orders and requests of governing agencies, Construction Directive and/or Change Orders received and implemented, services disconnected and/or connected, equipment start up or tests and partial use and/or occupancies. Contractor shall also include on the Daily Construction Report the above information for all Subcontractors at whatever tier.

C. Contractor shall submit on a monthly basis the forms found in Sections 015000 "Construction Facilities and Temporary Controls" certifying CEQA Mitigations and all forms as required within the approved Storm Water Pollution Prevention Plan (SWPPP).

D. Postage and Delivery Costs: Postage and delivery costs for Contractor generated materials are the responsibility of the Contractor and shall not be charged to Owner, regardless of whether the postage and/or delivery of Contractor generated materials resulted from a request and/or direction from Owner.

E. All other expendable field office support items specified elsewhere, including, but not limited to, furnishing toner cartridges, equipment maintenance, and bottled water, are to be supplied and paid for by Contractor. These costs are not to be deducted for the periodic replenishment of Owner field office supplies.

3.11 CEQA MITIGATIONS – Contractor RESPONSIBILITIES

A. Air Quality

MMIII-1. Contractor shall comply with and implement the applicable provisions of the most recently adopted South Coast Air Quality Management District Rule 403 and Rule 403 Implementation Handbook.

B. Cultural Resources

CR-1 Contractor shall notify Owner in the event that an archaeological find or a potential archaeological find is discovered and shall cease construction activities in affected area. Contractor may resume construction activities only after receiving written notice from Owner. For work cessation beyond five days on the critical path, Contractor will be entitled to additional days.

CR-2 Contractor shall notify Owner in the event that human remains, or possible human remains are discovered and shall cease construction activities in affected area. Contractor may resume construction activities only after

receiving written notice from Owner. For work cessation beyond five days on the critical path, Contractor will be entitled to additional days.

C. Noise

Noise-1. During construction, Contractor shall ensure that all construction is performed in accordance with City of Los Angeles noise standards. No noise intensive construction or repair work shall be performed between the hours of 9:00 pm and 7:00 am on any weekday, nor before 8 am or after 6 pm on any Saturday, or at any time on Sundays or federal holidays.

Noise-2. Contractor shall ensure that all internal combustion powered equipment shall be equipped with properly operating mufflers and kept properly tuned to alleviate noise and pollution.

Noise-3. During construction, Contractor shall locate portable equipment as far as possible from nearby residents.

Noise-4. Contractor shall store and maintain equipment as far as possible from nearby residents.

APPENDIX A How to format Appendix A

CONSTRUCTION INDOOR AIR QUALITY (IAQ) PLAN

The Contractor shall complete and submit this Plan to the District Project Manager no later than one hundred twenty (120) days after receipt of Notice to Proceed.

Contractor:

Name: _____ Title: _____

Telephone: _____ Fax: _____

Email: _____

I have read and understood and will implement the following Construction IAQ Plan.

Signature: _____ Date: ___

I. CONSTRUCTION VENTILATION

List all project materials requiring Construction Ventilation per Specifications and CHPS Best Practices Manual, Volume III (2006 Edition), Prerequisites EQ2.0.P7-P9 and EQ2.0.P14-P15 Attach additional sheets if necessary.

Circle the following Temporary Construction Ventilation approach to be used.

A	Ventilation will be supplied via building's HVAC system. • Return air grilles are sealed. Exhaust is provided via open windows or doors. • All outside make-up air will be filtered (MERV 8) at the make-up source. • HVAC in dust-producing areas will be turned off during dust-producing activities. Exhaust for dust-producing areas will be provided using temporary fans ducted directly to the outdoors via open windows and doors
B	Ventilation will be accomplished via open windows, temporary ducts, and/or temporary fans ducted directly to the outdoors. • Supply air diffusers, return air grilles, and/or open ducts will be sealed. Make-up air will be provided through open windows or doors or other transfer air devices. • Return air grilles will be sealed.
Required	• Ventilation will provide no less than three air changes per hour. • Ventilation will be continuous for a period no less than seventy-two (72) hours after completion of installation of VOC emitting materials. • All filters used during Construction Ventilation will be replaced prior to commencing building flush-out and upon completion of building flush-out.

II.

III. PRECONDITIONING

List all project materials requiring Preconditioning per Specifications and CHPS Best Practices Manual, Volume III (2006 Edition), Prerequisites EQ2.0.10 Attach additional sheets if necessary.

Circle the following Preconditioning approach to be used.

A	Preconditioning will occur in dry and well-ventilated offsite location. Where is the offsite location?
B	Preconditioning will occur onsite. Check the applicable approach. ☐ Ventilation will be supplied via building's HVAC system. ☐ Ventilation will be accomplished via open windows, temporary ducts, and temporary fans.
Required	• Containers and packaging will be removed prior to Preconditioning. • Preconditioning will occur for fourteen (14) continuous days prior to installation

IV. SEQUENCING

List all project porous and fibrous materials requiring Sequencing consideration per Specifications and CHPS Best Practices Manual, Volume III (2006 Edition), Prerequisites EQ2.0.P11 Attach additional sheets if necessary.	
Required	• Previously installed Porous or Fibrous Materials located in a room where VOC-Emitting Materials are to be installed will be protected with polyethylene vapor retarder. Polyethylene will not be removed until completion of a 72-hour ventilation period. • Installation of interior finish materials will complete fourteen (14) days prior the commencement of building flush-out/

IV. PROTECTION

List all project materials requiring Protection per Specifications. Describe the specifics of the plan for protecting materials from dust and moisture during transportation, delivery, storage and construction. Attach additional sheets if necessary.	
Required	• Weatherproof enclosures shall be provided to store and protect the materials from moisture sources. Materials shall be protected from rain and other moisture sources and, if resting on the ground, spacers shall be used to allow air to circulate between the ground and the materials. • Materials, including porous or Fibrous Materials, with visible microbial growth shall not be installed. • Materials that are not defined as Porous or Fibrous, but with visible microbial growth, shall be decontaminated prior to installation. Lumber exhibiting a minor amount of "lumberyard mold" need not be discarded. • Temporary ventilation will be provided during all dust producing activities. See Item I, Construction Ventilation. All supply air diffusers and return air grilles in the immediate vicinity of the dust producing activities will be sealed and the HVAC system turned off . • Ductwork will be sealed during transportation, delivery, and construction.

END OF SECTION

SECTION 01 5639

TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

1.02 DEFINITIONS

A. Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and defined by a circle concentric with each tree or shrub with a radius 1.25 times the diameter of the drip line unless otherwise indicated.

1.03 SUBMITTALS

A. Action Submittals as defined in Section 13300 “Submittal Procedures”:

1. Product Data: For each type of product indicated.
2. Samples: For each type of organic mulch in sealed plastic bags labeled with composition of materials by percentage of weight, protection-zone fencing and protection-zone signage.
3. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

B. Informational Submittals as defined in Section 13300 “Submittal Procedures”:

1. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.
2. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.
3. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1.04 QUALITY ASSURANCE

A. Arborist Qualifications: Certified Arborist as certified by ISA, licensed arborist in jurisdiction where Project is located, current member of ASCA, or registered Consulting Arborist as designated by ASCA.

B. Preinstallation Conference: Conduct conference at Project Site.

1.05 PROJECT CONDITIONS

A. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Topsoil: Natural or cultivated top layer of the soil profile or manufactured topsoil; containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 1 inch in diameter; and free of weeds, roots, and toxic and other non-soil materials.

B. Topsoil: Stockpiled topsoil from location shown on Drawings.

C. Organic Mulch: Ground or shredded bark, free from deleterious materials.

D. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements. Previously used materials may be used when approved by Architect.

1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2-inch opening, 0.148-inch- diameter wire chain-link fabric; with pipe posts, minimum 2-3/8-inch- OD line posts, and 2-7/8-inch- OD corner and pull posts; with 1-5/8-inch- OD top rails and 0.177-inch- diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.
2. Height of Fencing: 6 feet.
3. Gates: Swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones.

E. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Erosion and Sedimentation Control: Examine the Project Site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

C. Protection Zones: Mulch areas inside protection zones and other areas indicated with 6 inch average thickness of organic mulch. Do not place mulch within 6 inches of tree trunks.

3.02 PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones in a manner that will prevent people from easily entering protected area except by entrance gates.

Retain first subparagraph below for chain-link fencing.

1. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.

2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.

3. Access Gates: Install where indicated.

B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Owner / Architect.

C. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

D. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete, and equipment has been removed from the Project Site.

E. Upon written request from the Contractor and written approval by the Owner and In the event that protection-zone fencing is not feasible due to construction activities, the Contractor shall provide continuous vertical 2x4 wood slat protection around the circumference of the tree up to a height of 16’-0”. The tree shall be wrapped with 1” diameter backer rod at 4’-0” on-center with the 2x4’s attached to the tree with friction securing methods only. No nails or screws shall be placed into the trees to secure the 2x4 wood slat protection system.

3.03 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Division XX – Section XXXXXX “Earth Moving / Earthwork”.

B. Trenching near Trees: Where utility trenches are required within protection zones, hand excavate under or around tree roots or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots for root pruning.

C. Do not allow exposed roots to dry out before placing permanent backfill.

3.04 ROOT PRUNING

Retain first paragraph below if construction excavation near or within a protection zone is unavoidable.

A. Prune roots that are affected by temporary and permanent construction. Prune roots as follows:

1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
2. Temporarily support and protect roots from damage until they are permanently covered with soil.
3. Cover exposed roots with burlap and water regularly.
4. Backfill as soon as possible according to requirements in Division XX – Section XXXXXX “Earth Moving / Earthwork”.

B. Root Pruning at Edge of Protection Zone: Prune roots by cleanly cutting all roots to the depth of the required excavation.

C. Root Pruning within Protection Zone: Clear and excavate by hand to the depth of the required excavation to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

3.05 CROWN PRUNING

A. Prune branches that are affected by temporary and permanent construction. Prune branches as follows:

1. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.
2. Pruning Standards: Prune trees according to ANSI A300 (Part 1).
3. Cut branches with sharp pruning instruments; do not break or chop.
4. Do not apply pruning paint to wounds.

B. Chip removed branches and dispose of offsite.

3.06 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

C. Minor Fill within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

3.07 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.08 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

1. Have arborist perform the root cutting, branch pruning, and damage repair of trees and shrubs.
2. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
3. Perform repairs within 24 hours.
4. Replace vegetation that cannot be repaired and restored to full-growth status, as determined by Architect.

3.09 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 01 5723

STORM WATER POLLUTION CONTROL MEASURES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The Contractor shall exercise every reasonable precaution to protect channels, storm drains, and bodies of water from pollution.

B. Conduct and schedule operations to minimize or avoid muddying and silting channels, drains, and waters.

C. As required, obtain permits for erosion and water pollution control from the appropriate jurisdictional agency before starting Work.

D. Provide any necessary water pollution control devices to prevent, control, and abate water pollution, and implement good housekeeping pollution control measures to reduce the discharge of pollutants from worksites to the maximum extent practicable. These water pollution control devices include drains, gutters, slope protection blankets and retention basins and shall be constructed concurrently with other Work at the earliest practicable time.

E. Exercise care in preserving vegetation and protecting property, to avoid disturbing areas beyond the limits of the Work. Promptly repair any damage caused by Contractor operations.

F. Comply with the specific requirements based on acreage of disturbed soil.

G. Penalties: Failure to comply with this Section may result in significant fines and possible imprisonment. The RWQCB or other prosecuting authority may assess fines of up to $32,500 per day for each violation. Should the Owner be fined or penalized as a result of the Contractor failing to comply with this Section, the Contractor shall reimburse the Owner for any and all fines, penalties and related costs.

H. Notification and Report: If pollution occurs in the work area for any reason or when the Contractor becomes aware of any violation of this Section, correct the problem and immediately notify the Inspector. In addition, submit a written report to the Engineer within seven (7) calendar days describing the incident and the corrective actions taken. If either the Inspector or Engineer is first to observe pollution or a violation, the Contractor shall also explain in the written report why the Work was inadequately monitored.

I. The provisions of this Section describe minimum compliance and do not preclude other more stringent stormwater pollution control measures that may be required in the Contract.

1.02 DEFINITIONS

A. “Construction activity": Operations such as clearing, grading, disturbances to the ground such as stockpiling, or excavation that results in soil disturbances. If construction activity is part of a larger common plan of development, the amount of disturbed soil is the total land area of disturbed soil that results under the common plan.

1.03 PAYMENT

A. All costs for work required for compliance with this Section shall be included within the Bid Prices for other items of work.

1.04 LIABILITIES AND PAYMENTS

A. A.Payment of penalties for non-compliance by Contractor shall be the sole responsibility of Contractor.

B. B. Compliance with the Clean Water Act pertaining is the sole responsibility of Contractor. Any fine against Owner due to non-compliance by Contractor, Owner shall recover all costs of the fine by appropriate Owner Assessment.

1.05 COMPLIANCE PROCEDURES

A. The project requires the Contractor to develop and implement the use of storm water “Best Management Practices” (BMP) and monitoring by a Qualified SWPPP Practitioner (QSP) to comply with all provisions of the developed SWPPP for the project by the Qualified SWPPP Developer. The Contractor must fulfill all National Pollutant Discharge Elimination System (NPDES) regulatory requirements including providing a Project Site specific SWPPP.

B. The QSP and QSD shall be certified by a State Water Board – sponsored or approved training course.

C. The Contractor and any Subcontractor involved in earthwork shall:

1. Review the SWPPP.
2. Indicate, in the SWPPP, the names of all key Subcontractors involved in earthwork/ land disturbing activities.
3. Ensure that all key Project Site personnel involved in earthwork operations understand the requirements of the SWPPP.
4. Maintain a copy of the Storm Water Pollution Prevention Plan onsite at all times.

1.06 UNAUTHORIZED DISCHARGE

A. The Contractor will ensure that no unauthorized discharges leave the Project Site.

B. Failure to comply with this Specification Section may result in significant fines and possible imprisonment. The RWQCB or other prosecuting authority may assess fines for each violation. Should the Owner be fined or penalized as a result of the Contractor failing to comply with this Section, the Contractor shall reimburse the Owner for any and all fines, penalties and related costs.

C. The Contractor shall notify the Owner of any discharges of other than storm water in accordance with the procedures contained in the CGP Order NO. 2009-009-DWQ.

D. If pollution occurs in the work area for any reason or when the Contractor becomes aware of any violation of this Section, immediately correct the problem and notify the inspector. In addition, submit a written report to the Engineer within seven (7) calendar days describing the incident and the corrective action taken. If either the Inspector or Engineer is first to observe pollution or a violation, the Contractor shall also explain in the written report why the Work was inadequately monitored.

1.07 STORMWATER POLLUTION PREVENTION PLAN

A. The BMPs contained in the Development Best Management Practices Handbook – Part A, Construction Activities cover the following categories of construction activities:

1. Site preparation/ earth removal
2. Underground structures
3. Aboveground structures
4. Roadways, walkways and parking lots
5. Planting and landscaping

B. Shall be written and amended by the Contractors Qualified SWPPP Developer (QSD).

C. The Contractors qualified SWPPP Practitioner (QSP) is required to oversee implementation of the BMPs necessary to comply with the general permit. A QSP is required to comply with:

1. Develop Rain Event Action Plan (REAP) 48 hours prior to any likely precipitation event.
2. Begin implementation of the REAP no later than 24 hours prior to the likely precipitation event.

D. The Contractor is responsible for complying with the following forms, procedures and requirements:

1. Notice of Intent
    a. The Contractor shall fill out, sign and date the Notice of Intent (NOI). Submission of the NOI is required for land disturbance as contained in the CGP Order No. 2009-009-DWQ. Before construction operations begin.
2. Notice of Termination
    a. Upon Completion of the final stabilization of the construction Project Site, the Contractor shall file a Notice of Termination for the project, at the completion of the project.

3. Retention of Records

a. Keep a copy of the SWPPP in a readily accessible location at the construction Project Site from the commencement of construction activity until submission of the Notice of Termination (NOT) for storm water discharges associated with construction activity. Contractors with day to day operation control over SWPPP implementation shall have a copy of the SWPPP available at a central location, onsite, for the use of all operators and those identified as having responsibilities under the SWPPP.

4. Inspection and Monitoring Requirements

a. Inspections and monitoring shall be conducted in accordance with CGP Order NO. 2009-009-DWQ.

5. Certification Requirements

a. The persons or firms responsible for maintenance and inspection of the erosion and sediment control measures shall adhere to the minimum requirements as specified in CGP Order NO. 2009-009-DWQ.

E. Additional Permits

1. The Contractor is required to adhere to all local regulations and obtain all necessary permits as required by the local jurisdictions.

1.08 SUBMITTAL

A. Submit qualifications and certifications of qualified SWPPP Practitioner (QSP) and develop QSD.

B. Forms and documents as required by SWPPP and the QSP.

C. Submit Stormwater Pollution Prevention Plan

PART 2 - PRODUCTS

2.01 CONSTRUCTION ACTIVITY

A. Comply with the following minimum water quality protection requirements.

B. Retain eroded sediments and other pollutants onsite and do not allow transportation from the Project Site by sheet flow, swales, area drains, natural drainage, or wind. Control slope and channel erosion by implementing an effective combination of best management practices (BMPs). Such BMPs include scheduling grading during non-rainy seasons, planting and maintaining vegetation on slopes and covering erosion-susceptible slopes.

C. Protect stockpiles of earth and other construction-related materials from being transported from theProject Site by wind or water.

D. Properly store and handle fuels, oils, solvents, and other toxic materials to not contaminate the soil or surface waters, enter the groundwater, or be placed where they may enter a live stream, channel, drain, or other water conveyance facility. Protect all approved toxic storage containers from weather. Clean spills immediately and properly dispose of cleanup materials. Spills shall not be washed into live streams, channels, drains, or other water conveyance facilities. If rain or storm water runoff comes in contact with pollutants (such as soil stabilizers, paint or fluid from vehicles) report to inspector immediately. Contractor will be required to sample and remediate contaminated water.

E. Do not wash excess or waste concrete into the public way or any drainage system. Retain concrete wastes onsite until they can be appropriately disposed of or recycled.

F. Deposit trash and construction-related solid wastes in covered receptacles to prevent contamination of rainwater and dispersal by wind.

G. Do not allow sediments and other materials to be tracked from theProject Site by vehicle traffic. Stabilize construction entrance roadways to inhibit sediments from being deposited onto public ways. Immediately sweep up accidental depositions. Do not allow depositions to be washed away by rain or by any other means.

H. Contain non-stormwater runoff from equipment or vehicle washing and any other activity at the Project Site.

I. At completion of the Work, clear the worksite of debris and restore to a condition at least equal to or better than prior to construction.

J. When working in live streams, these are additional water pollution control requirements.

   1. Erect barriers sufficient to prevent muddying or polluting streams.

   2. Prior to removing materials from a flowing stream, use a stream bypass or other equivalent means to keep the flow in the stream free of the mud or silt from the removal operations.

   3. Avoid transporting materials across live streams. If not possible, the transportation operation must be designed to prevent materials from falling into the stream and cannot muddy the stream.

   4. Equipment may not be operated in a live stream or channel unless the Contractor can demonstrate to the Engineer's satisfaction that no other practical alternatives exist. The equipment must be designed to prevent materials from falling into the stream and cannot muddy the stream.

   5. Do not allow fresh Portland cement or fresh Portland cement concrete to enter the water flowing in streams, channels or drains.

   6. Do not allow material derived from the Work to be deposited in a live stream, channel or drain.

PART 3 - EXECUTION

3.01 MAINTAINANCE

A. To ensure the proper implementation and functioning of control measures, the Contractor shall regularly inspect and maintain the construction Project Site. The Contractor shall identify corrective actions and time needed to address any deficient measures or reinitiate any measures that have been discontinued. Inspections of the construction Project Site shall be conducted by the Contractor to identify deficient measures, as follows.

1. Prior to a forecast storm.
2. At 24-hour intervals during extended precipitation events.
3. After all precipitation, which causes runoff capable of carrying sediment from the construction Project Site.
4. Routinely, at a minimum of once every week during the rainy season (October 1st – April 30th) and once every month during non-rainy season (May 1st – September 30th)

B. All temporary and/or permanent post-construction control measures shall be maintained and regularly inspected by the Contractor after all improvements are in place and accepted by the Owner. Temporary and/or permanent post-construction landscaping maintenance shall include but not limited to, watering, seeding, hydro-seeding, matting, slope stabilization, re-vegetation, and any other maintenance control measures recommended by the Owner to insure proper erosion control and plant growth.

END OF SECTION 01 5723

SECTION 01 6000

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes administrative and procedural requirements governing selection of products for incorporation into the Work.

1.02 RELATED REQUIREMENTS

A. Section 01 3229 - Project Forms.

B. Section 01 3113 - Project Coordination.

C. Section 01 3300 - Submittal Procedures.

D. Section 01 3213 - Construction Schedule.

E. Section 01 4523 - Testing and Inspection.

F. Section 01 2513 - Product Substitution Procedures.

G. Section 01 7836 - Warranties.

1.03 DEFINITIONS

A. Definitions used in this Section are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and other similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation into the Work, whether purchased for the Work or taken from previously purchased stock. The term "product" includes the terms "material" and "equipment" and terms of similar intent.

a. "Named Products," are items identified by the manufacturer's product name, including make, model number or other designation, shown or listed in the manufacturer's published product literature, current as of the date of the Contract.

b. "Foreign Products," as distinguished from "domestic products," are items substantially manufactured (50 percent or more of value) outside the United States and its possessions. Products produced

or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens of, nor living within, the United States and its possessions are also considered to be foreign products.

2. "Materials," are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.

3. "Equipment," is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

1.04 SUBMITTALS

A. Material list: Prepare a list in tabular form acceptable to ARCHITECT and/or OAR showing proposed products. Include generic names. Include the manufacturer's name and proprietary names for each item listed.

1. Coordinate material list with the Construction Schedule and the submittal schedule.

2. Form: Prepare material list with information on each item tabulated under the following column headings.

a. Related Specification Section number.

b. Generic name used in Contract Documents.

c. Proprietary name, model number, and similar designations.

d. Manufacturer's name and address.

e. Supplier's name and address.

f. Installer's name and address.

g. Projected delivery date or time span of delivery period.

3. Initial Submittal: Within ten days after execution of each subcontract agreement, as set forth in General Conditions Article 6.23, submit three copies of an initial material list to the ARCHITECT with a copy to the OAR. Provide a written explanation for omissions of data and for known variations from the Contract Documents.

4. ARCHITECT Action: ARCHITECT will respond in writing to OAR within fourteen days and OAR will forward response to CONTRACTOR within sixteen days of receipt of the completed material list. No response

outside this period constitutes no objection to listed items but does not constitute a waiver of the requirement that selected items comply with the Contract Documents. ARCHITECT response will include a list of unacceptable item selections, containing a brief explanation of reasons for this action.

1.05 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.

1. CONTRACTOR is to verify necessary lead times for all materials; however, when specified products are available only from sources that do not, or cannot, produce a quality adequate to complete Work in a timely manner, consult with the ARCHITECT to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources producing these qualities, to the fullest extent possible.

B. Compatibility of Options: When the CONTRACTOR is given the option of selecting between two or more products for use in the Work, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

C. Foreign Product Limitations: Except under one or more of the following conditions, provide domestic products, not foreign products, for inclusion into the Work:

1. No available domestic product complies with the Contract Documents.

2. Domestic products that comply with the Contract Documents are available only at prices or terms substantially higher than foreign products that comply with the Contract Documents.

D. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturers or producer's nameplates or trademarks on exposed surfaces of products that will be exposed in view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The

nameplate shall contain the following information and other essential operating data:

a. Name of product and manufacturer.

b. Model and serial number.

c. Capacity.

d. Speed.

e. Ratings.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1. Schedule delivery to minimize long-term storage at the Project site and to prevent overcrowding of Work spaces.

2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to the Project site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

5. Store products at the Project site in a manner that will facilitate inspection and measurement of quantity or counting of units.

6. Store heavy materials away from structures in a manner that will not endanger the structure's supporting construction.

7. Store products subject to damage by the elements above ground, under cover in a weather-tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIAL SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.

1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.

2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other Projects.

B. Product Selection Procedures: The Contract Documents and governing regulations govern product selection. Procedures governing product selection include the following:

1. Proprietary Specification Requirements: Where Specifications name only a single material or manufacturer, provide the product indicated. No substitutions will be permitted.

2. Semi-proprietary Specification Requirements: Where Specifications name two or more products or manufacturers, provide one of the products indicated. No substitutions will be permitted.

a. Where Specifications specify products or manufacturers by name, accompanied by the term "or equal" comply with General Conditions Article 6.14 to obtain approval for use of an unnamed product.

3. Descriptive Specification Requirements: Where Specifications describe a product or assembly, list exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with the Contract Documents.

4. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated.

a. Manufacturer's recommendations may be contained in published material literature or by the manufacturer's certification of performance.

5. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard or

regulation, select a product that complies with the standards, codes, or regulations specified.

6. Visual Matching: Where Specifications require matching an established Sample, decision of the ARCHITECT will be final on whether a proposed product matches satisfactorily.

7. Visual Selection: Where specified product requirements include the phrase "… as selected from manufacturer's standard or premium colors, patterns, textures…" or a similar phrase, select a product and manufacturer that complies with other specified requirements. The ARCHITECT will select the color, pattern, and texture from the product line selected.

PART 3 - EXECUTION

3.01 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located, and aligned with other Work.

B. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration until Substantial Completion.

END OF SECTION

SECTION 01 6010

MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division I Specifications, apply to this Section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 – Section 014200 "References" specifies the applicability of industry standards to products specified.

2. Division 01 – Section 013300 "Submittal Procedures" and "Construction Schedule" specifies requirements for submittal of the Contractor's Construction Schedule and the Submittal Schedule.

3. Division 01 – Section 012500 "Substitution Procedures" specifies administrative procedures for handling requests for substitutions made after award of the Contract.

1.03 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

    a. "Named Products" are items identified by the manufacture's product name, including make or model number or other designation, shown or listed in the manufacture's published product literature that is current as of the date of the Contract Documents.

2. "Materials" are products substantially shaped, cut worked, mixed finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.

3. "Equipment" is a product with operation parts, whether motorized or manually operated, that requires service connections, such as wiring or piping

1.04 SUBMITTALS

A. Product List: Verify the list showing products specified in tabular form shown in the Specifications, by signing and returning the Submittal Register. Include the generic names of products required. Add the manufacturer's name and proprietary product names for each item listed.

1. Coordinate product list with the Contractor's Construction Schedule.

2. Form: Prepare product list with the information on each item tabulated under the following column headings:

   a. Submittal number per the submittal register.

   b. Proprietary name, model number, and similar designations.

   c. Manufacturer's name.

   d. Installer's name and address.

3. Initial Submittal: Within fifteen (15) days of the first Notice to Proceed, submit one electronic copy of all required submittals. Provide a written explanation for omissions of data and for known variations from Contract requirements.

4. Architect Action: The Architect will respond in writing to Contractor within twenty-one (21) days of receipt of the submittals. A review constitutes no objection to listed manufacturers or products but does not constitute a waiver of the requirements that products comply with Contract Document.

1.05 QUALITY ASSURANCE

A. Source Limitation: To the fullest extent possible, provide products of the same kind a single source.

1. When specified product are available only from sources that do not, or cannot, produce a quantity adequate to complete project requirements in a timely manner consult with the District Project Manager and the Architect to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability or compatibility. When a determination has been made, select products from sources producing products that possess these qualities, to the fullest extent possible.

B. Compatibility of Option: When the Contractor is given the option of selecting between two (2) or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. Contractor is responsible for providing products and construction methods that are compatible with products and construction methods of other the Subcontractors.

2. If a dispute arises between Subcontractors over concurrently selectable, but incompatible products, the Contractor will determine which products shall be retained and which are incompatible and must be replaced.

C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data.

    a. Name of product and manufacturer

    b. Model and serial number

    c. Capacity

    d. Speed

    e. Ratings

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products according to the manufacture's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

PART 2 - PRODUCTS

2.01 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.

1. Provide products completed with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.

2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selections Procedures: The Contract Documents and governing regulations govern product selection. Procedures governing product selections include the following:

1. Proprietary Specifications Requirements: Where Specifications name only a single product or manufacturer, and indicate "no substitutions" permitted, provide the product indicated. No substitutions will be permitted.

2. Semi Proprietary Specifications Requirements: Where Specifications name two (2) or more products or manufacturers, provide one (1) of the products indicated. No substitutions will be provided.

    a. Where Specifications specify products or manufacturers by name accompanied by the term "or equal" or "or approved equal," comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.

3. Nonproprietary Specifications: When Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of

these products only, the Contractor may propose any available product that complies with Contract Requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.

4. Descriptive Specifications Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics. And otherwise complies with Contract requirements.

5. Performance Specifications Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated.

    a. Manufacturer's recommendations may be contained in published product literature or by manufacturer's certification of performance.

6. Compliance with Standards, Codes, and Regulations: Where Specifications only required compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.

7. Visual Matching: Where Specifications required matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.

    a. Where no product available within the specified category matches satisfactorily and/or complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions," for selecting the matching product in another product category.

8. Visual Selection: Where specified product requirements include the phrase "…as selected from manufacturer's standard colors, patterns, textures…" or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern, and texture from the product line selection.

PART 3 - EXECUTION

3.01 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

    1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01 6010

SECTION 01 7000

EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

B. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.
9. Correction of the Work.
10. Final Acceptance

C. Related Sections:

1. Division 01 - Section 012500 "Submittal Procedures" for submitting surveys.
2. Division 02 - Section XXXXXX "Selective Demolition" for demolition and removal of selected portions of the building.
3. Division 01 - Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
4. Division 07 Section XXXXXX "Through-Penetration Firestop Systems" for patching penetrations in fire-rated construction.

1.02 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.03 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Land Surveyor or Professional Engineer.

B. Certificates: Submit certificate signed by Land Surveyor or Professional Engineer certifying that location and elevation of improvements comply with requirements.

C. Certified Surveys: Submit seven (7) copies signed by Land Surveyor or Professional Engineer. Provide both electronic CAD file and hard copy.

D. Final Property Survey: Submit seven (7) copies showing the Work performed and record survey data. Provide both electronic CAD file and hard copy.

1.04 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional Land Surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Professional Engineer Qualifications: A Professional Engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

C. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: Do not cut and patch structural elements unless detailed on structural drawings.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include but are not limited to the following:

a. Primary operational systems and equipment.

b. Fire separation assemblies.

c. Air or smoke barriers.

d. Fire-suppression systems.

e. Mechanical systems piping and ducts.

f. Control systems.

g. Communication systems.

h. Conveying systems.

i. Electrical wiring systems.

j. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

a. Water, moisture, or vapor barriers.

b. Membranes and flashings.

c. Exterior curtain-wall construction.

d. Equipment supports.

e. Piping, ductwork, vessels, and equipment.

f. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

D. Cutting and Patching Conference: Before proceeding, meet at Project Site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

E. Manufacturer's Installation Instructions: Obtain and maintain onsite manufacturer's written recommendations and instructions for installation of products and equipment.

1.05 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project Site.

3. Contractor shall locate by tracing/potholing all existing utilities in the areas where new trenching/utilities are proposed to be provided to avoid conflict and causing damage to existing utilities. All cost for repair of utilities damaged during trenching or placement of new utilities shall be borne by the Contractor. Contractor shall sequence potholing in advance or ahead of each such activities and show sequence of potholing. Plan to be submitted to District Project Manager for approval.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations. Examine surfaces to be cut and patched. Determine conditions under which cutting and patching are to be performed.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

   a. Description of the Work.

   b. List of detrimental conditions, including substrates.

   c. List of unacceptable installation tolerances.

   d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Existing Utility Information: Furnish information to local utility and the District Project Manager and Architect that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information or interpretation to Architect according to requirements in Division 01 - Section 013100 "Project Management and Coordination."

E. Surface and Substrate Preparation: Comply with manufacturer's recommendations for preparation of substrates to receive subsequent work.

3.03 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify District Project Manager and Architect promptly.

B. General: Engage a Land Surveyor or Professional Engineer to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
3. Inform installers of lines and levels to which they must comply.
4. Check the location, level and plumb, of every major element as the Work progresses.
5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
6. Close Project Site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out Project Site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.04 FIELD ENGINEERING

A. Identification Identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project Site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major Project Site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and Project Site work.

E. Final Property Survey: Engage a Land Surveyor or Professional Engineer to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by Land Surveyor or Professional Engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, Project Site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.

2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.05 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.

B. Contractor shall coordinate work prior to field installation. Contractor will receive a ‘no merit’ response on any change request for failure by the Contractor or it’s Sub-Contractors improperly or insufficiently coordinate their work with the drawings, Specifications, manufacturer’s installation instructions and other trades work.

C. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

D. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

E. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.

2. Allow for building movement, including thermal expansion and contraction.

3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project Site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.06 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Temporary Support: Provide temporary support of work to be cut.

C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements of Division 01 - Section 011100 "Summary."

E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Division 02 Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

6. Proceed with patching after construction operations requiring cutting are complete.

G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

a. Clean piping, conduit, and similar features before applying paint or other finishing materials.

b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather tight condition.

H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.07 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project Site for Owner's construction personnel working on Campus.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel and other Contractors working on Campus.

1. Construction Schedule: Inform the District Project Manager of Contractor's preferred Construction Schedule for Owner's portion of the Work. Adjust Construction Schedule based on a mutually agreeable timetable. Notify the District Project Manager if changes to schedule are required due to differences in actual construction progress.

2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work.

3.08 PROGRESS CLEANING

A. General: Clean Project Site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

a. Utilize containers intended for holding waste materials of type to be stored.

B. Site: Maintain Project Site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials onsite. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 - Section 017419 "Construction Waste Management."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.09 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components.

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Division 01 - Section 014000 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.11 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

3.12 FINAL ACCEPTANCE

A. Contractor shall satisfy or correct all deviations cited on the Deviation Notices issued by the Project Inspector and/or DSA Field Engineer before Substantial Completion can be established and before Final Acceptance. Any correction or remedy shall be at no cost to the Owner, but not limited to, design fees, labor, material and equipment cost.

END OF SECTION 01 7000

SECTION 01 7123

FIELD ENGINEERING AND SURVEY CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Surveying requirements for the Work.

1.02 RELATED SECTIONS

A. Division XX – Section XXXXXX “Earth Moving / Earthwork”

B. Division XX – Section XXXXXX “Asphalt Pavement”

C. Division XX – Section XXXXXX “Storm Utility Drainage Piping”

D. Division XX – Section XXXXXX “Cast-in-Place Concrete”

E. Division XX – Section XXXXXX “Sanitary Sewer”

1.03 WORK INCLUDED

A. Work by Contractor under this Section shall include but may not be limited to the following.

1. Establish and maintain additional horizontal and vertical control, lines and grades as required for construction layout survey.
2. Survey and measurement necessary to establish design lines and grades shown on the Construction Documents.
3. Document and field verify removal of foundations and other structures to the specified elevations.
4. Document foundations and new and existing utilities to remain.
5. Provide a certified as-built survey based upon the field measurements of all utilities and drainage work in accordance with the State of California Business and Professional Code Sec. 6735.6.
6. All maps, plans, reports, descriptions or other documents issued by the Contractor’s Licensed Land Surveyor shall be stamped and signed by the Registered Professional responsible for the work.
7. Land Surveyor shall provide one (1) electronic copy and one (1) hard copy of the cut sheets upon completion of staking to the Owner.

1.04 SURVEY SERVICE

A. Unless otherwise stated by the Architect or noted in the Special Provisions, the Contractor shall provide all surveying services.

B. All surveying shall be performed by a State of California Licensed Land Surveyor or a Registered Civil Engineer authorized to practice Land Surveying in the State of California or under his/her direction in conformance with the requirements of the Professional Land Surveyors Act.

1.05 QUALITY CONTROL

A. The Contractor shall maintain a complete and accurate log of all control and survey work as it progresses.

B. The District, or their consultants, reserves the option to check the Contractor's field survey measurements and calculations. Whether the District exercises this option or not, the Contractor shall perform accurate survey work meeting recognized industry standards.

1.06 PAYMENT FOR SURVEYING

A. The payment for surveying shall be included in respective items of work and shall include, but not to be limited to, construction staking, location and/or relocation of conflicting utilities, locating survey monuments, setting of survey monuments and center line ties, preparing and filing centerline tie sheets and Corner Records, locating Bench Marks and notifying the Office of the County Surveyor of same, professional office services and field calculations, and furnishing all labor, materials, tools, equipment and incidentals for doing all work involved. No additional compensation shall be allowed unless a separate bid item is provided.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 SUBMITTALS

A. Contractor shall submit the name and address of the State of California licensed surveyor to District Project Manager, Architect and Owner including any changes as they may occur.

B. Contractor shall submit to District Project Manager, Architect and/or Owner copies of cut sheets, coordinate plots, data collector printouts, and other documentation as available to verify completeness and/or accuracy of field surveying work.

C. Statement of Compliance: Contractor shall submit a statement of certification signed and sealed by Surveyor, counter-signed by Contractor indicating compliance with grade elevations, slopes and tolerances.

3.02 PAYOUT OF THE WORK

A. Contractor shall employ a State of California licensed surveyor to lay out the entire Work, set grades, lines, levels, control points, vertical and horizontal control, elevations, grids and positions. Before the commencement of Work, surveyor shall, , locate all reference points and benchmarks, then lay out all lines, elevations, and measurements for the entire Work including but not limited to, buildings, grading, paving and utilities.

B. All work under this contract shall be built in accordance with the lines and grades shown on the plans. Field survey for establishing these, and for the control of construction, shall be the responsibility of the Contractor. All such survey work including construction staking shall be done under the supervision of a California Licensed Land Surveyor or authorized Civil Engineer. Staking shall be done on all items ordinarily requiring grade and alignment, at intervals normally accepted by the agencies and trade involved.

C. The Contractor shall be responsible for any errors in the finished work, and shall notify the District, in writing, within 24 hours, of any discrepancies, or design errors during the construction staking.

D. Contractor shall immediately remediate any areas found not to meet specification requirements.

3.03 PERMANENT SURVEY MARKERS

A. Prior to the start of construction, the Contractor's licensed Land Surveyor or qualified Civil Engineer shall, in conformance with Section 8771 of the California State Business and Professions Code, locate all monuments (both of record and not of record), bench marks, and centerline ties within the construction zone, i.e., within one hundred feet of the construction activity. Additional ties to monuments shall be set when ties are missing (min. 4 ties per monument). The Contractor's Surveyor or qualified Civil Engineer shall prepare and submit for review to the City Engineer separate tie sheets and Corner Record sheets (monuments not of record shall have only tie sheets prepared). Corner Records shall conform to the County Engineers' Association of California's "Guide to the Preparation of Records of Survey and Corner Records" document as provided by the County Surveyor's Office. Upon review by the City Engineer, the Land Surveyor shall file the Corner Records with the County Surveyor's Office. Certified Corner Records shall be filed with the City Engineer of the City that the work is being completed in.

B. After construction and prior to final acceptance by the Owner of the construction project, the Contractor's Land Surveyor or qualified Civil Engineer shall re-survey all field monuments and centerline ties within the construction zone, prepare tie sheets and Corner Record sheets as indicated above, and file them with the City Engineer for review. After review by the City Engineer, the Land Surveyor shall file the Corner Records with the County Land Surveyors Office, and file certified copies of the Corner Records with the City Engineer.

C. All survey monuments removed or altered as a result of construction shall be reset, Corner Records filed with the County Surveyor's Office, and approved final Corner Records filed with the City Engineer. Centerline ties removed as a result of construction shall be reset and tie sheets filed with the City Engineer.

D. The Land Surveyor shall provide a letter of certification for all monuments having four or more existing ties which are within 0.02 ft plus or minus of the original City tie sheet records. When several monuments and ties appear on one tie sheet and one of the ties has changed the Land Surveyor shall re-measure all of the ties and re-file a new tie sheet with the City as required herein.

E. County of Los Angeles permanent and temporary bench marks within the construction zone shall be located by the surveyor, and the Contractor's Land Surveyor shall send a written notification of impending construction to the County of Los Angeles Surveyor's Office two weeks prior to construction.

3.04 SURVEY REQUIREMENTS

A. Utilize a minimum of two Record Control points on the Project Site, remote from the building area, referenced to data established by the survey control points.

1. Re-establish the basis of bearings and benchmark as shown on the approved plans.
2. All control to be tied to the basis of bearings and benchmarks.

B. Indicate the reference points on the project record drawings with the basis of elevation being the established benchmarks.

C. Establish lines, grades, locations and dimensions by instrumentation. From time to time, verify the layout of all Work by the same methods.

D. Provide grade stakes and elevations to construct over excavation and re-compaction, rough and final grades, paved areas, curbs, gutters, sidewalks, building pads, landscaped areas, and other areas as required.

E. Calculate and layout proposed finished elevations and intermediate control as required to provide smooth transitions between the spot elevations indicated in the Contract Documents.

F. Provide stakes and elevations for grading, fill, and topsoil placement.

G. Provide adequate horizontal and vertical control to locate utility lines, including but not limited to, storm, sewers, water mains, gas, electric and signal and provide vertical control in proportion to the slope of the line as required for accurate construction. Dry utilities will be based upon adequate horizontal and vertical control layout. Prior to trench closure, survey and record invert and flow line elevations. Survey and record top of curb and flow line elevations on finished concrete or AC surfaces at key locations such as BC's, EC's, grade breaks, corners or angle points in sufficient number to demonstrate the Work complies with the intent of the Contract Documents.

H. Provide horizontal and vertical control for batter boards for drainage, utility, and other onsite structures as required.

I. Furnish building corner offsets as required to adequately locate building pads. Provide cut and fill stakes within the building pad perimeter adequate to control both over excavation and re-compaction and the final sub-grade elevation of the building pad.

J. Submit a certification, signed by the surveyor, confirming the elevations and locations of improvements are in conformance with the Contract Documents. The statement shall include survey notes for the finish floor and building pad, showing the actual measured elevations on the completed sub-grade, recorded to the nearest 0.01'. Building pad tolerance will be +- 0.10'.

3.05 ESTABLISHMENT OF GRADES IN HARDSCAPE AREAS

A. All work shall conform to the lines, elevations, and grades shown on the Grading Plans. Three consecutive points set on the same slope shall be used together so that any variation from a straight grade can be detected. Any such variation shall be reported to the Engineer. In the absence of such report, the Contractor shall be responsible for any error in the grade of the finished work.

B. Areas having drainage gradients of 2 percent or more shall have elevation stakes, set with instrument, at grid intervals of 25 feet. Intermediate stakes may be set by using a tightly-drawn string line over the tops of adjacent stakes. Grade stakes must be set at all grade breaks, grade changes, etc.

C. Areas having drainage gradients of less than 2 percent shall have elevation stakes, set with instrument, at 10 foot intervals. Grade stakes must be set at all grade breaks, grade changes, etc.

D. Protect and maintain stakes in place until their removal is approved by the Owner. Grade or location stakes lost or disturbed by Contractor, shall be reset by the Surveyor at the expense of Contractor.

3.06 STORM DRAIN AND SANITARY SEWER PIPE INSTALLATION

A. All storm drain pipelines, sanitary sewer pipelines, trench drains, catch basins, cleanouts and drain inlets shall be staked by a licensed surveyor if slope of grade is less than 2% and a complete set of cut sheets shall be supplied to the Inspector. All construction staking shall be installed and verified for grade and alignment prior to the start of construction.

3.07 UTILITY BACKFILL

A. Prior to placing backfill, the Contractor shall perform as-built surveys based upon field measurements by the Land Surveyor to accurately record the installed depth, alignment, location of bends, valves, vaults, duct banks, manholes and all other items or conditions to provide an accurate record of all below–grade utilities. The field survey shall consist of Point number, Northing/Easting coordinates and Elevation (based on project datum), and limits of any structure, utility or other existing or new underground feature that will remain in place and be covered by the backfill.

3.08 RECORD DRAWINGS

A. Upon Substantial Completion, Contractor shall obtain and pay for electronic copies (CADD and pdf) of the as built survey drawings. Deliver to District Project Manager, Architect, final “record” drawings of the original drawings and completed Work within specified tolerances.

B. Record drawings shall indicate locations by coordinate of all utilities onsite with top of pipe elevations at major grade and alignment changes, rim grate or top-of-curb and flow line elevations of all drainage structures and manholes.

C. Completed record drawing shall be signed and certified as correct and within specified tolerances by the licensed surveyor.

D. Contractor to provide one (1) hard copy and one (1) electronic CADD copy of the completed record drawings certified by the licensed surveyor.

E. Attention is called to other sections of the Contract Documents requiring verification or measurements of installed Work by survey. Surveyor shall perform and certify all such surveys or verification are completed in accordance with the Contract Documents.

END OF SECTION

SECTION 01 7329

CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies procedural requirements for cutting and patching.

1.02 RELATED REQUIREMENTS

A. Section 01 2973 - Schedule of Values.

B. Section 01 3113 - Project Coordination.

C. Section 01 3119 - Project Meetings.

D. Section 01 3213 - Construction Schedule.

E. Section 01 3300 - Submittal Procedures.

F. Section 01 7123 - Field Engineering.

G. Section 01 7836 - Warranties.

1.03 SUBMITTALS

A. The word “cutting” as used in the Contract Documents includes, but is not limited to, cutting, drilling, chopping, and other similar operations and the word “patching” includes, but is not limited to, patching, rebuilding, reinforcing, repairing, refurbishing, restoring, replacing, or other similar operations.

B. Cutting and Patching Proposal: CONTRACTOR shall submit a proposal describing procedures well in advance of the time cutting and patching will be performed if the Contract Documents requires approval of these procedures before proceeding. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required. Denote how it will be performed and indicate why it cannot be avoided.

2. Describe anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in the building’s appearance or other significant visual elements.

3. List products to be used and firms or entities that will perform this Work.

4. Indicate dates when cutting and patching will be performed.

5. Utilities: List utilities that cutting and patching operations will disturb or affect. List utilities to be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.

6. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.

7. Review by ARCHITECT and DSA prior to proceeding with cutting and patching does not waive ARCHITECT right to later require complete removal and replacement of defective Work.

1.04 QUALITY ASSURANCE

A. Requirements for structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.

1. Obtain approval from ARCHITECT and DSA of the cutting and patching proposal before cutting and patching the following structural elements:

a. Foundation construction.

b. Bearing and retaining walls.

c. Structural concrete.

d. Structural steel.

e. Lintels.

f. Timber and primary wood framing.

g. Structural decking.

h. Stair systems.

i. Miscellaneous structural metals.

j. Exterior curtain-wall construction.

k. Equipment supports.

l. Piping, ductwork, vessels, and equipment.

m. Structural systems of special construction in Division 13 Sections.

B. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safely.

1. Obtain review of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:

a. Primary operational systems and equipment.

b. Air or smoke barriers.

c. Water, moisture, or vapor barriers.

d. Membranes and flashings.

e. Fire protection systems.

f. Noise and vibration control elements and systems.

g. Control systems.

h. Communication and/or data systems.

i. Conveying systems.

j. Electrical wiring systems.

k. Operating systems of special construction in Division 13 Sections.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the opinion of ARCHITECT, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

1. If possible, retain the original installer or fabricator to cut and patch the exposed Work listed below. If it is impossible to engage the original installer or fabricator, engage another recognized experienced and specialized firm.

a. Firestopping.

b. Acoustical ceilings.

c. Acoustical panels.

d. Finished wood flooring.

e. Synthetic sports flooring.

f. Carpeting.

g. HVAC enclosures, cabinets, or covers.

h. Ceramic and quarry tile.

i. Gypsum board.

j. Masonry (exterior and interior where exposed).

k. Tack boards.

l. Casework.

m. Finish carpentry.

1.05 WARRANTY

A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.

1. Before proceeding, meet at the Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.02 PREPARATION

A. Temporary support: Provide adequate temporary support of existing improvements or Work to be cut.

B. Protection: Protect existing improvements and Work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of existing improvements or Work that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Where the Work requires sandblasting of existing surfaces in order to receive new materials secured by cementitious, adhesive or chemical bond, completely remove existing finishes, stains, oil, grease, bitumen, mastic and adhesives or other substances deleterious to the new bonding or fastening of new Work. Utilize wet sand blasting for interior surfaces and for exterior surfaces where necessary to prevent objectionable production of dust.

3.03 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay. Carefully remove existing Work to be salvaged and/or reinstalled. Protect and store for reuse into the Work. Verify compatibility and suitability of existing substrates before starting the Work.

B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining Work. Where possible, review proposed procedures with the original installer; comply with the original installer's recommendations.

1. In general, where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

3. Cut through concrete and masonry using a cutting machine, such as a carborundum saw or a diamond-core drill. Saw cut reinforcing bars and paint ends with bituminous paint except where bonded into new concrete or masonry.

4. Comply with requirements of applicable Sections of Divisions 31, 32, and 33 where cutting and patching requires excavating, backfill, and recompaction.

5. Woodwork: Cut and or remove to a panel or joint line.

6. Sheet Metal: Remove back to joint, lap, or connection. Secure loose or unfastened ends or edges and seal watertight.

7. Glass: Remove cracked, broken, or damaged glass and clean rebates and stops of setting materials.

8. Plaster: Cut back to sound plaster on straight lines, and back bevel edges of remaining plaster. Trim existing lath and prepare for new lath.

9. Gypsum Wallboard: Cut back on straight lines to undamaged surfaces with at least two opposite cut edges centered on supports.

10. Acoustical ceilings: Remove hanger wires and related appurtenances where ceilings are not scheduled to be installed.

11. Tile: Cut back to sound tile and backing on joint lines.

12. Flooring: Completely remove flooring and clean backing of prior adhesive. Carefully remove wood flooring for patching and repairing of existing wood flooring scheduled to remain.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with required tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation. Verify conditions of existing substrates prior to executing Work.

2. Restore exposed finishes of patched areas and extend finish restoration into retaining adjoining construction in a manner that will eliminate all evidence of patching and refinishing.

3. Concrete: Maintain cut edges in a moist condition for twenty four hours prior to the placement of new concrete. In lieu of this an epoxy adhesive may be provided. Finish placed concrete to match existing unless noted otherwise. Concrete shall have a compressive strength of 3,000 psi where installed to repair and match existing improvements, unless noted otherwise.

4. Metal Fabrications: Items to remain exposed shall have their edges cut and ground smooth and rounded.

5. Sheet Metal: Replace removed or damaged sheet metal items for new Work.

6. Glass: Install matching glass and re-seal exterior window assemblies.

7. Lath and Plaster: Install new lath materials to match existing and fasten to supports at 6-inch centers. Provide a 6-inch lap where new lath to adjoins existing lath. Fasten new lath as required for new Work. Restore paper backings as required. Apply a bonding agent on cut edges of existing plaster. Apply three coat plaster of the type, thickness, finish, texture, and color to match existing.

8. Gypsum Wallboard: Fasten cut edges of wallboard. Install patches with at least two opposite edges centered on supports and secure at 6-inch centers. Tape and finish joints and fastener heads. Patching shall be non-apparent when painted or finished.

9. Acoustical Ceilings: Comply with the requirements for new Work specified in related sections of the Contract Documents.

10. Resilient Flooring: Completely remove flooring and prepare substrate for new material.

11. Painting: Prepare areas to be patched, patch and paint as specified under related sections of the Contract Documents.

3.04 CLEANING

A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged coverings to their original condition.

END OF SECTION

SECTION 01 7417

CLEANING AND SITE APPEARANCE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Principal work in this Section:

1. Keep premises, adjacent private properties and public properties free from accumulations of waste, debris and rubbish caused by construction operations daily.

2. Maintain construction area in a neat and workmanlike manner. Keep all tools, equipment, and materials stored in an organized and secure fashion. Avoid layouts or methods that create a public eyesore.

3. At completion of work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all exposed surfaces.

B. Related Documents:

1. General Conditions – Article 3.12.2 for information on scope of general final clean up.

1.02 SAFETY REQUIREMENTS

A. Standards: Maintain project in accord with State and local safety standards.

B. Hazard Control

1. Store volatile wastes in covered metal containers and remove waste from premised daily.

2. Prevent accumulation of wastes which create hazardous conditions.

3. Provide adequate ventilation during use of volatile or noxious substances.

4. Prevent accumulation of waste that may attract rodents, insects, or other pests.

C. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

1. Do not turn or bury rubbish and waste materials on Project Site.

2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains, or the Owner's waste containers. Store in containers with tight-fitting lids and remove to legal dump site.

3. Comply with the Los Angeles County, State of California, or City of Inglewood, which ever applies, Stormwater Pollution Control Requirements for Construction Sites which require implementation of the NPDES standards and SCAQMD requirements. The cost of implanting these standards and adhering to the Stormwater Pollution Control Requirements must be included in the lump sum bid for the Project.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Use cleaning materials which will not create hazardous to health or property and which will not damage materials. Use cleaning materials and methods recommended by the manufacturer of the surface material to be cleaned. Use cleaning materials only on surfaces recommended by the cleaning materials manufacturer.

PART 3 - EXECUTION

3.01 CLEAN-UP DURING CONSTRUCTION

A. Keep premises, adjacent properties and public properties free from accumulations of waste materials and rubbish. Remove debris and dirt from public property promptly: sweep sidewalks and adjacent streets daily when soiled by work performed under this Contract. Maintain the existing landscaped areas within the fenced area of the construction Project Site, including but not limited to weekly mowing and irrigation as required.

B. Remove or paint over, as appropriate to the substrate, graffiti on the Project Site or surrounding fence daily.

C. Wet down materials and rubbish to settle dust and prevent it from blowing.

D. At least once a week, or more often if required, dispose of waste materials, debris and rubbish off the Project Site in a legal manner. Remove combustible materials such as paper and cardboard daily. Bury no such waste material and debris on the Project Site. Burning of trash and debris on the Project Site will not be permitted. All containers must be emptied as soon as they reach 75% of capacity.

E. Provide onsite containers for collection of waste materials, debris and rubbish. Provide a collection can at each location used as an eating area. Pick-up all garbage daily.

F. At the conclusion of each work day, Contractor will walk the Project Site and collect all debris and rubbish and store all loose materials.

G. Remove waste materials, debris and rubbish from Project Site and legally dispose of at legal public or private dumpling areas off Owner's property. Location of dump for trash and debris and length of haul is to the Contractor's responsibility.

H. Handle materials in a controlled manner with as few handlings as possible, do not drop or throw materials from heights.

I. Owner's right to provide clean up at the Contractor's Expense.

1. Should the District Project Manager, or Inspector of Record determine that the Contractor is failing to maintain the Project Site in a properly clean and safe manner, they will notify

the Contractor that corrective action must be taken. Should the Contractors fail to clean the Project Site after sufficient notification, the Owner reserves the right to have the Project Site cleaned at the Contractor's expense.

2. In the case of public or safety hazard, the Owner reserves the right to have the hazard corrected immediately at the Contractor's expense.

J. Contaminated Earth:

1. Clean-up operations include the removal and disposal of earth contaminated or unsuitable for support of plant life in planting areas. Clean-up operations also include filling of resulting excavations with suitable soil.

2. Contaminated areas include those used for disposal of waste concrete, mortar, plaster, masonry, and similar materials, areas in which washing out of concrete and plaster mixers or washing of tools and like cleaning operations have been performed, and areas that have been oiled, paved, or chemically treated.

3. Do not dispose of waste oil, solvents, paint, solutions, mortar, concrete of any construction material or like penetrating material by depositing or burying on the Owner's property.

3.02 FINAL SITE CLEAN-UP:

A. In preparation of Substantial Completion or Occupancy conduct a thorough cleaning of all work.

B. Before final inspection and after all construction activity is essentially complete, thoroughly clean the buildings, utilizing professional building cleaners. Items to be cleaned include, but are not limited to: all glass, plastic, doors, opening frames, grilles, trim, exposed nonferrous metal surfaces, floor covering, light fixtures and plates, plumbing fixtures and trim, and all finish surfaces throughout the construction. Thoroughly remove ink trademarks from all surfaces, Vacuum clean the buildings (s) and remove all spots, smears, dust, debris, hand prints and defacements of every sort, including those of vandals. Follow the recommendations of the manufacturer of the materials and items to be cleaned for all cleaning, polishing, and treatment such as waxing.

C. Repair, patch and touch-up marred surfaces to specified finish to match adjacent surfaces.

D. Also, before final inspection, thoroughly clean the entire Project Site and put it into a neat, acceptable condition. Remove from the entire Project Site all construction waste and unused materials, rubbish, loose rock and stones, excess earth, roots, weeds, and all debris of any description resulting from the Work. Hose down and scrub where necessary all new concrete and asphalt pavement and walks dirtied as a result of the Work. Thoroughly remove mortar droppings from concrete walks and other pavements.

E. Keep project clean until Final Acceptance by the Owner.

1. 1.Should the District Project Manager or Inspector of Record determine that the Contractor is failing to maintain the Project Site in a properly clean and safe manner, they will notify the Contractor that corrective action must be taken. Should the Contractor fail to clean the Project Site after sufficient notification, the Owner reserves the right to have the Project Site cleaned at the Contractor's expense.

2. 2.In the case of public or safety hazard, the Owner reserves the right to have the hazard corrected immediately, at the Contractor's expense.

END OF SECTION 01 7417

SECTION 01 7419

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Preparation and implementation, including reporting and documentation, of a Waste Management Plan for reusing, recycling, salvage or disposal of non-hazardous waste materials generated during demolition and new construction (Construction and Demolition (C&D) Waste), to foster material recovery and re-use and to minimize disposal in landfills.

B. Related Requirements

1. Section 01 3300 - Submittal Procedures.

2. Section 01 5000 - Construction Facilities and Temporary Controls.

3. Section 01 7700 - Contract Closeout.

1.02 REFERENCES

A. California Integrated Waste Management Act of 1989 (AB 939).

B. California Code of Regulations Title 14, Section 18700 et seq.

C. California Green Building Standards Code.

1.03 SYSTEM DESCRIPTION

A. Collection and separation of all C&D waste materials generated on-site, reuse or recycling on-site, transportation to approved recyclers or reuse organizations, or transportation to legally designated landfills, for the purpose of recycling salvaging and reusing a minimum of 75 percent of the C&D waste generated.

1.04 SUBMITTALS

A. C&D Waste Management Plan (Exhibit 1): Within 10 calendar days after the Notice to Proceed and prior to any waste removal, submit the following to the OAR for review and approval. Update quarterly. Include:

1. Materials to be recycled, reused, or salvaged, either onsite or offsite.

2. Estimates of C&D waste quantity (in tons) by type of material. (If waste is measured by volume, give factors for conversion to weight in tons.)

3. Procedures for recycling and reuse program.

4. Permit or license and location of Project waste-disposal areas.

5. Site plan for placement of waste containers.

B. C&D Waste Management Monthly Progress Report (Exhibit 2): Summary of waste generated by Project, monthly with Application for Payment. Include:

1. Firms accepting the recovered or waste materials.

2. Type and location of accepting facilities (landfill, recovery facility, used materials yard, etcetera). If materials are reused or recycled on the Project site, location should be designated as "on-site reuse and recycling".

3. Type of materials and net weight (tons) of each.

4. Value of the materials or disposal fee paid.

5. Attach weigh bills and other documentation confirming amount and disposal location of waste materials.

C. C&D Waste Management Final Compliance Report: Final update of Waste Management Plan to provide summary of total waste generated by Project.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 IMPLEMENTATION

A. Implement approved Waste Management Plan including collecting, segregating, storing, transporting and documenting each type of waste material generated, recycled or reused, or disposed in landfills.

B. Designate an on-site person to be responsible for instructing workers and overseeing the sorting and recording of waste/ recyclable materials.

C. Include waste management and recycling in worker orientation and as an agenda item for regular Project meetings.

D. Recyclable and waste bin areas shall be limited to areas approved on the Waste Management Plan. Keep recycling and waste bins neat and clearly marked to avoid contamination of materials.

3.02 ATTACHMENTS

A. Exhibit 1: Waste Management Plan

B. Exhibit 2: Waste Management Monthly Progress Report.

EXHIBIT 1

WASTE MANAGEMENT PLAN
CONSTRUCTION/ MAINTENANCE/ALTERATION & DEMOLITION PROJECTS

PROJECT NAME: **«PROJECTTITLE» «CONTRACTTITLE»**
PROJECT NO: **«Project Number»**
NAME OF COMPANY:
CONTACT PERSON:
TELEPHONE:
PROJECT SITE LOCATION:
PROJECT TYPE: ☐ NEW CONSTRUCTION ☐ DEMOLITION
☐ MAINTENANCE/ALTERATION PROJECTS
PROJECT SIZE (SQ. FT.):
DATE & ESTIMATED PERIOD

(1) Material Type	(2) Tons Estimated Recycle	(3) Tons Estimated Reuse	(4) Tons Estimated Salvage	(5) Tons Estimated Landfill	(6) Proposed Disposal or Recycling Facility (e.g., Onsite, Name of Facility)
Total					
Diversion Rate: Columns [(2)+(3)+(4)] / [(2)+(3)+(4)+(5)]					=

Signature	Title	Date

Column 1 "Material Types" – Enter type of materials targeted for recycling, reuse, and/or salvage, either on- or off-site, and include a category for waste materials requiring disposal.

Columns 2 thru 4 "Estimated Generation" - Enter estimated quantities (tons) of recyclable, reusable, or salvageable waste materials anticipated to be generated and state number of salvageable items.

Column 5 "Estimated Landfill" - Enter quantities (tons) of materials to be disposed in landfill.

Column 4 "Disposal Location" - Enter end-destination of recycled, salvaged, and disposed materials.

General : (1) Attach proposed Recycling and Waste Bin Location Plan.

(2) Attach name and contact data for each recycling or disposal destination to be used.

EXHIBIT 2

WASTE MANAGEMENT PROGRESS REPORT
CONSTRUCTION/ MAINTENANCE/ALTERATION & DEMOLITION PROJECTS

PROJECT NAME: **«PROJECTTITLE» «CONTRACTTITLE»**
PROJECT NO: **«Project Number»**
NAME OF COMPANY:
CONTACT PERSON:
TELEPHONE:
PROJECT SITE LOCATION:
PROJECT TYPE: ☐ NEW CONSTRUCTION ☐ DEMOLITION
☐ MAINTENANCE/ALTERATION PROJECTS
PROJECT SIZE (SQ. FT.):
PERIOD to

(1) Material Type	(2) Tons Actual Recycle	(3) Tons Actual Reuse	(4) Tons Actual Salvage	(5) Tons Actual Landfill	(6) Disposal or Recycling Facility (e.g., Onsite, Name of Facility)
Total					
Diversion Rate: Columns [(2)+(3)+(4)] / [(2)+(3)+(4)+(5)]					=

Signature	Title	Date

Column 1 "Material Types" – Enter type of materials targeted for recycling, reuse, and/or salvage, either on- or off-site, and include a category for waste materials requiring disposal.

Columns 2 thru 4 "Estimated Generation" - Enter estimated quantities (tons) of recyclable, reusable, or salvageable waste materials anticipated to be generated and state number of salvageable items.

Column 5 "Estimated Landfill" - Enter quantities (tons) of materials disposed.

Column 4 "Disposal Location" - Enter end-destination of recycled, salvaged, and disposed materials.

General : (1) Attach proposed Recycling and Waste Bin Location Plan.

(2) Attach name and contact data for each recycling or disposal destination to be used.

END OF SECTION

SECTION 01 7700

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Project record documents submittal
4. Operation and maintenance manual submittal
5. Warranties.
6. Owner orientation and instruction
7. Final cleaning.

B. RELATED SECTIONS

1. Division 01 - Section 017000 "Execution Requirements" for progress cleaning of Project Site.
2. Division 01 - Section 017839 “Project Record Documents” for submitting Record Drawings, Record Specifications, and Record Product Data.
3. Division 01 - Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
4. Division 01 - Section 017900 "Demonstration and Training" for requirements for instructing Owner's personnel.
5. Divisions 02 through XX Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.03 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project Site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Completion of Commissioning and addressing all commissioning items from the final report.
13. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
14. Complete final cleaning requirements, including touchup painting.
15. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
16. Receive signed entire scope of work DSA form 6-PI from project Inspector of Record and signed entire scope of work DSA form 6-AE from the Architect of Record and the project design engineers of record.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, the District Project Manager and Inspector of Record will either proceed with inspection or notify Contractor of unfulfilled requirements. The District Project Manager will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by the District Project Manager, that must be completed or corrected before certificate will be issued.
   1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

2. Results of completed inspection will form the basis of requirements for final completion.

1.04 PROJECT RECORD DOCUMENT SUBMITTAL

A. General: Do not use project record documents for construction purposes. Protect record documents from deterioration and loss. Provide access to record documents for District Project Manager or Inspector of Record and reference during normal working hours. Project record document shall be updated on a weekly basis. Prior to submitting each application for payment, secure Inspector of Record and District Project Manager approval of project record documents.

B. Record Drawings: Maintain, in accordance with specification 17839 – Project Record Documents, one (1) electronic copy of the drawings and one (1) clean, undamaged set of blue or black line white prints of Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which Drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Drawings. Provide detailed and accurate field dimensions for concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work. Date and number entries in the same format as submitted. Call attention to entry by a “cloud” around the affected areas.
2. Mark new information important to Owner but was not shown on Drawings or Shop Drawings.
3. Utility location and depth below finished grade and above ceilings and attic spaces shall be fully dimensioned and indicated on record drawings. Dimensions shall be measured from building lines or permanent landmarks and shall be triangulated to those features.
4. Note related Change Order or Construction Directive numbers where applicable. RFI submissions shall be referenced on each affected sheet, Drawing and Shop Drawing.
5. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.
6. Prior to Contract Completion of the Work, review and approval of the project record drawings by the Contractor and Architect is required. Prepare a final set of project record drawings using reproducible vellum. Submit final set of Record Drawings in pdf format and CADD/BIM, to District Project Manager for review and acceptance.

C. Record Specifications: Maintain, in accordance with specification 17839 – Project Record Documents, one (1) electronic copy of the specification and one (1) hard copy of the Specifications, including Addenda. Include with the Specifications two copies of other written Contract Documents, such as Change Orders or Construction Directives issued during construction.

1. Mark these record documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
2. Give particular attention to substitutions and selection of options and information on concealed Work that cannot otherwise be readily discerned later by direct observation.

3. Note related record document information with Product Data.

4. Prior to Contract Completion of the Work, submit record Specifications to Owner records.

D. Record Product Data: Maintain two copies of each Product Data submittal. Note related Change Orders and Construction Directives and mark-up of record drawings and Specifications.

1. Mark these documents to illustrate significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the Project Site and from the manufacturer's installation instructions and recommendations.

2. Provide detailed and accurate information regarding concealed products and portions of Work that cannot otherwise be readily discerned later by direct observation.

3. Prior to Contract Completion, submit complete set of record Product Data to Owner records.

E. Record Samples: Immediately prior to Substantial Completion, Contractor shall meet with District Project Manager at the Project Site to determine which Samples are to be transmitted to Owner for record purposes. Comply with District Project Manager instructions regarding delivery to Owner storage area.

F. Miscellaneous Records: Refer to other Specification sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Prior to the date of Contract Completion, complete and compile miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit for Owner records.

G. Maintenance Manuals: Prior to Substantial Completion, organize operation and maintenance data into suitable two sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-3", 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Submit to Owner records. Include the following types of information. All information contained in the Maintenance Manuals are also required in pdf. electronic format. PDF documents shall be readable, searchable and provide bookmarks to separate sections to properly organize the information.

1. Emergency instructions

2. Spare parts list

3. Copies of warranties

4. Wiring diagrams

5. Recommended "turn-around" cycles

6. Inspection procedures

7. Shop Drawings and Product Data

8. Fixture lamping schedule

H. Verified Reports: Construction progress of the Work shall be reported to DSA via a duly verified report as per Sections 4-336 and 4-343 of the California Building Standards Administrative Code.

1.05 OPERATION AND MAINTENANCE:

A. Operation and Maintenance Instructions: Prior to Substantial Completion, arrange for each installer of equipment that requires regular operation and maintenance to meet with designated Owner personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:

1. Maintenance manuals
2. Spare parts and materials
3. Tools
4. Lubricants
5. Fuels
6. Identification systems
7. Control sequences
8. Hazards
9. Cleaning
10. Warranties and bonds
11. Maintenance agreements and similar continuing commitments

B. As part of instruction for operating equipment, demonstrate the following procedures:

1. Start-up
2. Shutdown
3. Emergency operations
4. Noise and vibration adjustments
5. Safety procedures
6. Economy and efficiency adjustments
7. Effective energy utilization

C. Notice Of Termination: Contractor shall submit a Notice of Termination (NOT) to the local Regional Water Quality Control Board, RWQCB. Provide a copy of NOT to District Project Manager.

1.06 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Division 01 - Section 012900 "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
   1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.07 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A or Contractor's comparable form.
   1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
   2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
   3. Include the following information at the top of each page:
      a. Project name.
      b. Date.
      c. Name of the District Project Manager
      d. Name of Architect.
      e. Name of Contractor.
      f. Page number.
   4. Submit list of incomplete items in the following format:
      a. Five paper copies of list, unless otherwise indicated. Architect will return two copies.

1.08 WARRANTIES

A. Submittal Time: Submit written warranties for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within fifteen (15) days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with maximum allowable VOC levels of authorities having jurisdiction.

PART 3 - EXECUTION

3.01 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

   a. Clean Project Site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

   b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

   c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

   d. Remove tools, construction equipment, machinery, and surplus material from Project Site.

   e. Remove snow and ice to provide safe access to building.

   f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

   g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

   h. Sweep concrete floors broom clean in unoccupied spaces.

   i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.

   j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

   k. Remove labels that are not permanent.

   l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

      1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.

   m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

   n. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

   o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

q. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter upon inspection.

1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report upon completion of cleaning.

r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

s. Leave Project clean and ready for occupancy.

C. Final Cleaning: The Owner will install its furnishings and equipment following cleaning included in Section B above and before Final Acceptance. The Contractor shall include an additional final cleaning of all surfaces of furnishing, equipment, and the balance of the Project interior following installation of furnishings, equipment, etc. by Owner's vendor.

D. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

E. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 - Section 017419 "Construction Waste Management."

END OF SECTION 01 7700

SECTION 01 7823

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Maintenance manuals for the care and maintenance of products, materials, finishes, systems and equipment.

B. Related Sections include the following:

1. Division 01 - Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Division 01 - Section 017700 “Closeout Procedures” for submitting operation and maintenance manuals.
3. Division 01 - Section 017839 “Project Record Documents” for preparing Record Drawings for operation and maintenance manuals.
4. Divisions 2 through XX Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.03 DEFINITIONS

Definition in section paragraphs below are from ASHRAE's "Technology Handbook."

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.04 CLOSEOUT SUBMITTALS

A. Initial Submittal: Submit one electronic pdf draft copy of each manual at least fifteen (15) days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return one copy of draft and mark whether general scope and content of manual are acceptable.

B. Final Submittal: Submit one electronic pdf copy of each manual in final form at least twenty-one (21) days before final inspection. District Project Manager will return copy with comments within twenty-one (21) days after final inspection.

1. Correct or modify each manual to comply with Architect's comments. Submit revised copy of each corrected manual within fifteen (15) days of receipt of Architect's comments.

2. Provide an external hard drive with the capacity to hold four (4) Terabytes of Information to the Owner upon final completion that contains the finalized and approved manuals.

1.05 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.01 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Format: Provide one (1) hard copy per the requirements listed within the specification and one electronic pdf copy that is a clean copy of the original editable document printed to a ".pdf" file format and text searchable capable and organized in the same format as the hard copy.

B. Organization: In electronic format, include a section and folder in the directory for each of the following:

1. List of documents.

2. List of systems.

3. List of equipment.

4. Table of contents.

C. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

D. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

E. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

F. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.02 MANUALS, GENERAL (ONE SCANNED ELECTRONIC COPY ALSO REQUIRED)

A. Format: Provide one (1) hard copy per the requirements listed within the specification and one electronic pdf copy that is searchable and organized in the same format as the hard copy.

B. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

C. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name, address, and telephone number of Design-Builder.
6. Name and address of Architect.
7. Cross-reference to related systems in other operation and maintenance manuals.

D. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

E. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear

plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.

b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.

4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.

5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.

b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.03 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.

2. Emergency instructions.

3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.

2. Flood.

3. Gas leak.

4. Water leak.

5. Power failure.

6. Water outage.

7. System, subsystem, or equipment failure.

8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.

2. Shutdown instructions for each type of emergency.

3. Operating instructions for conditions outside normal operating limits.

4. Required sequences for electric or electronic systems.

5. Special operating instructions and procedures.

2.04 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions.

2. Performance and design criteria if Design-Builder is delegated design responsibility.

3. Operating standards.

4. Operating procedures.

5. Operating logs.

6. Wiring diagrams.

7. Control diagrams.

8. Piped system diagrams.

9. Precautions against improper use.

10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.

2. Manufacturer's name.

3. Equipment identification with serial number of each component.

4. Equipment function.

5. Operating characteristics.

6. Limiting conditions.

7. Performance curves.

8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

2.05 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:
1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.

2. Types of cleaning agents to be used and methods of cleaning.

3. List of cleaning agents and methods of cleaning detrimental to product.

4. Schedule for routine cleaning and maintenance.

5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.06 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard printed maintenance instructions and bulletins.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.

3. Identification and nomenclature of parts and components.

4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.

2. Troubleshooting guide.

3. Precautions against improper maintenance.

4. Disassembly; component removal, repair, and replacement; and reassembly instructions.

5. Aligning, adjusting, and checking instructions.

6. Demonstration and training videotape, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.

2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.01 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.

2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format,

identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.

2. Comply with requirements of newly prepared Record Drawings in Division 01 - Section 017839 “Project Record Documents."

G. Comply with Division 01 - Section 017700 “Closeout Procedures” for schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 01 7836

WARRANTIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers and/or installer's standard warranties on products and special product warranties.

1. Refer to the General Conditions for terms of the guarantee period for the Work.

1.02 RELATED SECTIONS

A. Section 016010: Materials and Equipment

B. Section 017700: Closeout Procedures

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 WARRANTY REQUIREMENTS

A. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties shall not relieve Contractor of the warranty of the Work incorporating such materials, products, and/or equipment. Manufacturer's disclaimers and limitations on warranties do not relieve suppliers, manufacturers, installers, and Subcontractors of the requirement to countersign special warranties with Contractor.

B. Standard warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to Owner.

C. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for Owner.

D. Related Damages and Losses: When correcting failed or defective warranted Work, remove and replace Work that has been damaged as a result of such failure or which must be removed and replaced to provide access for correction of warranted Work.

E. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement with the reinstated warranty equal to the original warranty.

F. Replacement Cost: Upon determination the Work covered by a warranty has failed and/or is defective, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether Owner has benefited from use of the Work through a portion of its anticipated useful service life.

G. Owner Recourse: Expressed warranties made to Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which Owner can enforce such other duties, obligations, rights, or remedies.

H. Rejection of Warranties: District Project Manager reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

I. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, District Project Manager reserves the right to refuse to accept the Work until Contractor presents evidence the entities required to countersign such commitments have done so.

3.02 SUBMITTALS

A. Submit written preliminary warranties prior to Substantial Completion, and final warranties prior to Contract Completion. If the certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, submit written warranties as set forth in the certificate of Substantial Completion.

   1. When a designated portion of the Work is partially used and/or occupied by Owner, submit properly executed warranties to Architect within fifteen (15) days of the Partial Use or Occupancy of the designated portion of the Work.

B. When the Contract Documents require Contractor, or Contractor and a Subcontractor, installer, supplier or manufacturer to execute a special warranty, prepare a written document containing appropriate terms and identification, ready for execution by the required parties. Submit a draft to District Project Manager, through the Architect, for approval prior to final execution.

   1. Refer to Divisions 02 through XX for specific content requirements and particular requirements for submitting special warranties.

C. Form of Submittal: Prior to Contract Completion, compile two copies of each required final warranty properly executed by Contractor, or by Contractor and Subcontractor, installer, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the Specifications.

D. Once draft warranties are approved, provide an electronic copy of all warranties as well as one original “hard Copy” in a heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8½ by 11” (115 by 280 mm) paper.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the item or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the installer.

2. Identify each binder on the front and spine with the typed or printed title “WARRANTIES,” Project title and/or name, and name of Contractor.

3. When warranted Work requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

E. Contractor to provide a directory in electronic excel format and hard copy with information sorted by specification to list the following information, at a minimum: Specification Section, Description of Specification Section, Actual System or Work Installed, Subcontractor, Subcontractor Contact Person, Subcontractor Contact Person Phone Number, Subcontractor Contact Person e-mail address.

END OF SECTION

SECTION 01 7839

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings and Documents - Provide Hard copy and electronic files in both of the following formats:

a. Readable and searchable PDF format

b. BIM (Revit, ArchiCAD, etc. to match files as provided by the Design Team.) and/ or CADD (to match files as provided by the Design Team.)

2. Record Specifications - Provide Hard copy, pdf format, and word document files.

3. Record Product Data - Provide Hard copy and pdf format.

B. Related Sections include the following:

1. Division 01 - Section 017700 “Closeout Procedures” for general closeout procedures.

2. Division 01 - Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

3. Divisions 02 through XX Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.03 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set of corrected Record Transparencies and one set of marked-up Record Prints and electronic files with above information.

B. Record Specifications: Submit three copies of Project's Specifications, including Addenda and Contract Modifications.

C. Record Product Data: Submit three copies of each Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

D. Miscellaneous Record Submittals: Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit three copies of each submittal.

PART 2 - PRODUCTS

2.01 RECORD DRAWINGS

A. Record Construction Working Drawings and As-Built PDF files: Maintain one set of PDF files of the Contract Drawings and Shop Drawings. This set shall be maintained continuously by the General Contractor with access rights for viewing by the District Project Manager, Architect of Record, Inspector of Record and any other group authorized by the District Project Manager or General Contractor.

1. Preparation: Mark PDF files to show the actual installation where installation varies from that shown originally. Date each entry on the Drawings. Require individual or entity who obtained record data, whether individual or entity is Installer, Subcontractor, or similar entity, to prepare the marked-up Record PDFs. Contractor shall use Bluebeam Revu or equal software in order to generate the PDF mark ups. Contractor shall store the electronic PDF files in a central web based location and allow viewing access to the Project team.

   a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

   b. Accurately record information in an understandable drawing technique.

   c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

   a. Dimensional changes to Drawings.

   b. Revisions to details shown on Drawings.

   c. Depths of foundations below first floor.

   d. Locations and depths of underground utilities.

   e. Revisions to routing of piping and conduits.

   f. Revisions to electrical circuitry.

   g. Actual equipment locations.

   h. Duct size and routing.

   i. Locations of concealed internal utilities.

   j. Changes made by Change Order or Construction Change Directive.

k. Changes made following Architect's written orders. (ASIs, responses to RFIs, etc.)

l. Details not on the original Contract Drawings.

m. Field records for variable and concealed conditions.

n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.

4. Mark record sets with red-color. Use other colors to distinguish between changes for different categories of the Work at same location.

5. Mark important additional information that was either shown schematically or omitted from original Drawings.

6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where District Project Manager determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.

2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2. Record PDFs: Organize Record PDFs and newly prepared Record Drawing PDFs into manageable sets. Include identification in each PDF file.

3. Record Transparencies: Organize into unbound sets matching Record Prints. Place transparencies in durable tube-type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.

4. Record CADD Drawings: Organize CADD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CADD file.

5. Identification: As follows:

a. Project name.

b. Date.

c. Designation "PROJECT RECORD DRAWINGS."

d. Name of Architect.

e. Name of Contractor.

2.02 RECORD AS-BUILT DRAWINGS

A. As-Built Drawings: Drawings showing final as-built conditions of the project. The final BIM and CADD as-built drawings/model shall consist of one set of electronic BIM or CADD drawing files in the specified format, and one set of the approved working as-built drawings.

B. As-Built Drawings as Applies to BIM and CADD.

1. It is the scope of this section to provide guidance to the Contractor on preparing as-built drawings for construction projects. An as-built drawing is a construction drawing revised to reflect the final as-built conditions of the project as a result of modifications and corrections to the project design required during construction. The final as-built drawings shall not have the appearance of marked up drawings, but that of professionally prepared drawings as if they were the "as designed" drawings.

C. Maintenance of As-Built Drawings

1. Provide timely updates of the as-builts, carefully maintaining a record set of working as-built drawings at the job site, marked in red, of all changes and corrections from the contract drawings. Enter changes and corrections on drawings promptly to reflect "Current Construction". Provide this update on a weekly basis for the PDF drawings and on a quarterly basis for the BIM / CADD files. Provide confirmation that the as-builts are up to date with the submission of the monthly project schedule.

2. Contractor to review and provide written documentation or stamp each month signifying review / completeness that the as-builts are updated.

3. If the Contractors fails to maintain the as-built drawings, the District will retain an amount from the monthly payment representing the estimated monthly cost of maintaining the as-built drawings. Final payment with respect to separately priced facilities or the contract as a whole, will be withheld until the Contractor submits acceptable as-built drawings and the District approves them.

4. The marked-up set of PDF drawings shall reflect any changes, alterations, adjustments or modifications. Changes must be reflected on all sheets affected by the change. Changes shall include marking the drawings to reflect structural details, foundation layouts, equipment sizes, and other extensions of design.

5. Typically, room numbers shown on the contract drawings are selected for design convenience and do not represent the actual numbers intended for use by the end user. Final as-built drawings shall reflect actual room numbers adopted by the end user.

6. Indicate on the drawings the actual location, kinds and sizes of all sub-surface utility lines. On the as-built drawings, show offset dimensions of each end run, including changes of direction by two permanently fixed surface features in order for the underground utility lines to be located in the future.

7. Show valves, splice boxes and similar appurtenances by dimensioning along the utility run from a reference point. Record the average elevation of the top of each run or underground structure.

D. As-Built Conditions that are Different from the Contract Drawings

1. Accurately reflect all as-built conditions that are different, such as dimensions, road alignments and grades, and drainage and elevations, from the contract drawings on each drawing. If the as-built condition is accurately reflected on a shop drawing, then furnish that shop drawing in BIM or CADD format. Reference on the final as-built construction drawing the shop drawing file that includes the as-built information. In turn, the shop drawing will reference the applicable construction as-built drawing. Delete any options shown on drawings and not selected, clearly reflect options selected on final as-built drawings.

E. Additional As-Built Information that Exceeds the Detail Shown on the Contract Drawings:

1. These as-built conditions include those that reflect structural details, foundation layouts, equipment, sizes, mechanical and electrical room layouts and other extensions of design, that were not shown in the project design documents because the exact details were not known until after the time of approved shop drawings. It is recognized that these shop drawing submittals revised to show as-built conditions will serve as the as-built record without actual incorporation into the contract drawings. Include fire protection details, such as wiring, piping, and equipment drawings.

F. The District will withhold the amount of $50,000., or 1% of the total construction contract value, whichever is greater, until the final as-built drawing submittal has been approved by the District.

2.03 RECORD SPECIFICATIONS

A. Preparation: This manual shall be maintained continuously by the General Contractor with access rights for viewing by the District Project Manager, Architect of Record, Inspector of Record and any other group authorized by the District Project Manager or General Contractor. Mark PDF files of the Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, Addenda, and Contract Modifications. Contractor shall use Bluebeam Revu or equal software in order to generate the PDF mark ups. Contractor shall store the electronic PDF files in a central web based location and allow viewing access to the Project Team.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.

5. Note related ASIs, RFIs, Change Orders, Change Directives, Record Product Data, and Record Drawings where applicable.

2.04 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Include significant changes in the product delivered to Project Site and changes in manufacturer's written instructions for installation.

3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

Insert requirements for Record Samples if needed. See Evaluations.

2.05 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.01 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Samples in the field office. Store Record Documents in PDF format on a shared web based location. apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in legible condition, protected from deterioration and loss. Provide access to the electronic Project Record Documents for Design Team, District Project Manager and the Inspector of Record's reference at all times.

END OF SECTION 01 7839

SECTION 017 900

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training videotapes.

B. Related Sections include the following:

1. Division 01 - Section 013100 “Project Management and Coordination" for requirements for pre-instruction conferences.
2. Divisions 02 through 32 Sections for specific requirements for demonstration and training for products in those Sections.

1.03 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit three copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. At completion of training, submit two complete training manual(s) for Owner's use.

B. Attendance Record: For each training module, submit list of participants and length of instruction time.

C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.04 CLOSEOUT SUBMITTALS

A. Demonstration and Training Videotapes: Submit two copies within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:
    a. Name of Project.
    b. Name and address of photographer.
    c. Name of Architect.
    d. Name of District Project Manager
    e. Name of Design-Builder.
    f. Date videotape was recorded.
    g. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
2. Transcript: Prepared on 8-1/2-by-11-inch (215-by-280-mm) paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of videotape on each page.

1.05 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 - Section "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Photographer Qualifications: A professional photographer who is experienced photographing construction projects.

D. Pre-instruction Conference: Conduct conference at Project Site to comply with requirements in Division 01 - Section 013100 “Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
    1. Inspect and discuss locations and other facilities required for instruction.
    2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
    3. Review required content of instruction.
    4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.06 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

D. Coordination of training for all systems requiring training noted within division 2 through 48 shall be scheduled to occur within a one (1) week period. Do not schedule any training until all systems are signed off by the project inspection and Cx agent.

PART 2 - PRODUCTS

2.01 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

1. Motorized doors, including overhead coiling doors, overhead coiling grilles and automatic entrance doors.
2. Equipment, including projection screens, waste compactors, food-service equipment, appliances and other miscellaneous equipment.
3. Fire-protection systems, including fire alarm, fire pumps and fire-extinguishing systems.
4. Intrusion detection systems.
5. Conveying systems, including conveyor Equipment.
6. Medical equipment, including medical gas equipment and piping.
7. Laboratory equipment, N/A
8. Heat generation, including boilers, feed water equipment, pumps, steam distribution piping and water distribution piping.
9. Refrigeration systems, including chillers, cooling towers, condensers, pumps and distribution piping.
10. HVAC systems, including air-handling equipment, air distribution systems and terminal equipment and devices.
11. HVAC instrumentation and controls.
12. Electrical service and distribution, including transformers, switchboards, panelboards, uninterruptible power supplies, monitoring controls and motor controls.
13. Packaged engine generators, including transfer switches.
14. Lighting equipment and controls.

15. Communication systems, including intercommunication, surveillance, clocks and programming, voice and data, AVIT Equipment and television equipment.

16. Any Fire Alarm equipment, Monitoring equipment and Energy Management system.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

   a. System, subsystem, and equipment descriptions.

   b. Performance and design criteria if Design-Builder is delegated design responsibility.

   c. Operating standards.

   d. Regulatory requirements.

   e. Equipment function.

   f. Operating characteristics.

   g. Limiting conditions.

   h. Performance curves.

2. Documentation: Review the following items in detail:

   a. Emergency manuals.

   b. Operations manuals.

   c. Maintenance manuals.

   d. Project Record Documents.

   e. Identification systems.

   f. Warranties and bonds.

   g. Maintenance service agreements and similar continuing commitments.

   h. Monitoring Equipment

3. Emergencies: Include the following, as applicable:

   a. Instructions on meaning of warnings, trouble indications, and error messages.

   b. Instructions on stopping.

   c. Shutdown instructions for each type of emergency.

   d. Operating instructions for conditions outside of normal operating limits.

   e. Sequences for electric or electronic systems.

   f. Special operating instructions and procedures.

   g. Monitoring Equipment

4. Operations: Include the following, as applicable:

a. Startup procedures.

b. Equipment or system break-in procedures.

c. Routine and normal operating instructions.

d. Regulation and control procedures.

e. Control sequences.

f. Safety procedures.

g. Instructions on stopping.

h. Normal shutdown instructions.

i. Operating procedures for emergencies.

j. Operating procedures for system, subsystem, or equipment failure.

k. Seasonal and weekend operating instructions.

l. Required sequences for electric or electronic systems.

m. Special operating instructions and procedures.

n. Monitoring Equipment

5. Adjustments: Include the following:

a. Alignments.

b. Checking adjustments.

c. Noise and vibration adjustments.

d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.

b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.

b. Types of cleaning agents to be used and methods of cleaning.

c. List of cleaning agents and methods of cleaning detrimental to product.

d. Procedures for routine cleaning

e. Procedures for preventive maintenance.

f. Procedures for routine maintenance.

g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.

b. Repair instructions.

c. Disassembly; component removal, repair, and replacement; and reassembly instructions.

d. Instructions for identifying parts and components.

e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.01 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Provide overview of actual installation of system and overview of the contract documents. Note any deviations of the installed system from the contract documents during training.

C. Set up instructional equipment at instruction location.

3.02 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate with Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner with at least seven days' advance notice.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral, a written, or a demonstration performance-based test.

E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.03 DEMONSTRATION AND TRAINING VIDEOTAPES

A. General: Engage a qualified commercial photographer to record demonstration and training videotapes. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Videotape Format: Provide high-quality VHS color videotape in full-size cassettes.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.

D. Narration: Describe scenes on videotape by audio narration by microphone while videotape is recorded or by dubbing audio narration offsite after videotape is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.

E. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

END OF SECTION 017 900

SECTION 01 8620

TEST AND BALANCE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies the requirements for test and balance of HVAC and related systems.

1.02 RELATED SECTIONS

A. Section 011000: Summary

B. Section 013300: Submittal Procedures

C. Section 013210: Construction Schedule

D. Section 017700: Closeout Procedures

E. Division XX - Heating Ventilating and Air Conditioning

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 DEFINITIONS AND APPLICABLE PUBLICATIONS

A. For the purposes of this Section definitions are as indicated in applicable publications of AABC, NEBB, TABB, ASHRAE, ANSI and SMACNA.

1. TAB: Testing, Adjusting and Balancing.
2. TABB: Testing, Adjusting and Balancing Bureau.
3. AABC: Associated Air Balance Council
4. NEBB: National Environmental Balancing Bureau.
5. OAR: Owner's Authorized Representation
6. Inspector of Record: Inspector of Record

3.02 QUALITY ASSURANCE

A. The test and balance agency shall be directly subcontracted to Contractor. The qualifications of the agency shall comply with Section 3.02, Quality Assurance. The agency shall be responsible for furnishing labor, instruments, and tools required to test, adjust and balance the heating, ventilating

and air conditioning (HVAC) systems and related plumbing systems, as described and/or as indicated in the Contract Documents.

B. Contractor shall obtain services of an independent, qualified testing agency acceptable to Architect and Districts Commissioning Agent (if one is employed) to perform testing and balancing Work as specified and as follows:

1. Agency shall be currently certified by either The Associated Air Balance Council (AABC), The National Environmental Balancing Bureau (NEBB) or Testing, Adjusting and Balancing Bureau (TABB). NEBB or TABB certification shall be for Air and Hydronic Testing, Adjusting and Balancing and Sound and Vibration Measurement.

2. Work shall be in accordance with the latest edition of the AABC, NEBB or TABB National Standards. Where the requirements of the two standards are different, the more stringent requirements shall prevail. Also, if the Contract Documents impose a more stringent standard then the Contract Documents shall prevail.

C. Performance Criteria: Work of this Section shall be performed in accordance with approved Testing, Adjusting and Balancing agenda.

D. Test Equipment Criteria: Basic instrumentation requirements and accuracy/calibration required by Section Two of the AABC or Section II of the NEBB or TABB Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems.

E. Verification: The Test and Balance Agency shall recheck ten (10) percent (minimum ten) of the measurements listed in the report. The locations shall be selected by Inspector of Record/District Project Manager. The recheck will be witnessed by Inspector of Record/District Project Manager. If twenty percent of the measurements that are retested differ from the report and are also out of the specified range, an additional ten percent will be tested. If twenty percent fall outside the specified range, the report will be considered invalid and all test and balance work shall be repeated.

F. Due to more stringent acoustical requirements in the educational environment, the Test and Balance Agency shall recheck the air systems where the sound level is higher than the specified requirements and demonstrate compliance with the methodology specified in this document with emphasis on fan speed adjustment and balancing for optimum acoustical performance. The recheck will be witnessed by Inspector of Record/District Project Manager. When there are multiple air systems, a system selected by Inspector of Record/District Project Manager shall be rechecked. If this system is found to be not in compliance, a second system shall be checked. If the second system if also found to be not in compliance, the report will be considered invalid and all test and balance work shall be repeated. page

3.03 SUBMITTALS

A. Submit name of agency to perform the Work. Include in the submittal the certified qualifications of all persons responsible for supervising and performing actual Work of this Section. Agency shall submit a minimum of five (5) commercial or industrial HVAC system TAB projects of similar type,

size, and degree of difficulty completed within the last two years. Agency shall provide name and telephone number of contact person for each listed project.

B. Submit, for approval, 6 copies of the Agenda as indicated in Section 018620 " Test and Balance" 3.06 to test and balance all mechanical and relevant plumbing systems.

C. Preliminary Report: Review the Contract Documents, examine Work installations and submit a written report to Architect and/or Inspector of Record/District Project Manager indicating deficiencies in Work precluding proper testing and balancing of the Work.

D. Final TAB Report: Submit the final TAB report for review by Architect and/or Inspector of Record/District Project Manager outlining the conditions and Work completed on each HVAC system. All outlets, devices, HVAC equipment, etc. shall be identified, along with a numbering system corresponding to report unit identification.

E. Submit an AABC "National Project Performance Guaranty" or "NEBB Quality Assurance Certification" assuring the Project systems were tested, adjusted and balanced in accordance with the Specifications and AABC, NEBB or TABB National Standards.

F. CADD drawings: Submit single line, multi-color CADD drawings indicating outside return and supply air, volume control boxes, each outlet and inlet, room numbers, duct sizes at traverse locations, temperatures and pressures, systems balanced, components changed, and Contractor installed access points. In addition, drawings shall identify controls, equipment settings, including manual damper quadrant positions, manual valve indicators, fan speed control levers, and similar controls and devices shall be marked on the drawings to show final settings. CADD files shall be submitted on CD-ROM upon final submittal of TAB report. Reports shall identify discrepancies between completed Work and the Contract Documents affecting the performance and longevity of the system.

3.04 GENERAL SCOPE OF WORK

A. The general scope of Work shall include but not be limited to the following:

1. Measure airflow rates of HVAC systems and adjust to achieve design airflow rate. Tabulate results and submit reports.

2. Measure water-flow rates of HVAC systems and adjust to achieve design water flow rates. Tabulate results and submit reports.

3. Measure flow velocities, temperatures, static pressures or head, rotational speed, and electrical power demand of fans, pumps and other related HVAC system components, tabulate results and submit reports.

4. Measure sound levels in each conditioned space, tabulate results and submit reports.

5. Measure ambient sound levels of outdoor HVAC units and system components such as chillers and cooling towers, tabulate results and submit reports.

6. Reports shall contain sufficient data for the system designer to evaluate system performance and solve installation problems such as system pressure profiles and pressure drops across system components

3.05 SPECIFIC SCOPE OF WORK

A. The specific scope of Work shall include the following HVAC system components as indicated on the Drawings:

1. Air Handling Units
2. Air Conditioning Units
3. Heating and Ventilating Units
4. Heating and Cooling Coils
5. Supply, Return, Relief and Exhaust Fans
6. Outside Air and Return Air Plenums
7. Outside Air Intakes
8. All Supply and Return Ductwork
9. All associated Air Terminal Devices, i.e. Supply Diffusers, Return Registers, etc.
10. Mixing Boxes and Variable Air Volume (VAV) boxes
11. Reheat Coils (Electric or Hot Water)
12. Exhaust Duct Systems
13. Fire and Fire/Smoke Dampers
14. Kitchen Hoods
15. Heat Exchangers
16. Chillers
17. Boilers
18. Chilled water, heating hot water pumps

3.06 TESTING, ADJUSTING AND BALANCING AGENDA

A. Provide proposed materials, methods, procedures, forms, diagrams and reports for test and balance Work.

B. Agenda to be completed by the test and balance agency and submitted to Architect and Inspector of Record/District Project Manager for review and approval.

C. Agenda shall include one complete set of AABC, NEBB or TABB publications listed in Section 018620 “Test and Balance 3.02B2, applicable publications, or, in case of other test and balance agencies and or organizations, comparable publications to establish an approved, systematic and uniform set of procedures.

D. Agenda shall also include the following detailed narrative procedures, system diagrams and forms for test results:

1. Specific standard procedures required and proposed for each system of the Work.

2. Specified test forms for recording each procedure and for recording sound and vibration measurements.

3. Systems diagrams for each air, water and steam system. Diagrams may be single line.

E. In addition to information recorded for standard AABC, NEBB or TABB procedures, the following information is required:

1. Fan Data

2. System number, Location, Manufacturer, Model and Serial Number

3. Fan wheel type and size

4. Motor horse power, type and rpm

5. Drive size, type, number of grooves, and open turns on Variable Pitch Drives

6. Number and size of belts, motor and fan shaft sizes, center-to-center of shafts in inches, and adjustment available motor data, including nameplate data, actual amps, rated and actual motor rpm, volts, phase, hp, kW, starter heater size, and capacity

7. Fan design airflow and service (Supply, return, outdoor air or exhaust)

8. Fan static pressure, suction/discharge, static profile and static control point.

F. The following traverse data is required:

1. Traverse location, size of duct (inside dimensions), Area of duct in square feet

2. Column for each hole traversed/lines for each reading

3. Barometric pressure

4. Temperature/Static Pressure in the duct

5. Actual CFM corrected to SCFM

6. Notes

G. The following air distribution data is required:

1. Room identification

2. Outlet or intake balance sequence number

3. Size of outlet or inlet

4. AK Factor

5. Design and Actual FPM and CFM

6. Notes

H. The following hydronic coil data is required:

1. Air flow through the coil in CFM

2. Dry bulb and wet bulb temperatures entering/leaving coil

3. Enthalpy or total heat differences in BTU/lb.

4. Capacity in BTU/hr at time of test

5. Water temperature and pressure entering/leaving coil
6. Flow (in GPM) through coil
7. Air pressure drop across coil
8. Water head drop across coil
9. Notes

I. The following DX coil data is required:
1. Air flow through the coil in CFM
2. Dry and wet bulb temperatures entering/leaving coil
3. Enthalpy or total heat difference across coil in BTU/ lb.
4. Capacity in BTU/hr at time of test
5. Air pressure drop across coil
6. Notes

J. The following data is required for steam to water heat exchangers for heat and/or domestic generation:
1. Exchanger identification number
2. Nameplate data; manufacturer, model and serial number
3. Temperature entering/leaving unit
4. Flow through unit in GPM
5. Pressure drop through unit
6. Entering steam pressure
7. Notes

K. The following electric heating coil data is required:
1. Heating coil identification number
2. Nameplate data; manufacturer, model and serial number
3. Amperage/Voltage on each phase
4. Phase, kW and Stages
5. Safety device installed
6. Air pressure drop across coil
7. Notes

L. The following water-cooled chiller data is required:
1. Identification number
2. Nameplate data; manufacturer, model and serial number
3. Chilled water flow through evaporator in GPM

4. Water temperature entering/leaving evaporator
5. Pressure drop through evaporator
6. Condenser water flow through
7. Pressure drop through condenser
8. Water temperature entering/leaving condenser
9. Motor data, amps, volts, rpm, starter type, overload protection type, phase, hertz, nameplate, and actual measured kW input
10. Type of refrigerant
11. Notes

M. The following cooling tower data is required:
1. Identification number
2. Nameplate data; manufacturer, model and serial number
3. Performance test results for rated capacity
4. Water flow through the tower in GPM
5. Water temperature entering/leaving tower
6. Outside Air dry and wet bulb temperatures
7. Motor data, amps, volts, phase, hertz, and kW input
8. Starter size and type and heater size and capacity
9. Water droplets leaving tower - yes/no
10. Water balanced across tower pans and basins
11. Airflow across the tower within design rating according to fan curves
12. Notes

N. The following boiler and domestic water heater data is required:
1. Performance test results for rated capacity
2. Boiler identification number
3. Nameplate data; manufacturer, model and serial number
4. Water temperature entering/leaving the boiler
5. Outside conditions: temperature, humidity, general cloud cover
6. Barometric pressure

O. The following air-cooled split system condensing unit data is required:
1. Performance test results for rated capacity
2. Unit identification number
3. Nameplate data, manufacturer, model and serial number.

4. Compressor nameplate and actual amps, volts, phase, and hertz
5. RPM of motors, where applicable
6. Refrigerant type
7. Suction/Discharge pressure when gauge installed
8. Number of stages
9. Low-pressure/High-pressure control setting
10. Condenser fan sequence stages
11. Crankcase heater watts (nameplate)
12. Hot gas bypass installed - yes/no
13. SCFM Air Flow Measurement vs. Design CFM

P. The following air-cooled split system heat pump data is required:
1. Performance test results for rated heating and cooling capacities
2. Unit identification number
3. Nameplate data, manufacturer, model and serial number.
4. Compressor nameplate and actual amps, volts, phase, and hertz
5. RPM of motors, where applicable
6. Refrigerant type
7. Suction/Discharge pressure for both heating and cooling modes when gauge installed
8. Number of stages
9. Low-pressure/High-pressure control setting
10. Condenser fan sequence stages
11. Crankcase heater watts (nameplate)
12. Hot gas bypass installed - yes/no
13. SCFM Air Flow Measurement vs. Design CFM

Q. The following sound test data is required:
1. Area or location
2. Sound level in dB(A) as specified in Section 018620 “Test and Balance” 3.19.
3. Sound level at the center band frequencies of eight non-weighted octaves with equipment on and off for 5 rooms selected by the Inspector of Record/District Project Manager.
4. Plot corrected sound-level reading on Noise Criteria (NC) curve for the measurements in Q 3 above.

R. The following vibration test data is required:
1. Equipment identification number

2. Vibration levels at all accessible bearings, motors, fans, pumps, casings, and isolators
3. Measurements in mils defection and velocity in inches per second as specified per section XIV of this document
4. Each measurement taken in horizontal, vertical, and axial planes as accessible.

S. The following mixing damper leakage test data is required:
1. Equipment identification number (unit, box, zone, etc.)
2. Dry bulb temperature in the cold/hot (or bypass) deck
3. Dry bulb temperature in the mixed air stream
4. Calculated percent leakage
5. Data above taken in the full cool and full heat (or bypass) mode
6. Notes

T. The following airflow station data is required:
1. Station identification number
2. Nameplate data including effective area
3. Differential test pressure or velocity
4. Calculated CFM
5. Actual CFM (From Pitot tube traverse form)
6. Read out CFM
7. Notes

U. The following unit heater data is required:
1. Equipment identification number
2. Nameplate data; manufacturer, model and serial number
3. Test CFM (use manufacturer rated CFM if not ducted)
4. Heat test data per applicable procedure (hot water, electric, etc.)
5. Notes

V. The following fan coil and unit ventilator data is required:
1. Equipment identification number
2. Nameplate data; manufacturer, model and serial number
3. Tested supply CFM or manufacturer rated CFM if not ducted
4. Tested outside air in CFM
5. Motor data and actual amps and volts
6. Cooling/Heating test data
7. Static pressure

8. Notes

W. The following kitchen hood data is required:

1. Hood identification number
2. Nameplate data; manufacturer, model and serial number
3. Pitot-tube traverse total air flow
4. Exhaust and supply (when part of hood) CFM
5. Exhaust and supply (when part of hood) test velocities shown on hood face diagram
6. Face velocities
7. Hood opening dimensions
8. Notes (turbulence and flow patterns at the face and inside the hood)

X. The following laboratory hood data is required:

1. Hood identification number
2. Nameplate data; manufacturer, model and serial number
3. Pitot-tube traverse total air flow
4. Exhaust and supply (when part of hood) CFM
5. Exhaust and supply (when part of hood) test velocities shown on hood face diagram
6. Face velocities
7. Hood opening dimensions
8. Notes (turbulence and flow patterns at the face and inside the hood)

Y. The following data for water-to-water heat exchangers for domestic and/or heating is required:

1. Exchanger identification number
2. Nameplate data; manufacturer, model and serial number
3. GPM and Pressure drop through each side
4. Capacity of each side
5. Notes

Z. The following pump data, including but not limited to, chilled water, heating hot water, cooling tower water, boiler feed, domestic hot water booster, domestic hot water circulation, sewage ejectors, sump pumps and domestic hot water booster is required:

1. Pump number
2. Nameplate data; manufacturer, model and serial number
3. Motor data including nameplate data, actual amps, volts, RPM, horsepower, starter heater size and capacity
4. Pump discharge and suction pressure along with total dynamic head in the following modes

5. Shut-off head FT, Wide open Head FT and Final operating Head FT
6. Final GPM Test plotted on a pump curve
7. Notes

AA. The following water flow station data is required:

1. Station identification number
2. Nameplate data; manufacturer, model, and serial number
3. Design and actual GPM
4. Differential test pressure
5. Setting (open turns, degree, etc.) if required GPM
6. Notes

BB. The following terminal box data is required:

1. Box identification number
2. Node, address or designation on system
3. Box size
4. Cooling CFM
5. Minimum CFM (if applicable)
6. Heating CFM (if applicable)
7. Box fan amps and volts (if applicable)
8. For DDC controlled boxes, record computer readout maximum, minimum, and heat, along with box correction factor for calibrating to true CFM
9. Notes

3.07 PROCEDURES

A. Schedule the Work of this Section in order for test and balance activities to be completed prior to the date of Substantial Completion. Contractor shall place all heating, ventilating, and air conditioning equipment into operation during each day and until all HVAC adjusting, balancing, testing, demonstrations, and instructions on systems are completed. Agency shall prepare and submit reports within ten (10) days from completion of the Work of this Section to allow sufficient time for corrective measures to be completed before Substantial Completion of the Work. When an individual building or portion thereof is ready for occupancy, all equipment relative to such portion of Work shall be put into service, tested and balanced.

B. Prior to the date of Substantial Completion, and upon completion of test and balance Work, place all exhaust fans in operation, force all air handling units and air conditioning units into a 100% outdoor air economizer mode with heating and cooling locked out and flush the building continuously for a period of fourteen (14) days.

C. Coordinate test and balance procedures with any phased Project requirements so test and balance procedures on each phased portion of the Work will be completed prior to completion of said designated phase.

3.08 FIELD EXAMINATION

A. Before the commencement of test and balance Work, Contractor shall ascertain that following conditions are fulfilled:

1. Ensure that all water heating and water cooling systems have been flushed, cleaned, filled and high points vented
2. Boilers, steam and hot water, are filled
3. Refrigerant systems are fully charged with specified refrigerant
4. Over-voltage and current protection have been provided for motors
5. Equipment has been labeled as required
6. Curves and descriptive data on each piece of equipment to be tested and adjusted are available as required
7. Operations and maintenance manuals have been supplied
8. Controls manufacturer and boiler-burner representatives shall be available for consultation and supervision of adjustments during tests
9. Verify that heating and cooling coil fins are cleaned and combed and air filters clean and installed
10. Verify that duct systems are clean of debris and leakage is minimized, access doors are closed, and duct end caps are in place, fire and volume dampers are in place and open
11. Automatic control systems are completed and operating
12. Start up and initial commissioning of all HVAC equipment except fans shall be by the manufacturer.

B. In addition to the above, Contractor shall establish a specific, coordinated plan which details how each area of existing building will be balanced during the various phases of the Work. The evaluation shall address, at a minimum, the following concerns:

1. Owner operations
2. Building safety and security policies. Prior to any fire safety or security systems shutdown at any time during the Work, Contractor shall first advise and coordinate with Owner to ensure all concerned parties are notified.
3. Protecting furniture, computers, photocopiers, and other office equipment.
4. Protecting classroom fixtures and equipment.
5. Concerns specific and unique to building related issues.
6. Downtime required for each AHU including projected time to return each portion of the building back to its normal occupancy temperature and humidity.

7. Shutdown and reactivation of the fire alarm system to avoid accidental alarms during test and balance and related Work.

3.09 TEST AND BALANCE

A. For each heating, ventilating, or air conditioning system specific for the project in hand the following shall be performed, recorded and submitted in an approved format for review. Make, type, and model of unit, and location of each piece of equipment shall be included in the report. Readings shall include but not be limited to following:

1. Air Systems:

a. General

1) Verify all ductwork, dampers, grilles, registers, and diffusers have been installed per design and set in the full, open position. Agency shall perform the following TAB procedures in accordance with AABC or NEBB National Standards. Where the requirements of the two standards are different, the more stringent requirements shall prevail. Also, if the Contract Documents impose a more stringent standard then the Contract Documents shall prevail.

b. Zone, Branch and Main Ducts:

1) Adjust ducts to within design CFM requirements by means of Pitot-tube duct traverse.

c. Supply Fans:

1) Fan speeds: Test and adjust fan RPM to achieve maximum or design CFM. Contractor shall provide new belt pulleys when required.

2) Current and Voltage: Test and record motor voltage, and amperage, and compare data with the nameplate limits. Ensure fan motor is not in or above the service factor as published by the motor manufacturer.

3) Pitot-Tube Traverse: Perform a Pitot-tube traverse of main supply and return ducts, record total CFM.

4) Outside Air: Test and adjust the outside air using Pitot-tube traverse.

5) Static Pressure: Test and record system static profile of each supply fan.

6) Current and Voltage: Test and record motor voltage, and amperage, and compare data with the nameplate limits. Ensure fan motor is not in or above the service factor as published by the motor manufacturer.

d. Return, Relief and Exhaust Fans:

1) Fan speeds: Test and adjust fan RPM to achieve maximum or design CFM. Contractor shall provide new belt pulleys where required.

2) Pitot-Tube Traverse: Perform a Pitot-tube traverse of the main return ducts to obtain total CFM.

3) Static Pressure: Test and record system static profile of each fan.

e. VAV Systems:

1) Set volume regulators on all terminal boxes to meet design maximum and minimum CFM requirements.

2) Identification: Identify the type, location, and size of each terminal box. This information shall be recorded on terminal box data sheets.

f. Diffusers, Registers and Grilles:

1) Tolerances: Test and balance each diffuser, grille, and register to within 5% of design requirements.

2) Identification: Identify the type, location, and size of each grille, diffuser, and register. This information shall be recorded on air outlet data sheets.

g. Coils: Air Temperature: Once airflow is set to acceptable limits, agency shall take wet bulb and dry bulb air temperatures on the entering and leaving side of each cooling coil. Dry-bulb temperature shall be taken on the entering and leaving side of each heating coil.

h. Duct Leakage Testing:

1) On existing ductwork, agency shall calculate duct leakage by traversing the unit and reading associated diffusers.

2) On new installations each and every section of the entire air distribution system (all supply, return, exhaust and relief ductwork) shall be tested at one and one-half times (1-1/2) design static pressure. All ducts shall demonstrate 5% leakage maximum (per CBC 2013 Sec 905.7.3.).

i. Air Handling Units:

1) Prepare pressure profile and show design and actual CFM (outside air, return air, and supply air).

2) Measure and record each mode (minimum OA and 100% OA) where economizer cycle is specified.

3) Record pressure drops of all components (coils, filters, sound attenuators, louvers, dampers, and fans) and compare with design values.

4) Pressure profile and component pressure drops are performance indicators and are not to be used for flow measurements.

j. System Pressure Profiles:

1) Prepare pressure profiles from fan (supply, return exhaust) or air handling unit to extremities of system.

2) As a minimum, show pressure at each floor, main branch, and airflow, measuring device.

3) Make pilot tube traverses of all trunk lines and major branch lines where required for analysis of distribution system. Airflow measuring devices installed in ductwork, if available, may be utilized.

4) Record residual pressures at inlets of volume controlled terminals at ends of system.

5) Show actual pressures at all static pressure control points utilized for constant or variable flow systems.

k. Fan Speed Adjustments and Balancing for Optimum Acoustical Performance:

1) As the very first step, the speed of all fans (supply, return, exhaust, inside packaged equipment or air handling units) shall be adjusted to deliver the required fan total air quantity with all volume dampers and other flow rate control devices fully open. Adjustments shall be made with the outdoor air intake dampers, return air dampers and relief air dampers in the minimum outdoor air position. The adjustments shall be made again in the100% outdoor air position in systems with 100% outdoor air economizers.

2) The above adjustment shall be done with wet cooling coils where cooling coils are provided.

3) The airflow rates at each branch duct shall be adjusted as the second step with air with all volume dampers and other flow rate control devices fully open.

4) The airflow rates at each air inlet and outlet shall be adjusted as the final step. The volume damper in the branch duct shall be used for balancing. Opposed blade dampers at air inlets and outlets where provided shall only be used for fine adjustments and shall not be closed beyond 60% open or when the dampers start to generate audible noise.

5) Contractor shall provide the labor and materials for all dampers, pulleys and belt changes required for balancing. The design documents indicate the worst-case scenario with safety factors in fan static pressures for contingency. Properly coordinated and installed air systems may require a lower static pressure and a reduction in fan speed.

2. Water Systems: Contractor shall confirm all equipment, piping, and coils have been filled and purged, strainers are clean and all balancing valves (except bypass valves) are set full open. Agency shall perform the following TAB procedures in accordance with the AABC, TABB or NEBB National Standards:

B. Pumps:

1. Test and adjust chilled water, hot water, and condenser water pumps to achieve maximum or design GPM.

2. Measure and record suction and discharge pressures.

3. Check pumps for proper operation. Pumps shall be free of vibration and cavitation.

4. Current and Voltage: agency shall test and record motor voltage, and amperage, and compare data with the nameplate limits. Ensure pump motor is not in or above the service factor as published by the motor manufacturer.

5. Adjust pump flow by adjusting and setting balancing valves, to obtain amperage reading on a clamp-on ammeter, to correspond to amperage indicated on pump's curves for required flow.

6. Verify that the motor is not drawing more current than indicated on motor plate rating. When actual flows of primary pumps are found by test to vary more than 5% from specified amount, system shall be re-balanced to regulate flow within this tolerance. When a flow indicating device(s) is in circuit, it shall be used to verify pump flows.

7. When testing is completed, a pump capacity chart with pump number and location indicated shall be marked indicating operating point of pump on the curve. Chart shall then be included in the report.

C. Chillers: (Start-up and initial commissioning by manufacturer only.)

1. Test and balance chiller water flows to achieve maximum or design GPM.

2. Current and Voltage: Test and record motor voltage, and amperage, and compare data with the nameplate limits. Ensure compressor motor is not in or above the service factor as published by the motor manufacturer.

3. Test and record temperature and pressure profiles of chillers;

   a. Inlet and outlet water temperature.

   b. Inlet and outlet water pressure.

   c. Evaporator temperature.

   d. Condensing temperature pressure.

   e. Purge pressure.

   f. Oil temperature and pressure.

4. Outside Climatic Conditions: Outside air DB, WB, atmospheric conditions, during temperature profile runs.

D. Boilers: (Start-up and initial commissioning by manufacturer only.)Test and balance boilers only after test and balance of pumps have been completed. Boilers shall not be initially operated, or tests performed with students or faculty on the Project Site. Boilers shall be tested for the following:

1. Heating Hot Water Boilers and Domestic Hot Water Boilers:

   a. Current and Voltage: Test and record motor voltage, and amperage, and compare data with the nameplate limits. Ensure motor is not in or above the service factor.

   b. Test and balance water flow through water boilers.

   c. Test and record temperature and pressure profiles of water and/or steam boilers.

   d. Upon completion of tests, controls and devices shall be returned to their normal operating condition and boiler shall remain in service.

2. Steam Boilers: Start-up and initial commissioning by manufacturer only.

E. Heat Exchangers:

1. Steam to Hot Water Heat Exchanger: Steam pressure, entering and leaving hot water temperatures, gpm flow, pressure drop, and control set point.

2. Water to Water Heat Exchanger:

a. Primary Heating Water: Entering and leaving hot water temperatures, gpm flow, and pressure drop.

b. Secondary Heated Water: Entering and leaving hot water temperatures, gpm flow, pressure drop, and control set point.

F. Coils:

1. Tolerances: Test and balance all chilled-water and hot-water coils within 5% of design requirements.

2. Verify the type, location, final pressure drop and GPM of each coil.

G. System Mains and Branches including chilled water, heating hot water, cooling tower water, domestic hot water and domestic cold water:

1. Balance water flow in pipes to achieve maximum or design GPM.

H. Steam Heating Systems:

1. Heating Coils: Steam pressure at coils, cfm, coil pressure drop, entering and leaving air DB temperatures.

2. Boiler: Steam pressure, temperature and quantity of feed-water (see Testing and Adjusting procedures); boiler make, type, serial number and rated capacity; flue gas temperature at boiler outlet ahead of back-draft diverter; percent carbon dioxide in flue gas; condensate quantities and temperatures.

3. Air Conditioning Units: (Start-up and initial commissioning by manufacturer only.)

a. Suction pressure and temperature.

b. Discharge pressure and temperature.

c. Amps and volts.

d. Make, type, and model of unit, capacity rating.

e. Ambient temperature: WB, DB

f. Supply, return, relief and exhaust fans shall be balanced as indicated in Section 018629 “Test and Balance” 3.09A1, Air Systems.

g. Proper operation of controls: Temperature controllers and safety devices shall be tested during operating tests, with all other controls and devices, except one under test, being by-passed.

h. Upon completion of tests, controls and devices shall be returned to their normal operating condition and boiler shall remain in service.

4. Condensing and Refrigerating Units: (Start-up and initial commissioning by manufacturer only.)
    a. Suction pressure and temperature.
    b. Discharge pressure and temperature.
    c. Amps and volts.
    d. Make, type, and model of unit, capacity rating.
    e. Ambient temperature: WB, DB
    f. Proper operation of controls: Temperature controllers and safety devices shall be tested during operating tests, with all other controls and devices, except one under test, being by-passed.
    g. Upon completion of tests, controls and devices shall be returned to their normal operating condition and boiler shall remain in service.
5. Split System Heat Pump Units: (Start-up and initial commissioning by manufacturer only.)
    a. Suction pressure and temperature.
    b. Discharge pressure and temperature.
    c. Amps and volts.
    d. Make, type, and model of unit, capacity rating.
    e. Ambient temperature: WB, DB
    f. Supply, return, relief and exhaust fans shall be balanced as indicated in Section 018620 “Test and Balance” 3.09A1. Air Systems.
    g. Proper operation of controls:Temperature controllers and safety devices shall be tested during operating tests, with all other controls and devices, except one under test, being by-passed.
    h. Upon completion of tests, controls and devices shall be returned to their normal operating condition and boiler shall remain in service.
6. Miscellaneous:
    a. Electric Heaters:
        1) Amperage.
        2) Voltage.
        3) Make, type, model, and name plate capacity rating.

3.10 VERIFICATION OF HVAC CONTROLS

A. Agency shall verify in conjunction with Contractor all control components are installed in accordance with the intent of the Contract Documents and are functioning according to the design intent, including all electrical interlocks, damper sequences, air and water resets, fire stat's, and other safety devices.

B. Contractor shall verify all control components are calibrated and set for design operating conditions and intent.

3.11 TEMPERATURE TESTING

A. To verify system control and operation, agency shall perform a series of three temperature tests taken at approximately two-hour intervals in each separately controlled zone. The resulting temperatures shall not vary more than two (2) degrees Fahrenheit from the thermostat or control set point during the tests. Outside temperature and humidity shall also be recorded during the testing periods.

3.12 KITCHEN HOOD TESTING

A. Agency shall test and adjust hood total airflow by duct Pitot-tube traverse. If a Pitot-tube traverse is not practical, an explanation of why a traverse was not made must be made in writing to Architect and subsequently appear on the appropriate data sheet. Face velocities shall be tested under design operating conditions using a maximum of a one square foot grid pattern across the entire open face. Contractor shall set sash height on hoods to obtain face velocities within 20% of 100 feet per minute unless specified otherwise. Agency shall test and adjust exhaust airflows and make-up air flows to maintain design hood pressures and face velocities, and design room pressurization. Agency shall test for turbulence and proper air flow patterns at the face and inside the hoods using a hand-held smoke puffer or other approved smoke-emitting device.

3.13 BUILDING/ZONE PRESSURIZATION

A. Agency shall test and adjust building/zone pressurization by setting the design flows to meet the required flow direction and pressure differentials. Positive/Negative area(s) supply air shall be set to design flow and exhaust air rates adjusted to obtain the required pressure differential(s).

3.14 FIRE AND SMOKE DAMPER TESTING

A. This work is to be performed by Owner and State Fire Marshall. Do not include in agency scope of work.

3.15 LIFE AND SAFETY CONTROLS TESTING

A. This work is to be performed by Owner and State Fire Marshall. Do not include in agency scope of Work.

3.16 FINAL TABULATION

A. After heating, ventilating, and air conditioning components are satisfactorily tested and balanced, entire system shall be put into operation and all pressures, temperatures, gpm, cfm, velocities, etc., shall be recorded and checked against design schedules. Design requirements shall be listed on reports and final tabulation shall be within a tolerance of plus or minus 5% of design requirements.

B. Readings at various locations as described herein will be made every hour for four (4) hours, during normal working hours for three (3) days. Boilers, forced-air furnaces, and chillers shall be started up far enough in advance to meet design conditions during period of testing.

3.17 VIBRATION TESTING

A. Furnish instruments and perform vibration measurements if specified in Division 015. Provide measurements for all rotating HVAC equipment half horsepower and larger, including reciprocating/centrifugal/screw/scroll compressors, pumps, fans and motors.

B. Record initial and final measurements for each unit of equipment on test forms. Where vibration readings exceed allowable tolerance and efforts to make corrections have proved unsuccessful, forward a separate report to Architect.

3.18 SOUND TESTING

A. Perform and record sound measurements as specified in this section and if specified in Section 015070 “Sound Vibration and Seismic Control”. Take additional readings if required by Architect.

B. Take measurements with a calibrated Type 1 sound level meter and octave band analyzer.

C. Sound reference levels, formulae and coefficients shall be according to ASHRAE handbook, Current Systems Volume; Chapter: Sound and Vibration Control.

D. Determine compliance with the Contract Documents as follows:

1. Where sound pressure levels are specified as noise criteria or room criteria in Section 15070: Sound, Vibration and Seismic Control.

    a. Reduce background noise as much as possible by shutting off unrelated audible equipment.

    b. Measure octave band sound pressure levels with specified equipment "off".

    c. Measure octave band sound pressure levels with specified equipment "on".

    d. Use difference in corresponding readings to determine sound pressure due to equipment.

DIFFERENCE:	0	1	2	3	4	5	9-10 or More
FACTOR:	10	7	4	3	2	1	0

Sound pressure level, due to equipment, equals sound pressure level with equipment "on" minus factor.

    e. Plot octave bands of sound pressure level due to equipment for typical rooms, on a graph, which also shows, noise criteria (NC) curves.

2. When sound power levels are specified:

a. Perform steps in Section 3.19, D, 1.a. through 1.d.

b. For indoor equipment: Determine room attenuating effect; i.e., difference between sound power level and sound pressure level. Determine sound power level will be sum of sound pressure level due to equipment, plus room attenuating effect.

c. For outdoor equipment: Use directivity factor and distance from noise source to determine distance factor, i.e., difference between sound power level and sound pressure level. Measured sound power level will be sum of sound pressure level due to equipment, plus distance factor.

3. Where sound pressure levels are specified in terms of dbA, measure sound levels using the "A" scale of meter. Single value readings will be used instead of octave band analysis.

E. Where measured sound levels exceed specified level, Contractor shall take all remedial action and necessary sound tests shall be repeated.

F. Measure and record sound levels in decibels at each diffuser, grille or register in occupied areas. Sound levels shall be measured approximately 5'-0" above floor on a line approximately 45 degrees to center of opening, on the "A" and "C" scales of a General Radio Company sound level meter, or similar instrument.

G. Report shall also include ambient sound levels of rooms in which above openings are located, taken without air-handling equipment operating. A report shall also be made of any noise caused by mechanical vibration.

END OF SECTION 01 8620

SECTION 01 9113

GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Commissioning

1. Commissioning is a systematic process of ensuring that all building systems perform interactively according to the Owner's project requirements and operational needs. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing adjusting and balancing, performance testing and training.

2. Commissioning during the construction phase is intended to achieve the following specific objectives:

   a. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing Contractors

   b. Verify and document proper functional performance of equipment and systems

   c. Verify that O&M documentation left onsite is complete.

   d. Verify that the Owner's operating personnel are adequately trained.

1.02 RELATED WORK

A. Division 01 – General Requirements

1. Section 013300 – Submittals

2. Section 017700 – Closeout Procedures

B. Division XX – Plumbing

1. Section XXXXXX – Commissioning of Plumbing

C. Division XX – Heating, Ventilating, and Air Conditioning

1. Section XXXXXX – Commissioning of HVAC

D. Division XX – Electrical

1. Section XXXXXX – Commissioning of Electrical Systems

1.03 ABBREVIATIONS AND DEFINITIONS

A. A/E: Design Professional

B. ASI: Architectural Supplemental Instruction

C. BAS: Building Automation System

D. BoD: Basis of Design. A narrative of how the designer plans to achieve the OPR

E. CxA: Commissioning Authority

F. CxS: Commissioning Supervisor

G. CC: Controls Contractor

H. District Project Manager: District Project Manager / Owner Project Manager

I. Cx: Commissioning

J. CxA: Commissioning Authority

K. CxS: Commissioning Supervisor

L. Cx Plan: Commissioning Plan

M. Cx RFI: Commissioning Request for Information

N. DDC: Direct Digital Control System

O. Deficiency: A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents and cannot be corrected in five (5) minutes time.

P. EC: Electrical Contractor

Q. FBO: Furnished By Others

R. FT: Functional Performance Test

S. GC: General Contractor

T. IAW: In Accordance With

U. MC: Mechanical Contractor

V. O&M: Operation and Maintenance

W. OPR: Owner Project Requirement. A dynamic document expressing how the Owner expects the building systems to perform upon project completion.

X. PC: Prefunctional Checklist

Y. RFI: Request for Information

Z. SI: Systems Integration Contractor

AA. Sub(s): Subcontractors or Prime Contractor

BB. TAB: Test, Adjust and Balance

CC. TBD: To Be Determined

1.04 EQUIPMENT AND SYSTEMS TO BE COMMISSIONED

A. Plumbing Systems (and all integral equipment controls)

1. Instantaneous Hot Water Heaters
2. Gas-Fired Water Heater
3. Domestic Hot Water Circulation Pump
4. Air Compressor (existing)

B. Mechanical Systems (and all integral equipment controls)

1. Air Handling Units
2. Variable Air Volume Terminal Units
3. Fan Coil Units
4. Exhaust Fans
5. Building Automation System

C. Electrical Systems (and all integral equipment controls)

1. Exterior and Interior Lighting
2. Emergency Lighting
3. Light Control System

D. Exterior Improvements (and all integral equipment controls)

1. Landscape Irrigation System
2. Irrigation Control System

1.05 COMMISSIONING TEAM COORDINATION

A. Members

1. The members of the commissioning team consist of the Commissioning Authority (CxA), the District Project Manager facilities personnel, the CxS, the MC, the EC, the TAB representative, the SI, and any other installing Subs or suppliers of equipment. In addition,

representatives of the A/E team are also commissioning team members and are invited to observe critical procedures and attend Cx coordination meetings.

B. Management

1. The CxA is hired by the Owner and directs and coordinates the commissioning activities and reports to the District Project Manager. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.

C. Scheduling

1. The CxA shall work with the General Contractor, according to established protocols, to project an initial commissioning schedule. The General Contractor shall integrate the tentative commissioning schedule into the master schedule. All parties shall address scheduling problems and make necessary notification in a timely manner in order to expedite the commissioning process. The functional testing will not begin until the CxA is notified in writing by the General Contractor that all pre-functional checklists have been completed and the Subcontractors have functionally tested the systems.

2. The CxA will provide the initial schedule of primary commissioning events at the commissioning scoping meeting. As construction progresses, more detailed schedules are developed by the CxA and General Contractor.

1.06 SUBMITTALS

A. The General Contractor shall provide the CxA a list of required equipment/system submittals to the CxA. The CxA will identify submittals to be submitted to the CxA concurrent with submission to the A/E for review.

B. All Subs, through the General Contractor, shall submit required installation, start-up, and preventive maintenance equipment data sheets to the CxA within 45 days of equipment approval by the A/E.

C. All Subs, through the General Contractor, shall submit O&M data for system and equipment being commissioned under this specification. O&M data shall be submitted within 45 days of equipment approval by the A/E, but no less than 8 weeks prior to the beginning of functional testing.

D. The General Contractor shall submit a copy of the construction meeting minutes, updated Construction Schedule, RFI log, and ASI log to the CxA within seven days of each meeting or update.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Division Contractor for the equipment being

tested. For example, the mechanical Contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC and control systems in Division 23.

B. Special equipment, tools, instruments, and setup software (only available from vendor/Subs, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be provided by the Contractor and left onsite, for the CxA and their test/adjust/balance (TAB) firm to use during TAB, functional testing, seasonal testing, and deferred testing. The equipment, tools, instruments, and setup software will be returned to the vendor/Subs after successful conclusion of the commissioning effort.

C. The controls Contractor shall provide the CxA with temporary software license to be loaded on the CxA's and/or TAB firm's computer, and any necessary network connection cables, for accessing the direct digital control system field panels for system testing. The controls Contractor shall also provide a palm device with attachments, software, and cables, to check setpoint values of terminal device controllers. The controls Contractor shall provide the CxA with log-on ID, password, and modem phone number for remote dial-in connection to direct digital control system. All of the software, cables, and modems provided to the CxA will be returned at the successful conclusion of the commissioning effort.

D. All testing equipment used by the Contractors shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements shall apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.1°F and a resolution of +/- 0.1°F. Humidity sensors shall have a certified calibration within the past 6 months and a resolution of +/- 1%. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. Accuracy of other sensors shall be at least twice that of the instrumentation being tested. All equipment shall be calibrated according to the manufacturer's recommended intervals, in addition to just after being dropped or damaged. Calibration tags shall be affixed or certificates readily available.

PART 3 - EXECUTION

3.01 COMMISSIONING PROCESS

A. The following narrative provides an overview of the commissioning tasks during construction and the general order in which they occur.

1. Commissioning during construction begins with a scoping meeting conducted by the CxA where the commissioning process and the draft Cx Plan is reviewed with the commissioning team members. After this meeting, the draft Cx Plan, which is initially provided prior to the scoping meeting, is then updated with the project specific communication protocols, Cx team contact information, and the preliminary commissioning schedule, which is developed during the scoping meeting.

2. Additional meetings will be conducted as needed throughout construction. The District Project Manager, CxA and General Contractor will schedule these meetings with necessary parties attending. The meetings will be conducted in order to plan, scope, coordinate, schedule future activities and resolve problems. In general, the commissioning meetings will be held monthly during the construction period.

3. Equipment documentation is submitted to the CxA, concurrent with the normal submittals to the A/E, including detailed pre-startup checklists and startup procedures. Specific submittals requirements are detailed as referenced above, and in Subsection 1.06 above.

4. The CxA works with the General Contractor and its Subs in developing startup plans and startup documentation formats, including providing the Subs with pre-functional checklists to be completed, during the startup process. The pre-functional checklists are developed by the CxA for the equipment listed in Subsection 1.04 above, using the A/E approved submittals.

5. In general, the checkout and performance verification proceeds from simple to complex, from component level to equipment to systems and intersystem levels with pre-functional checklists being completed before functional testing.

6. The CxA will review shop drawings and material certifications, review reports from independent testing agencies, conduct independent onsite periodic construction observation and attend selected quality control-related and construction progress meetings.

7. The Subs, under their own direction, execute and document the pre-functional checklists and perform startup and initial checkout. The CxA documents that the checklists and startup were completed by the Subs. This will include the CxA witnessing start-up of selected equipment.

8. The CxA develops specific equipment and system functional performance test procedures. The CxA submits the proposed functional tests to the District Project Manager, A/E and General Contractor for their review and comment, and provides a copy of the proposed functional tests to the responsible Sub who shall review the tests for feasibility, safety and equipment warranty protection.

9. O&M data is submitted to the CxA prior to execution of functional tests. The CxA reviews the documentation for completeness. The CxA also uses the documentation for reference during the functional testing.

10. Manufacturers will perform and document all specified Factory Testing and start-up. Copies of test reports are provided to the A/E and CxA for review.

11. The functional test procedures are executed by the Contractor, under the direction of, and documented by the CxA.

12. Items of non-compliance in material, installation or startup are corrected at the Sub's expense and the system retested.

13. The CxA reviews and pre-approves the training provided by the Subs and verifies that it was satisfactorily completed.

14. Commissioning is completed before Owner occupancy/use.

15. Deferred testing is conducted, as specified in these Specifications.

3.02 RESPONSIBILITIES

A. General Contractor

1. Shall verify completeness of the building envelope, perimeter and interior items, which affect proper operation and control of equipment and systems.

2. Shall schedule and coordinate participation and cooperation of all Subcontractors required for the commissioning process.

3. Shall incorporate commissioning tasks into the master Construction Schedule.

4. Shall be responsible for providing written responses to the CxA's submittal review comments.

5. Shall provide a Commissioning Supervisor (CxS) who will be responsible for communication between each individual Contractor/Subcontractor and the CxA. This representative shall be responsible to: coordinate meetings, plan and schedule Cx activities into the project schedule, distribute Cx documentation to responsible Contractors, receive written notification from Contractors that Cx issues are corrected, perform corrective actions for resolution of deficiencies, and handle required submittals to the CxA.

6. Review and approve the completion of the PCs, then notify the CxA that functional testing can proceed.

7. Ensure Installing Contractors or their Vendors provide all specialized tools or the use of specialized tools that may be required to start, check-out and functionally test equipment and systems.

8. Shall meet requirements of other commissioning requirements within the Project Manual.

9. Shall schedule and coordinate participation and cooperation of all Subcontractors and vendors in Owner training.

10. Shall provide final operation and maintenance documentation in formats required including submission in scanned digital media format. Provide to CxA for the required Systems Manual.

B. Subcontractors/Suppliers

1. Shall be responsible for providing labor, material, equipment, etc., required within the scope of their specialty to implement and facilitate the commissioning process.

2. Shall include all special tools, software, and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these contract documents in the base bid price to the Contractor, except for stand-alone data-logging equipment that may be used by the CxA.

3. Shall demonstrate the operation of the equipment and systems is per the contract documents.

4. Shall assist the General Contractor in the development of the master schedule as relates to commissioning and milestones.

5. Shall respond in writing to written submittal review comments by the CxA.

6. Shall respond in writing as to the completion or resolution of each issue in the commissioning issue log.

7. Shall meet requirements of other commissioning requirements within the Project Manual.

8. Shall provide to General Contractor and CxA information required for the Systems Manual per CALGreen criteria.

C. Owner

1. Schedules the participation of facilities personnel in the commissioning process in writing.

2. Advises the CxA of any changes to the building's use or occupancy.

3.03 MEETINGS

A. Scoping Meeting: The CxA will schedule, plan, and conduct a commissioning scoping meeting with the entire commissioning team in attendance. Meeting minutes will be distributed to all parties by the CxA within two weeks after the meeting. Information gathered from this meeting will allow the CxA to revise the Commissioning Plan to its “final” version.

B. Miscellaneous Meetings: Other meetings will be planned and conducted by the CxA as construction progresses. These meetings will cover coordination, deficiency resolution, and planning issues with particular Subcontractors.

3.04 START-UP, PRE-FUNCTIONAL CHECKLISTS, AND INITIAL CHECKOUT

A. The following procedures apply to all equipment and building systems to be commissioned, according to Subsection 1.4, EQUIPMENT AND SYSTEMS TO BE COMMISSIONED. Some systems that are not comprised so much of actual dynamic machinery, e.g., electrical system power quality, may have very simplified PCs and start-up.

B. General. Prefunctional checklists are important to ensure that the equipment and systems are completely installed and integrated with other building components and systems, hooked up and operational. It ensures that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment or assembly receives full Prefunctional checkout. No sampling strategies are used. The Prefunctional testing for a given system must be successfully completed prior to formal functional performance testing of the equipment or subsystems of the given system.

C. Start-up and Initial Checkout Plan. The CxA shall assist the commissioning team members responsible for start-up of any equipment in developing detailed start-up plans for all equipment. The primary role of the CxA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed. Parties responsible for

Prefunctional checklists and start-up are identified in the commissioning scoping meeting and in the checklist forms. Parties responsible for executing functional performance tests are identified in the testing requirements in Specification Sections 220800, 230800, 260800, 320800 and any other sections where test requirements are found.

1. The CxA generates generic and representative Prefunctional checklists and procedures as required in Specification Sections 220800, 230800, 260800 and 320800. These checklists will indicate required procedures to be executed as part of start-up and initial checkout of the systems and the party responsible for their execution.
2. These generic checklists and tests are provided by the CxA to the Contractor. The Contractor determines which trade is responsible for executing and documenting each of the line item tasks and notes that trade on the form. Each procedure and associated forms may have more than one trade responsible for its execution.
3. The Subcontractor responsible for the purchase of the equipment develops the full start-up plan by combining (or adding to) the CxA's checklists with the manufacturer's detailed start-up and checkout procedures from the O&M manual and the normally used field checkout sheets. The plan will include checklists and procedures with specific boxes or lines/fields for recording and documenting the checking and inspections of each procedure and a summary statement with an initial block/ "completed by" associated with each procedure. The responsible party marks the applicable areas in the procedures and makes initial and date lines at each test procedure.
4. The full start-up plan could consist of something as simple as:
    a. The CxA's pre-functional checklists.
    b. The manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
    c. The manufacturer's normally used field checkout sheets.
5. The Subcontractor submits the full start-up plan to the CxA for review and approval.
6. The CxA reviews and approves the procedures and the format for documenting them, noting any procedures that need to be added.
7. The full start-up procedures and the approval form may be provided to the District Project Manager for review and approval, depending on management protocol.

3.05 FUNCTIONAL PERFORMANCE TESTING

A. The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of material completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.

B. In general, each system shall be operated through all modes of operation where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions shall also be tested. Specific modes required in this project are given in Specification Sections 230800, 260800 and any other sections where test requirements are found.

C. The CxA shall review Owner-contracted, factory testing or required Owner acceptance tests which the CxA is not responsible to oversee, including documentation format, and shall determine what further testing or format changes may be required to comply with the *Specifications*. Redundancy of testing shall be minimized.

D. The Subs shall provide sufficient notice to the CxA regarding their completion schedule for the Prefunctional checklists and start-up of all equipment and systems. The CxA will schedule functional tests through the District Project Manager, General Contractor, and affected subs. The CxA shall direct, witness and document the functional testing of all equipment and systems. The CxA shall generally execute most standard tests with initial participation of the affected subs.

3.06 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation

1. The CxA will witness and document the results of all functional performance tests using the specific functional checklist forms developed for that purpose. Prior to testing, these forms are provided to the A/E, District Project Manager and Subs for review.

B. Non-Conformance

1. The CxA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues will be noted and reported to the District Project Manager in writing.

2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented.

3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CxA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the District Project Manager. A test shall be aborted if any system deficiency prevents the successful completion of the test or if any participating Contractor team member of which participation is specified is not present for the test.

4. As tests progress and a deficiency is identified, the CxA discusses the issue with the executing Contractor.

   a. When there is no dispute on the deficiency and the Sub accepts responsibility to correct it:

      1) The CxA documents the deficiency and the Sub's response and intentions and they go on to another test or sequence. After the day's work, the CxA

submits the non-compliance reports to the District Project Manager for signature, if required. A copy of the deficiencies is provided to the General Contractor and Subs. The Sub corrects the deficiency, then signs-off that the correction has been made, certifying that the equipment is ready to be retested and sends it back to the CxA.

2) The CxA reschedules the test and the test is repeated.

b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:

1) The deficiency shall be documented, along with the Sub's response, and a copy given to the District Project Manager, the General Contractor and to the Sub representative assumed to be responsible.

2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the District Project Manager.

3) The CxA documents the resolution process.

4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, signs-off that the correction is complete, and provides the written sigh-off to the CxA. The CxA and General Contractor shall reschedule the test, and the test is repeated.

5. Cost of Retesting

a. The cost for the Sub to retest a pre-functional or functional test, if they are responsible for the deficiency, shall be theirs.

b. The time and expenses for the CxA to direct any retesting, above one retest, required because a specific pre-functional checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be back charged to the General Contractor, who may choose to recover costs from the responsible Sub.

6. The General Contractor shall respond in writing to the CxA and District Project Manager at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.

7. Any required retesting by any Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the prime Contractor.

C. Failure Due to Manufacturer Defect

1. If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the General

Contractor, the District Project Manager, the A/E, or the CxA. In such case, the responsible Sub shall provide the Owner with the following:

a. Within one week of notification from the District Project Manager, the Sub or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the District Project Manager within two weeks of the original notice.

b. Within two weeks of the original notification, the Contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.

c. The District Project Manager will determine whether a replacement of all identical units or a repair is acceptable.

d. Two examples of the proposed solution shall be installed by the Sub and the District Project Manager will be allowed to test the installations for up to one week, upon which the District Project Manager will decide whether to accept the solution.

e. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

f. The time and expenses for the CxA to direct any retesting, above one retest, required because of an equipment failure, will be back charged to the General Contractor, who may choose to recover costs from the responsible Sub. An example would be motor failures in series powered terminal induction units. Once all motors have been replaced, pre-functional checklists completed, and documents submitted that all repairs and corrections have been completed; the CxA will direct one retest. If any failures occur during the retest, the CxA will back charge the General Contractor for additional testing.

D. Approval

1. The CxA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CxA, if necessary. The CxA recommends acceptance of each test to the District Project Manager. The District Project Manager gives final approval on each test.

3.07 OPERATION AND MAINTENANCE MANUALS

A. Standard O&M Manuals.

1. The specific content and format requirements for the standard O&M manuals are detailed in Section 017700. Special requirements for TAB Contractor in appropriate Division 23 Sections and for the Controls Contractor are found in appropriate Division 23 Sections. Electrical requirements are located in the appropriate Division 26 Sections. A/E

Contribution. The A/E will include in the beginning of the O&M manuals a separate section describing the systems including:

a. The design intent narrative prepared by the A/E, updated to as-built status by the A/E.

b. Simplified professionally drawn single line system diagrams on 8 ½" x 11" or 11" x 17" sheets. These shall include chilled water distribution system, water system, condenser water system, heating system, supply air systems, and exhaust systems and others as designated. These shall show major pieces of equipment such as pumps, heat exchangers, humidifiers, control valves, expansion tanks, coils, service valves, etc.

c. Completed Testing, Adjusting and Balancing reports.

d. As-built sequences of operations for all equipment including detailed sensor ranges and initial setpoints.

e. Seasonal operational guidelines by the equipment and system manufacturer.

f. Data sheets for all sensors and actuators by type and use for the equipment and systems including recommendations for recalibration.

g. Troubleshooting and diagnostic information for all equipment and systems.

h. Preventative maintenance procedures for all equipment and systems.

2. CxA Review and Approval. Prior to material completion, the CxA shall review the O&M manuals, documentation and redline as-builds *for systems that were commissioned* and list other systems documentation that the CxA should review to verify compliance with the *Specifications.* The CxA will communicate deficiencies in the manuals to the District Project Manager or A/E, as requested. Upon a successful review of the corrections, the CxA recommends approval and acceptance of these sections of the O&M manuals to the District Project Manager or A/E. The CxA also reviews each equipment warranty and verifies that all requirements to keep the warranty valid are clearly stated. This work does not supersede the A/E's review of the O&M manuals according to the A/E's contract.

3.08 TRAINING OF OWNER PERSONNEL

A. The General Contractor shall be responsible for training coordination and scheduling and ultimately for ensuring that training is complete.

B. The CxA will be responsible for overseeing and approving the adequacy of the training of Owner personnel for commissioned equipment.

1. Instructor capabilities shall be commensurate with level of instruction required. Instructor qualifications shall be submitted to Owner and CxA for review prior to training.

2. The specific training requirements of Owner personnel by Subs and vendors are specified in Divisions 01, 22, 23, 26 and 32.

3. Each Sub and vendor responsible for training shall submit a written training plan to the CxA for review and approval prior to training. The plan shall include the following elements:

   a. Equipment (included in training)

   b. Intended audience

   c. Location of training

   d. Objectives

   e. Subjects covered (description, duration of discussion, special methods, etc.)

   f. Duration of training on each subject

   g. Instructor name and qualifications for each subject

   h. Methods (classroom lecture, video, Project Site walk-through, actual operational demonstrations, written handouts, etc.)

4. The CxA develops criteria for determining that the training was satisfactorily completed, including attending some of the training, etc. The CxA recommends approval of the training to the District Project Manager.

3.09 DEFERRED TESTING

A. Unforeseen Deferred Tests

1. If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the District Project Manager, A/E and CxA. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated.

B. Seasonal Testing

1. During the warranty period, seasonal testing shall be completed as part of this contract. Seasonal testing is intended to test the performance of systems under full load conditions that cannot be simulated during the functional testing period. For example, it is impossible to test the heating system under full load conditions in July, so the heating system would be full load tested during the winter months. The CxA will coordinate this activity. Tests will be executed, documented, and deficiencies corrected by the appropriate Subs, with facilities staff and the CxA witnessing. The General Contractor and its Subs will make any final adjustments to the O&M manuals and as-builts due to this testing.

END OF SECTION 01 9113

SECTION 02 2600

ABATEMENT OF HAZARDOUS MATERIALS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Abatement of hazardous materials identified in the Hazardous Materials Phase I Assessment Report, except for underground storage tanks, contaminated soil or groundwater. Furnish labor, materials, supplies, and incidentals required, protect Project site personnel and the surrounding public from exposure to potentially hazardous substances, and prevent the spread of potentially contaminated or hazardous substances.

2. The furnishing of labor, supervision, materials, equipment, tools, permits, manifesting, and services required in the characterization, transportation, and disposal of identified or suspected hazardous substances. The suspect substance may be in drums, containers, stockpiled, or may exist as debris piles on the Project site.

B. Related Requirements:

1. Section 00 3126 - Existing Hazardous Materials Information.

2. Division 01 - General Requirements.

3. Section 02 4116 - Demolition

4. Section 02 8213 - Asbestos Abatement

5. Section 02 8333 - Lead Abatement and Lead Related Construction Work.

C. Regulatory Requirements shall include, but not be limited to: Comply with laws, ordinances, codes, rules, and regulations of the Federal, State and local authorities having jurisdiction over any of the Work specified herein. Comply with federal EPA and state Department of Transportation regulations for shipping of hazardous substances to offsite disposal facilities. Comply with any regulatory requirements imposed by the treatment, storage, and disposal facility. Regulations pertaining to the transport and disposal of hazardous substances/materials include, but are not limited to, the following:

1. Department of Transportation 49 CFR 172 through 179.

2. Department of Transportation 49 CFR 387 (46 FR 30974, 47073).

3. Department of Transportation DOT-E 8876.

4. Environmental Protection Agency 40 CFR 136 (41 FR 52779).

5. Environmental Protection Agency 40 CFR 261, 262 and 761.

6. Resource Conservation and Recovery Act (RCRA).

D. Any transporter of hazardous substances shall be licensed in the state in which handling and transportation will take place in accordance with applicable regulations.

E. Comply with OSHA (Occupational Safety and Health Administration) Standards and Regulations contained in Title 29 Code of Federal Regulations, Part 1910.120 "Hazardous Waste Operations and Emergency Response."

F. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.02 QUALITY ASSURANCE

A. The Work of this Section shall be performed by an entity possessing the following minimum qualifications:

1. Contractors License in the state where the Work is performed, supplemented by a Hazardous Waste specialty license, where applicable (i.e., California).

2. MCS 90 Endorsement on Liability Insurance.

3. Pollution Liability Insurance in the amount of $2,000,000 occurrence.

4. Forty-hour OSHA Training and site-specific health and safety plan for its employees proposed to work at the Project site as defined in 29 CFR 1910.120.

5. A Comprehensive Quality Assurance Plan on file with the California Environmental Protection Agency.

6. Project site personnel shall wear personal protective equipment and protective clothing consistent with the levels of protection required for this Work as specified by OSHA (29 CFR Part 1910.120).

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 ABATEMENT OF HAZARDOUS MATERIALS

A. Abate hazardous materials including hazardous materials identified in the Phase I Assessment Report.

B. The Work of this section does not include the removal of underground storage tanks, contaminated soil or groundwater, unless specifically authorized in writing by the OAR.

3.02 CONTAINMENT OF RELEASED SUBSTANCES

A. If a hazardous material appears to be leaking or otherwise spreading, contain the release of the material. Provide measures to prevent the release of the material to the environment and protect Project site personnel, adjacent properties and occupants, and the general public from potential exposure.

B. During the course of substance containment or evacuation of Project site personnel, protect personnel (onsite workers, non-workers, or the general public) from contact with or exposure to the released substances.

C. The abatement or evaluation of any suspected hazardous material shall only be performed by properly trained and/or certified personnel.

3.03 HEALTH AND SAFETY

A. In an emergency or imminent hazard situation the health and safety of personnel on or near the Project site are the responsibility of the Work of this section. Immediately notify the Owner office of Environmental Health and Safety (OEHS) and the OAR designated representative of the Owner Consultant. Owner representatives will notify Federal, State and Local regulatory authorities, if required.

B. Project site personnel or members of the general public who have been exposed to or have come in contact with any hazardous materials or chemicals shall be immediately transported to the nearest hospital.

3.04 TESTING, TRANSPORT, AND DISPOSAL OF HAZARDOUS SUBSTANCES

A. Collect one composite sample from each media type (solid, liquid, or sludge) of potentially hazardous substance stored in drums, stockpiled, or otherwise identified at the Project site for the purposes of obtaining approvals for proper transport and disposal of the suspect materials. Submit analytical results to a representative of the Owner Consultant, as designated by the OAR.

B. If required, overpack any leaking or deteriorated drums to prevent leaks or spills, and pack small 5-gallon containers into larger new 55-gallon drums. Cover solid waste

materials and stockpiled soils with an HDPE liner to prevent storm water runoff from contaminating surrounding areas.

C. Prepare manifests, material profiles, and submit lab analysis for drums/containers and any other documentation required by the receiving facility for signature by a representative of the Owner Consultant and/or Owner, as designated by the OAR. Copies of waste profiles, manifests, and disposal documentation shall be submitted to the OAR designated representative of the Owner, prior to disposal and/or transporting of hazardous substances.

D. Coordinate waste sampling and analysis requirements with the disposal facility and properly complete profiling and transport documents prior to loading and transport.

E. A State registered "Hazardous Waste Hauler" shall transport the waste to a lawfully permitted and Owner approved facility.

F. Prior to transport, a copy of the hazardous waste manifest shall be transmitted by facsimile, through the Project site Owner Consultant, to the Owner Office of Environmental Health and Safety (OEHS) for review and approval. The manifests shall list the generator's name as "Los Angeles Unified School District" and the mailing address as "1449 S. San Pedro Street, Los Angeles, CA 90015". The OAR designated representative of the Owner Consultant shall provide the Project site specific generator's EPA ID # which shall be included on the manifest. Attach the land disposal restriction (LDR) form to the manifest prior to submission to the Owner office of OEHS. The blue and yellow manifest copies and a copy of the LDR form shall be mailed to the Owner office of OEHS at 1449 S. San Pedro Street, Los Angeles CA 90015. Other copies of the manifest and LDR shall be submitted to the waste transporter.

G. Load, handle, and transport 55-gallon drums and other waste containers to the appropriate disposal facility in accordance with Federal and State regulations.

H. Transport documentation from the receiving facility verifying acceptance and receipt of drums/containers at the facility and sampling and associated test results shall be submitted to the representative of the Owner Consultant, as designated by the OAR, within fifteen days following receipt of hazardous substances to the disposal facility.

I. Materials identified as hazardous wastes under RCRA are not permitted to remain at the Project site more than 30 days after being deemed to be a hazardous waste. During this period of Project site storage, provide precautions to contain and prevent the release of hazardous or potentially hazardous materials to the environment.

END OF SECTION

SECTION 02 4116

DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Furnishing labor, materials and equipment necessary for demolition, dismantling, cutting and alterations as indicated, specified, or required for completion of the Work. Includes items such as the following:

1. Protection of existing improvements to remain.

2. Cleaning existing improvements to remain.

3. Disconnecting and capping utilities.

4. Removing debris, waste materials, and equipment.

5. Removal of items for performance of the Work.

6. Salvageable items to be retained by the Owner.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 01 1100 - Summary of Work.

3. Section 01 5000 - Construction Facilities and Temporary Controls.

4. Section 01 7329 - Cutting and Patching.

5. Section 01 7419 - Construction and Demolition Waste Management.

6. Division 22 –- Plumbing.

7. Division 26 –- Electrical.

1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating the extent of items and systems to be removed. Indicate items to be salvaged or items to be protected during demolition. Indicate locations of utility terminations and the extent of abandoned lines to be removed. Include details indicating methods and location of utility terminations.

1.03 QUALITY ASSURANCE

A. Perform the Work of this section by workers skilled in the demolition of buildings and structures. Perform the Work of this section under direct superintendence at all times.

B. Prior to commencement of Work, schedule a walkthrough with the OAR, to confirm Owner property items have been removed from scheduled Work areas. Identify and mark remaining property items and schedule their removal.

C. Coordinate demolition for the correct sequence, limits, and methods. Schedule demolition Work to create least possible inconvenience to the public and facility operations.

D. Related Standard: ANSI/ASSE A10.6.

1.04 PROJECT CONDITIONS

A. Drawings may not indicate in detail all demolition Work to be performed. Examine existing conditions to determine the full extent of required demolition.

B. Repair damage to existing improvements or damage due to excessive demolition.

C. Provide all measures to avoid excessive damage from inadequate or improper means and methods, improper shoring, bracing or support.

D. If conditions are encountered that varies from those indicated, promptly notify the Architect for clarification before proceeding.

PART 2 - PRODUCTS

2.01 HANDLING OF MATERIALS

A. Items scheduled for salvage by the Owner shall be delivered to a location designated by the OAR. Items shall be cleaned, packaged and labeled for storage.

B. Items scheduled for reuse shall be stored on the Project site and protected from damage, theft and other deleterious conditions.

PART 3 - EXECUTION

3.01 GENERAL

A. Protection:

1. Do not commence demolition until safety partitions, barricades, warning signs and other forms of protection are installed. Refer to Section 01 5000 - Construction Facilities and Temporary Controls.

2. Provide safeguards, including warning signs, lights and barricades, for protection of workers, occupants, and the public.

B. If safety of existing construction appears to be endangered, take immediate measures to correct such conditions; cease operations and immediately notify the OAR.

3.02 DEMOLITION

A. Do not throw or drop materials. Furnish ramps or chutes as required by the Work.

B. Remove existing construction only to extent necessary for proper installation of Work and interfacing with existing construction. Cut back finished surfaces to straight, plumb or level lines as required for a smooth transition.

C. Where openings are cut oversize or in improper locations, replace or repair to required condition.

3.03 CUTTING EXISTING CONCRETE

A. Cutting of existing concrete shall be performed by skilled workers familiar with the requirements and space necessary for placing concrete. Perform concrete cutting with concrete cutting wheels and hand chisels. Do not damage concrete intended to remain.

B. Extent of cutting of structural concrete shall be as indicated on Drawings. Cutting of non-structural concrete shall be as indicated on Drawings or as reviewed by the Architect or structural engineer. Replace concrete demolished in excess of amounts indicated.

C. Prior to cutting or coring concrete, determine locations of hidden utilities or other existing improvements and provide necessary measures to protect them from damage.

3.04 REMOVAL OF EXISTING PLUMBING AND ELECTRICAL EQUIPMENT AND SERVICES

A. Remove existing plumbing and electrical equipment fixtures and services not indicated for reuse and not necessary for completion of the Work. Remove abandoned lines and cap unused portions of existing lines.

3.05 REMOVAL OF OTHER MATERIALS

A. Masonry: Cut back to joint lines and remove mortar without damaging units to remain. Allow space for repairs to backing where applicable.

B. Woodwork: Cut or remove to a joint or panel line.

C. Roofing: Remove as required, including accessory components such as insulation and flashings. At penetrations through existing roofing, trim cut edges back to sound roofing with openings restricted to the minimum size necessary to receive Work.

D. Sheet Metal: Remove back to joint, lap, or connection. Secure loose and unfastened ends or edges and provide a watertight condition. Re-seal as required.

E. Glass: Remove broken or damaged glass and clean rebates and stops of glazing channels.

F. Modular materials such as acoustical ceiling panels, resilient tile, or ceramic tile: Remove to a natural joint without leaving damaged or defective Work where joining new Work. After flooring removal, clean substrates to remove setting materials and adhesives.

G. Gypsum Board: Remove to a panel joint line on a stud or support line.

H. Plaster: Saw cut plaster on straight lines, leaving a minimum 2-inch width of firmly attached metal lath for installing new lath and plaster.

I. Remove existing improvements not specifically indicated or required but necessary to perform Work. Cut to clean lines, allowing for installation of Work.

3.06 PATCHING

A. Patch or repair materials to remain when damaged by the performance of the Work of this section. Finish material and appearance of patch and/or repair Work shall match existing.

3.07 CLEANING

A. Clean existing materials to remain with appropriate tools and equipment.

B. Protect existing improvements during cleaning operations.

C. Debris shall be dampened by fog water spray prior to transporting by truck.

D. Debris pick-up area shall be kept broom-clean and shall be washed daily with clean water.

E. Remove waste and debris, other than items to be salvaged. Turn over salvaged items to Owner, or store and protect for reuse where required. Continuously clean up and remove items as demolition Work progresses.

F. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 02 8213

ASBESTOS ABATEMENT AND ASBESTOS RELATED DISTURBANCE

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Abatement of building and/or structure related Asbestos.

2. Removal of building and/or structure related Asbestos.

3. Disturbance of building and/or structure related Asbestos.

B. Related Requirements:

1. Section 00 3126 - Existing Hazardous Material Information

2. Division 01 - General Requirements.

3. U.S. Environmental Protection Agency Regulations for Asbestos (Title 40, Code of Federal Regulations, Part 61, Subparts A and B, and Part 763, Subpart E.)

4. Title 8, Article 4, California Code of Regulations Construction Industry Safety Orders, Section 1529 "Asbestos" or current revised California regulations.

5. South Coast Air Quality Management District (SCAQMD) Rule 1403.

1.02 SECTION DEFINITIONS AND ACRONYMS

A. Abatement – Procedures to control fiber release from Asbestos Containing Materials or Asbestos Containing Construction Materials. Includes Removal, Encapsulation, Enclosures, Repair, Demolition, and Renovation activities but does not include Asbestos Related Disturbance.

B. AHERA - Asbestos Hazard Emergency Response Act, 40 CFR, Part 763, Subpart E, and subsequent amendments.

C. Air Filtration and Ventilation System - A portable exhaust system, equipped with HEPA filtration, and capable of maintaining a constant air flow into a Regulated Area from adjacent areas and exhausted outside the Regulated Area.

D. Amended Water - Water to which a surfactant (wetting agent) has been added.

E. ANSI - American National Standards Institute.

F. Asbestos - Means the asbestiform varieties of chrysotile (Serpentine); crocidolite (Riebecktite); amosite (cummingtonitegrunerite); anthophyllite; tremolite; and actinolite.

G. Asbestos Containing Construction Material (ACCM) – Means any manufactured construction material which contains more than one tenth of one percent (0.1 percent) Asbestos by weight.

H. Asbestos Containing Material (ACM) – Means any material containing more than one-percent (1 percent) Asbestos.

I. Asbestos Containing Waste (Non-hazardous) – Non-Friable Asbestos Containing Material including, but not limited to, floor covering, roofing materials and cementitious materials requiring disposal.

J. Asbestos Containing Waste (Hazardous) – Friable Asbestos Containing Materials and Asbestos contaminated objects and debris requiring disposal.

K. Asbestos Related Disturbance – is the drilling, coring, removal or similar disturbance of ACCM or ACM not to exceed three square feet in any one opening and not to disturb 100 square feet or greater cumulatively on any one project (contract).

L. ASTM - American Society for Testing and Materials.

M. Building ID Number or Code - A six digit alphanumeric identification code assigned to each building on an Owner site, also referred to as the insurance code, ID number or similar terms.

N. Bulk Samples - Samples of building or other materials collected for analysis to determine the presence and quantities of Asbestos.

O. Class I, II, III, and IV asbestos work has the meaning as defined in California Code of Regulations Title 8, Section 1529.

P. Clean Room - An uncontaminated area or room, which is a part of the worker Decontamination Enclosure System with provisions for storage of worker's street clothes and clean protective equipment.

Q. Competent Person - Has the same meaning as defined in the California Code of Regulations Title 8, as it relates to, "Competent Person."

R. Controlled Disturbance – An activity by which a contractor disturbs an asbestos containing material or an asbestos containing construction material using the work practices allowed for in this specification and in compliance with regulatory limitations.

S. Curtained Doorway – A device to allow ingress and egress from one room to another while permitting minimal air movement between the rooms, typically constructed by placing two overlapping sheets of plastic over an exiting or temporarily framed doorway, securing each along the top of the doorway, securing the vertical edge of one sheet along

one vertical side of the doorway and securing the vertical edge of the other sheet along the opposite vertical side of the doorway. Other effective designs may be submitted for review.

T. Decontamination – The process of eliminating Asbestos contamination from building surfaces, objects, and property, by cloths, mops, or other utensils dampened with water and disposed of afterwards as Asbestos contaminated waste.

U. Decontamination Enclosure System – Means an enclosed area, which is adjacent and connected to the Regulated Area, consisting of an Equipment Room, Shower Room, and Clean Room for the Decontamination of workers, materials, and equipment contaminated with Asbestos.

V. Demolition - The wrecking or taking out of any load supporting structural member of a facility together with any related handling operations.

W. DOSH - Division of Occupational Safety & Health or Cal/OSHA.

X. DOT – Department of Transportation.

Y. DTSC – Department of Toxic Substances Control.

Z. Encapsulating Material - A liquid material applied to Asbestos Containing Materials which controls the possible release of Asbestos fibers from the material either by creating a membrane over the surface (bridging agent) or by penetrating into the material and binding its components together (penetrating Encapsulating Material).

AA. Encapsulation - The application of an Encapsulating Material to Asbestos Containing Materials to prevent the release of Asbestos fibers into the air.

BB. Enclosure - The construction or application of an airtight, impermeable, permanent barrier around Asbestos Containing Material to control the release of Asbestos fibers into the air.

CC. Equipment Room - A room within the worker Decontamination Enclosure System with provisions for storage of used clothing and equipment and for controlled transfer of materials and equipment into and out of the regulated area.

DD. Facility Component – Means any part of a facility including equipment.

EE. FETU - Facilities Environmental Technical Unit.

FF. Fixed Object - A piece of equipment, furniture, or improvement in the Work area, which cannot be removed from the Work area.

GG. Friable Asbestos - Asbestos Containing Material which, when dry, can be crumbled, pulverized or reduced to a powder by hand pressure or as defined by current regulations.

HH. Glove Bag Technique - A method with limited applications for removing small amounts of Asbestos Containing Material from short piping runs, valves, joints, elbows, and other non-planar surfaces in a Work area. The glove bag assembly is a manufactured or fabricated device consisting of a glove bag (typically constructed of 6 mil transparent polyethylene or polyvinyl chloride plastic), two inward projecting long sleeves gloves, an internal tool pouch, and labeled for Asbestos waste. The glove bag is constructed and installed in such a manner that it surrounds the object or material to be removed and contains asbestos fibers released during the process. Workers who are permitted to perform the Glove Bag Technique shall be thoroughly trained, experienced, and skilled in this method.

II. Hazardous Waste - Means Friable Asbestos generated and prepared for waste disposal. Does not include non-friable material or materials containing one-percent or less of Asbestos as determined by PLM and/or the point counting method.

JJ. HEPA Filter - Means a filtering system capable of trapping and retaining at least 99.97 percent of mono-dispersed particles 0.3 microns in diameter or larger. For respirators this shall include NIOSH rated P-100 cartridges only.

KK. HEPA Vacuum - A vacuum system furnished with HEPA filtration.

LL. High Volume Vacuum - A vacuum system with the capacity to collect material through a four inch diameter hose a minimum distance of 150 feet. This system shall be furnished with HEPA Filter at the air exhaust port and water applicators within the hopper.

MM. HVAC – Heating, Ventilation, and Air Conditioning System.

NN. Location Code - Refers to a unique four digit numeric code assigned by the Owner to each of its Project sites.

OO. Lockdown Coat – A material applied to surfaces where Asbestos has been completely removed. The manufacturer shall determine the concentration of this material.

PP. Member – A component part of a structure complete in itself.

QQ. Movable Object - A portable piece of equipment or furniture in the Work area, which can be removed from the Work area.

RR. NESHAP - National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61).

SS. NIOSH - National Institute for Occupational Safety and Health.

TT. Outside Air - Air outside of buildings and structures.

UU. Owner Consultant (OC) - Refers to the firm, company or individual designated by the Owner.

VV. PCM - Phase Contrast Microscopy as it relates to clearance air, personnel exposure assessment, and ambient air monitoring. This procedure must follow the NIOSH Method 7400, Asbestos Fibers by PCM.

WW. PLM - Polarized Light Microscopy used for bulk sample analysis with dispersion staining for the determination and quantifying of Asbestos in Bulk Samples building materials.

XX. Regulated Area - Designated rooms, spaces or areas of the Project in which asbestos Abatement actions are to be performed or which may become contaminated as a result of Abatement activities. A contained Work area is a Work area, which has been sealed and furnished with a Decontamination Enclosure System. A non-contained Work area is an isolated or controlled access Work area, which has not been sealed or furnished with a Decontamination Enclosure System.

YY. Removal – Means operations where ACM and/or PACM is removed or stripped from structures or substrates including Demolition.

ZZ. Renovation – Means the modifying of any existing structure, facility, or portion thereof.

AAA. SCAQMD – South Coast Air Quality Management District.

BBB. Shower Room - A room between the Clean Room and the Equipment Room in the worker Decontamination Enclosure System furnished with hot and cold running water controllable at the tap, and suitably arranged for complete showering during Decontamination.

CCC. Small Scale Short Duration – Such work not to exceed amounts greater than those which can be contained in a single glove bag or may not exceed amounts which can be contained in a single prefabricated mini-enclosure. Such an enclosure shall conform spatially and geometrically to the localized work area, in order to perform its intended containment function, and as completely defined in 40CFR, 763, Subpart E, Appendix C.

DDD. Staging Area - Areas near the Waste Transfer Airlock where containerized Asbestos waste is temporarily placed prior to permanent removal from the Work area.

EEE. Surfactant - A chemical wetting agent added to water.

FFF. TEM - Transmission Electron Microscopy as defined for Asbestos clearance air monitoring within AHERA. This procedure must follow the NIOSH Method 7402, Asbestos Fibers by TEM.

GGG. TSI - Thermal System Insulation as defined in AHERA.

HHH. USEPA or EPA – United States Environmental Protection Agency.

III. Visible Emissions - Any emissions from a known or suspected Asbestos Containing Material that is visually discernible.

JJJ. Waste Transfer Airlock - A Decontamination system provided for transferring containerized waste from inside to outside of the Work area.

1.03 POLICIES AND PROCEDURES

A. The Owner has a zero tolerance policy for uncontrolled Asbestos releases during construction or Abatement Work. An Asbestos release requiring an emergency response is any uncontrolled release of Asbestos Containing Construction Materials. The Owner shall be immediately notified of such uncontrolled releases.

B. Pre-qualified Asbestos Abatement Subcontractors are not permitted to subcontract any Abatement work to a lower tier Subcontractor without the prior written approval of the Owner.

C. Where ACM is damaged or disturbed, except during Controlled Disturbance or Abatement, Work in that room shall cease, the room be vacated immediately, the Owner Consultant notified of the disturbance with corrective action provided as required by the Owner Consultant.

1.04 ROLES AND RESPONSIBILITIES

A. Roles and Functions:

1. Coordinate the Work of this section directly with the Owner and/or Owner Consultant.

2. Work under this section shall be performed in strict accordance with applicable Federal, State, and Local regulations, standards, and codes governing asbestos Abatement and any other Work performed in conjunction with the Asbestos Abatement Work.

3. The most recent edition of any relevant regulation, standard, document, or code is in effect. Where conflict among the requirements or with this Specification exists, the most stringent requirement shall be provided.

1.05 SITE SECURITY

A. The Work area shall be restricted to authorized, trained, and protected personnel. A list of authorized personnel shall be established by the Owner Consultant prior to commencement of the Work and posted at the entrance of the Regulated Area.

B. Report to the Owner Consultant any unauthorized entry into the Regulated Area. Following notification, a written report of the incident shall be provided to the Owner Consultant.

C. A logbook shall be maintained at the entrance of the Regulated Area. Persons entering the Regulated area shall record their name, company affiliation, time in, and time out for each entry and exit.

D. Access to the contained area shall be through the worker Decontamination Enclosure System or other room established when worker Decontamination Enclosure System is not required. Other means of access shall be blocked or locked to prevent entry to or exit from the Work area. The only exceptions are the waste pass-out airlock, which shall be sealed except during the Removal of containerized Asbestos waste from the Work area, and emergency exits in case of fire or accident. Emergency exits shall be operable from inside the Work area; however they shall be sealed with polyethylene sheeting and tape.

E. Maintain Regulated Area security during Abatement Work. Regulated Areas and ancillary equipment accessible to non-authorized personnel shall be protected from unauthorized access by constructing a minimum barrier of 3/8 inch CDX plywood supported by 2 by 4 studs, 16 inches on center. Height shall be as required to safely access Regulated Area. An access door shall be provided with hasp and padlock sufficient to prevent unauthorized entry. A key shall be provided to the Owner and Owner Consultant. Required barriers within an occupied building shall be furnished with sheathing as required by state and local fire protection regulations.

F. The protective barrier for a High Volume Vacuum shall be a minimum of eight feet in height. Barriers for these systems may be constructed of chain link type fencing instead of the specified barriers. Such fencing, if provided, shall be covered with an opaque covering resistant to environmental conditions. This barrier system shall be maintained at times while the enclosed equipment is on the Project site.

G. Unless otherwise specified, remove barriers upon completion of the Work of this section. Repair and/or replace to original condition, damage resulting from installation, use, and removal of the barriers.

1.06 EMERGENCY PLANNING

A. Emergency planning and procedures shall be developed, submitted, reviewed, and agreed to by the Owner prior to the commencement of Abatement Work.

B. Emergency procedures shall be provided in the written languages understood by employees working on the Project and shall be prominently posted at the entrance of the Decontamination Enclosure System. Prior to entering the Work area, parties must read and sign these procedures to acknowledge receipt and understanding of the Work site layout, location of emergency exits, and emergency procedures.

C. Emergency planning shall consider the effects of fire, explosion, toxic atmospheres, electrical hazards, slips, trips and falls, confined spaces, and heat related injury. Develop and provide written procedures and training to employees.

D. Employees shall be trained in evacuation procedures in the event of workplace emergencies.

E. In the event of non-life threatening situations requiring medical treatment, injured or otherwise incapacitated employees shall decontaminate following normal procedures with assistance from fellow workers if necessary, before exiting the Work area.

F. In the event of life threatening injury or illness requiring immediate medical treatment, worker Decontamination shall be given minimum priority. Provide measures to stabilize the injured worker, remove them from the Work area and secure proper medical treatment.

G. Telephone numbers of emergency response personnel shall be prominently posted at the entrance of the Decontamination Enclosure System along with the location of the nearest telephone. In addition to the 911 emergency number, post the address and telephone number of the nearest emergency medical services provider.

H. Provide at least one employee on the Project site at times during progress of Abatement work that is trained and certified in first aid and cardiopulmonary resuscitation (CPR). This employee shall be identified by name and proof of training shall be provided to the Owner Consultant prior to the commencement of the Work of this section.

I. Provide at least one 4A/60BC dry chemical extinguisher in the Equipment Room and one at each corner of contained areas in excess of 1,000 square feet. Workers shall be trained in the proper operation of fire extinguishers.

J. Emergency exits shall be provided and clearly marked with arrows or other clearly visible markings to permit easy identification from anywhere within the Work area. Exits shall be secured to prevent access from uncontaminated areas while still permitting emergency egress. Exits shall be properly sealed with polyethylene sheeting, which can be cut to permit emergency egress. Emergency exits may lead through the worker Decontamination Enclosure, the waste removal airlock or other alternative exits as required by fire officials.

1.07 LICENSING

A. The Work of this section shall be performed by an entity duly licensed in the State of California in accordance with the provisions of Chapter 9 of Division 3 of the Business and Professions Code, as amended. The Abatement work of this section shall be performed by an entity holding a license with an "ABS" Asbestos Certification as issued by the Contractors State License Board.

B. The entity performing the Work of this section, other than Asbestos Related Disturbance involving less than 100 square feet shall be registered with the Department of Industrial Relations in accordance with the provisions of Section 6501.5 of the California Labor Code.

1.08 ASBESTOS RELATED REQUIREMENTS

A. Qualifications:

1. Comply with the provisions of the California Labor Code, Division 5, Part 1, as it pertains to safety in employment and the applicable provisions of Title 8, Chapter 4, Subchapters 1 through 21, California Code of Regulations (CCR) as it pertains to Occupational Safety and Health, and Subchapter 7, Section 5208 Article 4, and Section 1529, Asbestos regulations.

2. Where Electrical Work is required in a Regulated Area this work shall be performed as required in Division 16 and personnel who enter a Contained and Regulated Class I and II Asbestos work area are required to possess a current EPA certification as an Asbestos worker. Personnel who enter a Class III Asbestos Related Disturbance work area shall require personnel trained in accordance with AHERA Operations and Maintenance training requirements.

B. Abatement Activities:

1. The Asbestos Abatement work shall be performed by persons who comply with applicable Federal, State, and local regulations including AHERA certified training.

2. Supply labor, materials, services, insurance, permits, and equipment necessary to perform the Work in accordance with applicable Federal, State, and Local regulations and this Specification.

3. For Class I asbestos work, collect pre-Abatement air samples. Results shall be submitted prior to commencement of the Work of this section. Include location of Samples, name of air sampling professional, equipment, and methods utilized for sampling and analysis.

4. Submit weekly job progress reports detailing Abatement activities for Projects with schedules that exceed thirty days of Abatement work. Include review of progress with respect to previously established Milestones and schedules, major problems and action taken, injury reports, equipment breakdown, and air sampling results.

5. Within five workdays of transport and/or disposal, submit copies of transport manifests, disposal receipts, and weight certificates for Asbestos waste removed from the Work area during the Abatement process. Weight certificates shall indicate in pounds the net weight of waste disposed from the Project site as indicated on the manifest.

6. Submit copies on a daily basis of the Work site entry logbooks.

7. Submit logs on a weekly basis documenting filter changes on respirators, HEPA Vacuums, HEPA Filtered ventilation units, water filtration units, and other approved engineering controls.

8. Submit results of materials testing conducted during Asbestos Abatement work for purposes of utilization during such activities. (i.e., depth test, substitution materials, etcetera).

9. Where Decontamination Enclosure System is required, post at the entrance a list containing the names, addresses, and telephone numbers of the entity performing the Work of this section, designated Competent Person, the Owner and/or Owner Consultant, the testing laboratory and any other personnel who may be required to access the Work area or perform services during the Abatement Work.

10. For employee review, post at the entry of the Work area a copy of the scope of Work, special conditions, the current standard Specifications, and the applicable prevailing wage.

C. Asbestos Related Disturbance:

1. The Asbestos Related Disturbance Work shall be performed by persons who comply with applicable Federal, State, and local regulations including AHERA certified training.

2. Within ten days of analysis, submit results of air sampling data collected for Cal/OSHA compliance air monitoring during the course of the Asbestos Related Disturbance (Class III asbestos work). If this data is used to discontinue use of employee protective equipment then the data shall be provided before discontinuing use of protective equipment.

3. Within five workdays of transport and/or disposal of Asbestos Containing Waste, submit copies of transport manifests and/or disposal receipts.

1.09 SUBMITTALS

A. Provide in accordance with Division 01 and this section.

B. Prior to commencement of the Asbestos Abatement work of this section, submit the following notices, documentation, Shop Drawings, and Product Data:

1. For Projects involving Asbestos Containing Materials 100 square feet or more, provide a typed written notification in accordance with Rule 1403 of SCAQMD and 40 CFR Part 61.146 of Subpart M to the SCAQMD, and to and in accordance with the Division of Occupational Safety and Health prior to start of the Work. For Projects within the geographical limits of Los Angeles City, provide an additional copy of the SCAQMD notice to the Los Angeles City Fire Department, marked "COURTESY COPY."

2. Submit to the Owner, satisfactory proof the required permits, site location, and arrangements for transport and disposal of Asbestos Containing Waste materials have been completed in accordance with California Health and Safety Code, Section 25143.7. Obtain and submit a copy of handling procedures and a list of protective equipment utilized for Asbestos disposal at the landfill.

3. Submit to the Owner satisfactory documentation that employees, including foremen, supervisors, and any other company personnel or agents who may be exposed to airborne Asbestos fibers or who may be responsible for any aspects of Asbestos Abatement work or Asbestos Related Disturbance have received adequate training that includes, at a minimum, information as described within this section and as required by AHERA.

4. Prior to commencement of Abatement Work, personnel required to construct and enter the Work area or handle containerized Asbestos Containing Materials shall have received adequate training, in accordance with the requirements of this Specification and by 40 CFR, Part 763, Subpart E (AHERA) and Title 8, Section 1529, of the California Code of Regulations applies.

5. Special Project site training for equipment and procedures unique to this Project site shall be provided as required.

6. Training in emergency response and evacuation procedures shall be provided to personnel performing Asbestos Abatement work of this section.

7. Submit documentation from a physician certifying that employees are medically monitored and are physically capable of working while wearing the required respiratory protection without suffering adverse health effects as required by California D.O.S.H regulations. Where such documentation is required, the certification shall state that the employee or agent is approved to work with Asbestos and wear a respiratory protection without restrictions. Provide information to the examining physician about unusual conditions in the workplace environment that may impact on the employee's ability to perform Abatement Work activities.

8. Submit Shop Drawings for layout and construction of Decontamination Enclosure Systems and barriers for isolation of the contained Asbestos Abatement work area as detailed in this Specification and required by applicable regulations.

9. When used, submit manufacturer's certification that HEPA Vacuums, air filtration units, and other local exhaust ventilation equipment complies with ANSI Z9.2.

10. Submit Product Data verifying that air filtration devices (i.e., air filtration units and vacuums) for use on this project have been registered or certified, as applicable, in compliance with the SCAQMD Rules.

11. If rental equipment is to be furnished in Abatement Work areas or to transport Asbestos contaminated waste, written notification concerning the intended use of the rental equipment shall be provided to the rental agency with a copy submitted to the Owner.

12. Document NIOSH approvals for respiratory protective devices furnished as required by the Work. Include manufacturer certification of HEPA filtration capabilities for cartridges and filters.

13. Submit documentation of respirator fit testing for employees and agents entering the Abatement work area or areas where respiratory protection is required. This fit testing shall be performed in accordance with DOSH regulations.

14. Submit a Sample of forms to be used in documenting required items to be submitted and/or reviewed.

C. Provide other required submittals specified as part of the Work of this section.

1.10 PRE-ABATEMENT MEETING

A. Attend a meeting to be held prior to the commencement of Abatement Work. Attending this meeting shall be representatives of the Owner, the Owner Consultant if applicable, and the testing/monitoring personnel who shall actually participate in the testing/monitoring program. Secure the attendance of the individual who will be the Project site Competent Person for the Abatement Work.

B. Included in the general preconstruction meeting will be a discussion of requirements and submittals for Asbestos Related Disturbance, where such applies.

C. At this meeting provide required submittals except for those to be submitted during progress of the Work. In addition, provide detailed information concerning:

1. Preparation of Work area and Shop Drawings. (Abatement Only).

2. Personal protective equipment, including respiratory protection and protective clothing. (Abatement, and Asbestos Related Disturbance if required).

3. Employees who will participate in the Project, including delineation of experience, training, and assigned responsibilities during the Work. (Abatement and Asbestos Related Disturbance).

4. Decontamination procedures for personnel, Work area, and equipment. (Abatement and Asbestos Related Disturbance).

5. Abatement methods and procedures to be provided. (Abatement Only).

6. Required air monitoring procedures (pre-Abatement and SCAQMD requirement **[Abatement Only]**, and Cal/OSHA mandatory **[Abatement and Asbestos Related Disturbance]**).

7. Procedures for handling and disposing of waste materials, including disposal facility. (Abatement and Asbestos Related Disturbance).

8. Procedures for final Decontamination and cleanup. (Abatement Only).

9. A sequence of Work activities and performance schedule. (Abatement Only).

10. Procedures for dealing with heat stress. (Abatement Only).

11. Emergency procedures. (Abatement Only).

1.11 CLOSE OUT DOCUMENTATION

A. Provide the following close out documentation:

1. Filter change logs for air filtration units, water filtration units and respirators. (Abatement Only).

2. Foreman's daily job reports. (Abatement Only).

3. Employee entry/exit logs for containment. (Abatement Only).

4. Visitor entry/exit logs for containment. (Abatement Only).

5. Manometer printout reports for applicable containment. (Abatement Only).

6. Air sample results for personnel (Abatement and Asbestos Related Disturbance).

7. Air Samples for Abatement Work areas and air filtration units. (Abatement Only).

8. Copies of hazardous and non-Hazardous Waste manifests. (Abatement and Asbestos Related Disturbance).

9. Hazardous Waste weight tickets. (Abatement Only).

10. Signed Daily Personnel Report Forms. (Abatement Only).

11. Signed code of conduct form from each employee working on a Project. (Abatement Only).

12. Signed asbestos Abatement Project Personnel Logs. (Abatement Only).

B. Receipt of the last workday attendance log and the daily personal monitoring results shall be submitted within two days upon completion of the Abatement Work of this section.

PART 2 – PRODUCTS

2.01 Materials and Equipment:

A. Materials

1. Products: The following products have been specifically approved for use as encapsulants/lock-down or bridging agents for Owner asbestos abatement and asbestos related construction projects and lead abatement and lead related construction projects. Products not approved by the Owner shall not be used.

a. Asbestos Removal Encapsulant: Foster 32-60 blue by Foster Products Corporation; removal, lock down or penetrating with dilution.

b. Asbestos Bridging Encapsulant: Foster 32-80 by Foster Products Corporation; for pipe covering and boiler lagging.

c. A-B-C Fiberspray 6410 and 6422SP by Fiberlock Technologies, Inc.; for coring, small jobs and gloves bags.

d. A-B-C Asbestos Binding Compound 6421, 6422 and 6423 by Fiberlock Technologies, Inc.; for general use, removal, lock down, penetrating and bridging; good for soils.

e. Fiberset PM 7475 clear by Fiberlock Technologies, Inc.; compatible with flooring.

f. Fiberset PM 7470 white by Fiberlock Technologies, Inc.; compatible with flooring.

g. Lag-Kote by Fiberlock Technologies, Inc.; multi-use product including fireproofing and thermal system insulation.

h. Lag-Klothe by Fiberlock Technologies, Inc.;water activated repair cloth for pipes, boilers and breaching.

2. General:

a. Deliver materials in the original sealed packages, containers, or bundles bearing the name of the manufacturer and brand name.

b. Store materials subject to damage off the ground, away from wet or damp surfaces, and under cover sufficient enough to prevent damage or contamination. Replacement materials shall be stored outside of the Abatement Work area until area is cleared for normal occupancy.

c. Damaged, deteriorating or previously used materials shall not be furnished and shall be removed from the Project site and legally disposed of.

d. A sufficient supply of disposable mops, rags, and sponges for Abatement Work area Decontamination shall be provided.

e. Unless otherwise specified, the Owner will provide water and power for construction purposes. Connect to existing system as required.

3. Asbestos Related:

a. Plastic, polyethylene sheeting or visqueen shall be a fire retardant type. Provide documentation from the manufacturer verifying compliance with this requirement.

b. Where a contained work area is required for Abatement Work, a minimum of two layers of 4-mil polyethylene sheeting shall be installed for walls. For floors and other installations, polyethylene sheeting of at least 6-mil thickness shall be furnished in sufficient widths to minimize the frequency of joints.

c. Method of attaching polyethylene sheeting shall be reviewed prior to installation and/or commencement of Abatement Work. Method of attaching polyethylene sheeting shall not cause damage to equipment, finish surfaces, or other property.

d. Polyethylene sheeting furnished for the Decontamination Enclosure System shall be opaque white or black in color and shall be a minimum of 6-mil thick.

e. Disposal bags shall be of 6-mil polyethylene, with the outer bag pre-printed with labels as required by SCAQMD and applicable Cal/OSHA and DOT requirements at a minimum.

f. Apply labels as per SCAQMD, Cal/OSHA, and DOT requirements for disposal containers.

g. Provide warning signs as required by CAL/OSHA.

h. Surfactant (wetting agent) shall be a material that, when tested, demonstrates a surface tension of 29 dynes/cm as tested in its properly mixed concentration, using ASTM method D1331 - Surface and Interfacial Tension of Solutions of Surface Active Agents. Where Work area temperature may cause freezing of the Amended Water solution, the addition of approved antifreeze in a manufacturer recommended amount is permitted.

B. Equipment

1. General:

   a. Equipment delivered to the Project site shall be free of Asbestos and/or fibrous debris. No equipment with Asbestos and/or fibrous debris in or on it is permitted on Owner properties.

   b. Provide sufficient lighting to illuminate the Work area for safe visual working conditions and to clearly examine surfaces.

   c. Provide a sufficient supply of scaffolds, ladders, lifts, and hand tools that meet applicable Federal, State, and local regulations.

   d. Provide non-metallic dustpans, squeegees, and shovels for cleanup.

2. Asbestos Related:

   a. A sufficient quantity of air filtration ventilation units furnished with HEPA filtration and operated in accordance with ANSI Z9.2-79 and EPA guidance documents shall be furnished to provide one workplace air change every 15 minutes creating -0.02 column inches of water pressure differential everywhere within the contained area when compared to the pressure outside the area. For small Enclosures and glove bags, a HEPA Filtered vacuum system may be furnished to provide the pressure differential. A log documenting the filter change history of each unit is required before use. Any unit without this log shall have filters changed and the unit decontaminated.

   b. Provide a printable manometer for determining and recording the pressure differential within the isolated Work area as compared with the ambient environment. A printed record is required for the duration of the Project. The manometer shall operate 24 hours per day with a printed differential reading not to exceed fifteen minute intervals.

   c. High volume vacuum equipment shall be provided during soil Removal operations unless otherwise specified.

   d. Provide sprayers with pumps in a quantity capable of providing Amended Water in sufficient quantities to adequately wet materials during Asbestos Abatement activities. Provide spray bottles or adequate equipment necessary to keep materials impacted by Asbestos Related Disturbance adequately wet.

   e. Non-skid footwear shall be worn by Abatement workers. Disposable clothing shall be adequately sealed to the footwear to prevent body contamination.

   f. Provide other required safety equipment to workers and authorized visitors.

g. When roll-off disposal containers are delivered to a Project site, four wheels of each container shall be moved and rested upon a sheet of plywood no smaller than four-foot by four-foot by ¾ inch minimum.

2.02 EMPLOYEE PERSONAL PROTECTIVE EQUIPMENT

A. Respiratory Protection:

1. Where respirators are required these shall be provided for protection from particulate contaminants as required by the National Institute of Occupational Safety and Health.

2. The respirators provided shall furnish a protection factor as required by CCR Title 8, Section 1529 for the fiber concentration in the work area. When powered air purifying respirators are provided, a sufficient supply of charged replacement batteries, filters, and a flow test meter shall be provided in the Clean Room area. Air purifying respirators with dual HEPA Filters may be provided during Work area preparation activities.

3. Provide spectacle kits and eyeglasses for employees who wear glasses and must wear full-face respirators.

B. Fit Testing:

1. Workers must perform positive and negative air pressure fit tests each time a respirator is donned, whenever the respirator design so permits. Powered air purifying respirators shall be tested for adequate flow as specified by the manufacturer.

2. Workers shall be undergo a qualitative fit test in accordance with procedures detailed in the D.O.S.H. requirements for respirators provided to comply with the requirements of this Project. An appropriately administered quantitative fit test may be substituted for the qualitative fit test.

3. Where respirators are required, documentation of adequate respirator fit must be provided to the Owner Consultant.

4. No one wearing a beard shall be permitted to don a respirator and enter the Work area.

5. Where respirators are required, a minimum of two additional respirators of each type and training on their donning and use must be provided at the Work site for authorized visitors required to enter the Work area.

C. Protective Clothing:

1. Where protective clothing is required, full body disposable protective clothing, including head, body, and foot coverings, shall be provided to workers and authorized visitors in sizes adequate to accommodate movement without tearing.

2. Disposable clothing including head, foot, and full body protection shall be provided in sufficient quantities and adequate sizes for workers and authorized visitors.

3. A new suit shall be donned upon each entry to the Abatement Work area or area where the permissible exposure level will be exceeded.

4. Hard hats, protective eye wear, gloves, rubber boots and/or other footwear shall be provided as required for workers and authorized visitors. Safety shoes may be required and shall be provided.

PART 3 - EXECUTION

3.01 ABATEMENT PROCEDURES AND WORK AREA PREPARATION

A. Work Area Preparation

1. For Class I and II asbestos work, shut down and lock out heating, cooling and air conditioning system (HVAC) components that are located in, supply, or pass through the Work area. Seal intakes and exhaust vents in the Work area with tape and 6-mil polyethylene. Seal seams in any system components that pass through the Work area.

2. Provide and post signs at locations and approaches to the Regulated Area. The signs shall comply with Cal/OSHA regulations.

3. In conjunction with the Owner, shut down and lock out/tag out electric power to Class I and II asbestos work areas. Provide equipment for temporary power with ground fault interrupters and lighting sources. Temporary power sources and equipment shall comply with applicable electrical code requirements and Cal/OSHA requirements for temporary electrical systems. The Owner shall perform electrical connections of electrical cable and equipment provided as part of the Work of this section to existing Owner systems. The Owner shall pay for the costs of electric power consumed during performance of the Work of this section, unless otherwise noted.

4. For Class I and II asbestos work, clean and seal off windows, doorways, elevator openings, corridor entrances, drains, ducts, grills, grates, diffusers, skylights, and any other openings between the Abatement Work area and areas outside of the Abatement Work area with 6-mil polyethylene sheeting and tape prior to proceeding with required cleaning.

5. Clean Movable Objects within the Abatement Work area with a HEPA Filtered vacuum and wet cleaning methods. After cleaning, these objects shall be

removed from the Abatement work area and carefully stored in a location designated by the Owner.

6. Clean Fixed Objects in the Abatement Work area with a HEPA Filtered vacuums and wet cleaning methods. Careful attention shall be given to machinery behind grills or gratings where access may be difficult but contamination is present. Cleaning of walls, floors, and ceilings behind fixed items is required. After cleaning, enclose Fixed Objects in 6-mil polyethylene sheeting and seal securely in place with durable tape.

7. Clean surfaces in the Abatement Work area with a HEPA Filtered vacuums and wet cleaning methods. Do not utilize any methods, such as dry sweeping or vacuuming, with equipment not furnished with HEPA Filters thereby creating airborne dust and particulates. Do not disturb Asbestos Containing Materials during this cleaning phase.

8. For Class I and II asbestos work, floors shall be covered with two layers of 6-mil (minimum) polyethylene sheeting. Additional layers of sheeting may be furnished as drop cloths for cleanup of bulk materials.

9. Polyethylene sheeting shall be sized and installed to minimize seams. If the floor area to be covered requires seaming, seams on successive layers of polyethylene sheeting shall be staggered a minimum of six feet between each seam to reduce the potential for water penetration into the existing flooring. Do not install seams at the junction between a wall and floor.

10. Polyethylene sheeting installed on a floor shall extend at least 12 inches up the sidewalls of the Abatement Work area.

11. Polyethylene sheeting shall be installed so as to prevent slippage between successive layers of installed material.

12. For Class I and II asbestos work, walls shall be covered with two layers of 4-mil minimum thickness polyethylene sheeting.

13. Polyethylene sheeting installed on a wall shall overlap floor sheeting by at least 12 inches beyond the wall/floor joint to provide a seal against water damage.

14. Polyethylene sheeting installed on a wall shall be adequately fastened to prevent it from falling away from the walls. Provide additional support/attachment when air filtration ventilation systems are provided.

15. For Class I and II asbestos work with porous, dropped, or perforated ceilings, those ceilings shall be covered with one layer 4-mil minimum thickness polyethylene sheeting.

16. Polyethylene sheeting installed on ceilings shall be adequately fastened to prevent it from falling away from the ceiling.

17. Provide one layer of 3-mil maximum, polyethylene sheeting (non-fire retardant type) for isolation of fire sprinkler devices. Installed taping shall not impede the normal function of the fire sprinkler device. Approved wire sprinkler guards shall be furnished in conjunction with isolation.

18. Where required, install and operate air filtration equipment to provide one air change in the Abatement Work area every 15 minutes. Openings made in the Enclosure System to accommodate these units shall be made airtight with durable tape and/or caulking as needed. If more than one unit is installed, they shall be turned on one at a time, checking the integrity of barriers after each unit is started. Insure that adequate power supply is available to satisfy the requirements of the air filtration units. Exhaust from these units shall be directed to the outside of the building whenever feasible. They shall not be exhausted into occupied areas of the buildings. Exhaust duct shall be extended from the Abatement Work area to the outside as required. Careful installation and daily inspections shall be performed to verify the exhaust ducts do not discharge into any areas of the building.

19. Once the Enclosure system is constructed and reinforced with air filtration units in operation as required, test the Enclosure for leakage utilizing smoke tubes. Repair, replace or reconstruct as required.

20. Following completion of the construction of polyethylene barriers and Decontamination Enclosure System, operate the air filtration units overnight to insure the barriers will remain intact and secured to walls and fixtures before beginning actual Abatement Work.

21. Commencement of the Work of this section shall not occur until:

    a. The entire containment system has been constructed and inspected by Owner Consultant in accordance with the required Shop Drawings.

    b. Air filtration units are functioning within the requirements of this section.

    c. Air filtration units are functioning within the requirements of this section.

    d. Pre-Abatement submittals, notifications, postings, and permits have been provided and reviewed by the Owner Consultant.

    e. Equipment for Abatement, Decontamination, and disposal are on the Project site.

    f. Worker training, respirator fit testing, and medical surveillance has been provided and reviewed by the Owner Consultant.

    g. A Notice to Proceed is transmitted by the Owner.

3.02 ASBESTOS RELATED DISTURBANCE WORK PRACTICES (Small-Scale, Short Duration – SSSD)

A. For Class III work, shut off air handling equipment to rooms work will occur in.

B. Provide and post signs at the entrance to the work area affected. The signs shall comply with Cal/OSHA regulations.

C. For Class III work clean the area immediately under the location to be disturbed.

D. For Class III work move any moveable furniture or objects from immediately beneath the area to be disturbed.

E. Provide an enclosure around the area of disturbance. This may include, but is not limited to:

1. Mini-enclosure where not more than two persons may occupy for the purpose cutting holes up to three square feet in walls or ceilings.

2. For drilling, coring, sawing or similar disturbance, an enclosure shall be placed over the area of disturbance of sufficient size to cover that area and contain the tools used. This can include drilling with a shroud, through a wet sponge, through a plastic enclosure, or similar designs which will ensure control of Asbestos fibers and other dust. Drilling or coring with the use of a vacuum collection device shall be equipped with a HEPA filtered vacuum.

F. Class III work performed without a HEPA vacuum collection device shall have surfaces of disturbance adequately wet to control fiber release.

G. Clean by wet method the surfaces disturbed, the enclosure device and/or materials used, and any tools used during the disturbance operation.

H. Clean up by wet method and/or HEPA vacuum any debris that may have escaped outside the enclosure required by this section.

3.03 DECONTAMINATION ENCLOSURE SYSTEM FOR ABATEMENT WORK

A. Decontamination Enclosure Systems shall be provided at locations where workers will enter or exit the Abatement Work area of Class I and II asbestos work prior to any other set up. Only one system at a single location for each Regulated Area is required. At least one individual shall be stationed at the entrance of each system at times Abatement Work is in progress.

B. These systems may consist of existing rooms outside of the Abatement Work area, if the layout permits, and that can be enclosed in polyethylene sheeting, and are accessible from the Abatement Work area. If this intended layout is not feasible, given existing site conditions, Enclosure systems may be constructed out of metal, wood, or plastic support as required.

C. Decontamination Enclosure Systems constructed at the Project site shall be furnished with 6-mil opaque white or black polyethylene sheeting or other approved materials for privacy. Detailed descriptions of portable, prefabricated units, if furnished, shall be submitted for review. Shop Drawings must include floor plan with dimensions, materials, size, thickness, plumbing, and electrical utilities.

D. Decontamination Enclosure System shall consist of at least a Clean Room, a Shower Room, and an equipment room, each separated from the other, from the Abatement Work area and from the non-Work area by "Z-flaps" at a minimum. The system shall be furnished with, at a minimum, two layers of 6-mil polyethylene sheeting on the floors, walls, and ceiling.

E. Clean room shall be of adequate size to accommodate the Abatement crew. Clean work clothes, clean disposable clothing, replacement filters for respirators, disposable towels, and other necessary items shall be provided for in adequate supply adjacent to the Clean Room. A location for posting notices shall also be provided adjacent to this area. When required, a lockable door shall be furnished to control access into the Clean Room from outside the Abatement Work area. Comfort lighting, heat, and electricity shall be provided as required. The Clean Room shall not be used for storage of tools, equipment, materials, or as office space.

F. Shower room shall contain one or more showers as required to adequately accommodate workers. Each showerhead shall be supplied with hot and cold water adjustable at the tap. The shower Enclosure shall be constructed to ensure against any kind of leakage. Provide an adequate supply of soap, shampoo, and disposable towels, available at times. Shower water shall be drained, collected, and progressively filtered through a system achieving a maximum particle size of 1.0 microns.

G. The Equipment Room shall be used for storage of equipment and tools at the end of a shift. These shall have been cleaned using a HEPA Filtered vacuum and wet cleaning methods. A container lined with a labeled 6-mil polyethylene bag for collection of disposable clothing shall be located in this room. Reusable footwear shall be stored in this area after being cleaned.

3.04 WASTE CONTAINER REMOVAL AIRLOCK AND EMERGENCY EXITS

A. The waste container pass-out airlock shall be constructed away from the Decontamination Enclosure System. This airlock shall be in a location that provides direct access from Abatement Work area to the outside of the building if possible.

B. This system shall consist of an airlock, container Staging Area, and another airlock providing access to outside Abatement Work area.

C. The waste container airlock shall be constructed in similar fashion with similar materials as the Decontamination Enclosure System.

D. This airlock system shall not be used to enter or exit the Abatement Work area.

3.05 ALTERNATIVE PROCEDURES

A. Soil Removal

1. Required Asbestos Abatement shall be performed prior to soil Removal.

2. If soil Removal is specified, debris within or upon the soil shall be considered part of the soil and shall be removed as a contaminated waste. Debris includes, but is not limited to, fabric, paper, and other fibrous or porous materials.

3. It is not the intention of this section to require the Removal of large rocks, abandoned non-Asbestos-containing pipe, lumber, and similar debris. If these conditions are encountered, clean and encapsulate these materials instead of removing them as a contaminated waste, provided Asbestos contamination is not ingrained within and/or affixed to them. Any such materials remaining shall be stacked to one side to allow for access to the soil below for removal purposes.

4. Unless otherwise specified, soil shall be removed with a High Volume Vacuum system. Soil shall be removed to the hard pan unless otherwise specified or required.

5. After soil Removal has been completed, the Owner Consultant shall inspect the Work. Approval of the Removal Work is required prior to lock down and Encapsulation.

6. Soil requires Encapsulation following Asbestos Removal, including but not limited to, High Volume Vacuum removal. Apply a continuous even coat of encapsulating material at the rate of no more than fifty square feet per gallon. Other structural surfaces shall receive an evenly applied coat of lock down material.

B. Other:

1. High Volume Vacuum systems shall be provided with an Enclosure constructed at the waste discharge port. This Enclosure shall be of sufficient size to accommodate the workers and disposal containers necessary for the Project. The Enclosure shall be constructed of one layer, 6-mil minimum, of polyethylene sheeting. An air filtration unit shall be furnished during operation of the High Volume Vacuum.

2. Where pipe insulation is to be removed in a crawl space and/or attic space a single layer of 6-mil polyethylene sheeting with a minimum width of four feet shall be placed centered under the Removal surfaces.

3. If specified procedures cannot be furnished, a written request shall be provided to the Owner outlining details of the problem encountered and recommended alternative solutions.

4. Alternative procedures shall provide equivalent or greater protection than the specified and/or required procedures.

5. Any alternative procedure requires the written approval of the Owner prior to implementation.

3.06 WORKPLACE ENTRY AND EXIT PROCEDURES

A. Before entering the Regulated Area personnel shall read and be familiar with posted regulations, personal protection requirements, and emergency procedures. A signature sheet shall be posted for signatory acknowledgement these have been reviewed and understood by personnel prior to entry.

B. Workers and other authorized personnel shall enter the Abatement Work area through the Decontamination Enclosure System or other room required when Decontamination Enclosure System is not required.

C. Personnel who enter or exit the Regulated Area shall sign the entry and exit log located adjacent to the Clean Room.

D. Personnel shall proceed first to the Clean Room, don respirator, and washable and/or disposable clothing.

E. General construction area equipment including, but not limited to, hard hats, eye protection, and gloves shall also be provided as required. Clean respirator and cartridges, and protective clothing shall be provided and utilized by each person for each separate entry into the Regulated Area.

F. Before leaving the Regulated Area for Class I and II asbestos work personnel shall remove gross contamination from the outside of respirators and protective clothing by vacuuming and/or wet wiping methods. Each person shall clean protective footwear just prior to entering the Equipment Room.

1. Personnel shall proceed to Equipment Room where they remove protective equipment except respirators. Deposit disposable clothing into appropriately labeled containers.

2. Still wearing respirator, personnel shall proceed to the shower area, clean the outside of the respirators and the exposed face area under running water prior to removal of respirator then shower and shampoo to remove residual Asbestos contamination. Various types of respirators will require slight modification of these procedures. A powered air purifying respirator face piece will have to be disconnected from the filter/power pack assembly when such is not waterproof, upon entering the shower. A dual cartridge respirator may be worn into the shower and cartridges shall be replaced for each new entry into the Work area.

3. After showering and drying off, proceed to the Clean Room and don clean clothing.

G. At no time shall any personnel exit an Abatement Work area into a space occupied by staff or students without being completely dressed. Any violation of this requirement will result in the permanent removal of the person from the Project site.

3.07 REMOVAL PROCEDURES

A. Brushes furnished for removing loose Asbestos Containing Material during detail cleaning of substrate shall be furnished with nylon or fiber bristles. Metal or wire brushes are not permitted. Brushes used during this process shall be disposed as contaminated waste when use of the brush for this work is completed.

B. A sufficient supply of HEPA Filtered vacuum systems shall be provided during cleanup of Abatement Work. Brush attachments are not permitted for use with vacuum systems.

C. Barriers constructed to isolate the Regulated Area from other areas shall be inspected at least three times per shift; prior to the start of Abatement activities; half way into the shift; and following the completion of the Abatement activities at the end of the shift. Inspect and document observations in the daily Project log.

D. Damage and defects in the Enclosure system shall be repaired immediately upon discovery.

E. At any time during Abatement Work, following barrier installation, if visible debris is observed outside of the Regulated Area or damage occurs to the barriers, stop Work immediately. Repairs shall be performed to the barriers and debris/residue shall be cleaned up with appropriate HEPA Vacuuming and wet wiping methods. These incidents shall be recorded in the daily Project log.

F. If air samples collected outside of the Work area during Abatement Work indicate airborne fiber concentrations greater than 0.01 f/cc or the pre-measured background levels (whichever is lower) Work shall stop immediately. An inspection and repair of barriers shall be performed as required. Surface cleaning with HEPA Vacuums and wet wiping methods of areas outside of the Work area may be required by the Owner. Findings, observations, and corrective actions shall be documented in the daily Project log.

3.08 ENCAPSULATION AND BRIDGING AGENTS

A. Clean and isolate the Work area in accordance with "Work Area Preparation" of this Section.

B. Repair damaged and missing areas of existing materials with non-Asbestos containing substitutes. Material shall adhere adequately to existing surfaces and provide an adequate base for application of Encapsulating Material. Filler material shall be installed in accordance with manufacturers recommended specifications.

C. Remove loose or hanging Asbestos Containing Materials in accordance with the requirements of "Removal Procedures" in this Section.

D. Lockdown and Encapsulating Material, and bridging agents shall be reviewed by the Owner Consultant prior to the commencement of the Work of this section.

E. Encapsulating Material shall be sprayed applied with airless spray equipment. Nozzle pressure shall be adjustable within a range of 400 to 1500 PSI.

F. Lock down coat shall be spray applied with low pressure providing a continuous even coat.

G. Bridging agents shall be a palm or brush grade.

H. Colorless lock down materials, Encapsulating Material, and bridging agents shall be furnished with a compatible color additive. A different color shall be furnished for each separate coat of applied material.

I. Install penetrating type Encapsulating Material to penetrate existing sprayed applied Asbestos Containing Materials to a depth as required.

J. During installation of the penetrating type Encapsulating Material; remove selected random core samples of the Asbestos Containing Materials in the presence of the Owner Consultant to verify depth of penetration.

K. Lock down coating and Encapsulating Material for installation on hot water, steam, or any other high temperature equipment shall be manufactured and recommended for installation on high temperature systems.

3.09 CLEAN UP PROCEDURES

A. Asbestos Clean Up Procedures:

1. Unless decontaminated daily, reusable footwear and kneepads shall be stored in the Equipment Room when not in the Work area. Upon completion of Abatement Work, these shall be disposed of as Asbestos contaminated waste or may be decontaminated at the completion of Abatement Work.

2. Remove and containerize visible accumulations of Asbestos Containing Material and Asbestos contaminated debris with rubber dustpans and rubber squeegees. Do not use metal shovels to pick up or move accumulated waste. Special care shall be taken to minimize damage to flooring materials.

3. Remove containerized waste from the Abatement Work area and the waste container airlock.

4. Wet wipe surfaces in the Regulated Area with clean rags, mops, and sponges as appropriate.

5. After cleaning remove the top layer of polyethylene sheeting from walls and floors.

6. Clean the second layer of polyethylene sheeting by wet wipe and HEPA Vacuuming. Windows, doors, HVAC system vents, and other critical seals shall remain sealed until the Abatement Work area passes final clearance. The air filtration units shall remain in continuous operation and the Decontamination Enclosure System shall remain in place and be utilized.

7. Decontaminate tools and equipment and remove at the appropriate time in the cleaning process.

8. Provide notification to the Owner at least one day in advance when Abatement Work will be completed and ready for final visual inspection. If, upon inspection, Abatement Work is not completed or the area does not pass final visual inspection, finish or correct the Abatement Work as required before notifying the Owner. Subsequent inspections shall commence not later than one day following notice.

9. The Owner Consultant shall inspect the Work area for visible residue. If residue is observed, it shall be deemed to contain Asbestos and the cleaning process shall be repeated. The lock down coat shall be applied only after inspection by the Owner Consultant and during non-school hours.

10. The second layer of isolation shall only be removed after the Owner Consultant inspects the lock down coat or installed Encapsulation, but in no case prior to overnight drying of lock down coat or Encapsulation.

11. Following completion of air clearance monitoring the remaining barriers shall be removed and properly disposed of. A final visual inspection by the Owner Consultant shall be performed to verify that no contamination remains in the Abatement Work area. Unsatisfactory conditions may require additional cleaning and air monitoring.

3.10 WASTE HANDLING AND TRANSPORTATION

A. Asbestos Waste Handling

1. As the Work progresses, to prevent exceeding available storage capacity on the Project site, sealed and labeled containers of Asbestos Containing Waste shall be removed and transported to the prearranged disposal location.

2. Waste disposal shall occur at an authorized site in accordance with regulatory requirements of NESHAP and applicable State and Local regulations.

3. Once the drums, bags, and/or wrapped components have been removed from the Work area, they shall be loaded into an enclosed truck for transportation.

4. Waste shall not be transported from the work are to the storage container or waste hauler's vehicle while students or staff are present in the path of travel. Where a

path of travel cannot be cordoned off the movement of waste must be completed prior to or after the presence on site of students and staff.

5. Personnel loading Asbestos waste shall be protected with disposable clothing and at a minimum half-face, air purifying, dual cartridge respirators furnished with HEPA Filters.

3.11 TRANSPORTATION OF NON HAZARDOUS WASTE

A. Waste shall be containerized, labeled, and transported in accordance with federal, state, and local regulations.

B. Waste shall be transported under cover a non-Hazardous Waste manifest.

C. Containers shall be enclosed during transportation.

3.12 TRANSPORTATION OF HAZARDOUS WASTE

A. Dump receipts; trip tickets, transportation manifests, weight certificates or other documentation of disposal shall be delivered to the Owner Consultant within 48 hours of disposal. As the material and responsibility for the material changes hands, the generator or designee, the transporter(s), and the Disposal Site Operator shall sign the Uniform Hazardous Waste Manifest. If a separate waste hauler is employed, the name, address, U.S.E.P.A. ID number, and signature of the transporter shall also be affixed onto the manifest.

B. The enclosed cargo area of trucks or containers shall be free of debris and lined with 6 mil polyethylene sheeting to prevent contamination from leaking or spilled containers. Floor sheeting shall be installed first and extend up the sidewalls. Wall sheeting shall be overlapped and taped into place.

C. Drums shall be placed on level surfaces in the cargo area and packed tightly together to prevent shifting and tipping. Large structural components shall be secured to prevent shifting, with bags placed on top.

D. Access openings on large metal containers, which are used for storing or transporting Asbestos waste, shall have doors and tops that can be closed and locked. Materials not properly bagged shall not be placed in these containers nor shall these containers be used for non-Asbestos waste or nonhazardous asbestos waste. Bags shall be placed, not thrown, into these containers to avoid damage.

3.13 MONITORING

A. Abatement Project Management and Inspection:

1. Owner has the right to perform air and performance monitoring at any time.

2. The Owner has unlimited access to the regulated and surrounding areas at times during progress of the Work, including, but not limited to, use of ladders, scaffolds, and other equipment required to gain access to the Work surfaces.

B. Work Area Monitoring:

1. Visual inspections and air testing may be performed at any time during the progress of the Abatement Work. Provide corrective measures as required to maintain the Work area in compliance with this Specification and regulatory requirements.

C. Contractor's Employee – Personal Air Monitoring:

1. Provide air monitoring as required California Code of Regulations, Title 8, Section 1529. Results shall be provided to the Owner Consultant within ten working days of sampling. Negative Exposure Assessments utilizing prior project monitoring require submittal of applicable data for approval before work proceeds.

D. Clearance Air Monitoring:

1. Following the completion of Abatement Work and clean up operations, lock down coat application, and visual inspection by the Owner, clearance air monitoring shall be performed by the Owner Consultant.

2. The Owner Consultant shall arrange for sampling of the air in the Abatement Work area for airborne fiber concentrations. Unauthorized interference or tampering with air sampling equipment may result in termination of the Contract and/or removal of the Abatement Contractor from the List of Prequalified Abatement Contractors.

3. If air-sampling results are within the limits of 40 CFR, Part 763, Subpart E (AHERA), the Abatement Work area shall be released for occupancy.

4. Areas failing clearance monitoring shall be cleaned as required in article 3.09, CLEAN UP PROCEDURES, and tested until satisfactory levels are provided in accordance with this Specification where required.

3.14 RE-ESTABLISHMENT OF THE WORK AREA AND SYSTEMS

A. Reestablishment of the Work area shall only occur following the completion of final inspection and clearance air monitoring.

B. Critical barriers shall be removed at this time.

C. Accompanied by the Owner Consultant, visually inspect the Abatement Work area for any remaining visible residue. Evidence of contamination will require additional cleaning requirements.

D. Install and secure Moveable Objects.

E. Relocate Moveable Objects that were removed to temporary locations back to their original positions.

F. Reestablish HVAC, mechanical, and electrical systems to the condition prior to commencement of the Work of this section.

G. Repair areas of damage deemed to be a result of the Abatement Work.

H. Restore the Work area and auxiliary areas utilized during the Abatement to conditions equal to or better than original. Any damage caused during the performance of Abatement Work, including, but not limited to, damage caused by tape, adhesive, staples, nails, water, Encapsulating Material, or any other material shall be repaired as required.

I. Prior to occupancy of a space following clearance monitoring, HVAC systems filters associated with the Work area shall be removed and disposed of as Asbestos waste. Decontaminate filter assembly and surrounding area with HEPA Vacuums and wet cleaning methods.

END OF SECTION

SECTION 02 8333

LEAD ABATEMENT AND LEAD RELATED CONSTRUCTION WORK

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Abatement, Lead Related Construction Work or painting of lead-containing materials and/or Lead Based Paint.

2. Transportation and disposal of lead-containing materials and/or Lead Based Paint.

B. Related Requirements:

1. Section 00 3126 - Existing Hazardous Materials Information.

2. Division 01 - General Requirements.

3. Cal/OSHA Title 8, California Code of Regulations (CCR).

4. California Air Resources Board Ambient Air Quality Standard, Title 24 CCR.

5. California Department of Public Health, Title 17, CCR.

6. Cal/EPA, Title 22 CCR.

7. California Labor Code, Division 5, Part 1, as it pertains to safety in employment and with the applicable provisions of the Title 8, CCR as it pertains to Occupational Safety and Health in the work place.

8. Environmental Protection Agency, 40CFR, Part 745.

9. UD – Title X, Residential Lead-Based Paint Hazard Reduction Act of 1992.

10. Los Angeles County Public Health Code (Chapter 11).

1.02 DEFINITIONS AND ACRONYMS

A. AAS - Atomic Absorption Spectrophotometry used for lead paint chip and dust wipe sample analysis.

B. Abatement – Any set of measures designed to reduce or eliminate lead hazards or Lead Based Paint for public and residential buildings, but does not include containment or cleaning.

C. Action Level – Means the Action Level as defined in Title 8, California Code of Regulations, Section 1532.1.

D. ANSI – American National Standards Institute.

E. ASTM – American Society for Testing and Materials.

F. Building ID number or code (Maximo) – A six digit alphanumeric identification code assigned to each building on an Owner site, also referred to as the insurance code, ID number or similar terms.

G. Certificate – Means the document issued by CDPH to an individual meeting the certification requirements as described in CCR Title 17, Sections 35083, 35085, 35087, 35089, or 35091.

H. Clean Room – An uncontaminated area or room which is a part of the worker Decontamination Enclosure System with provisions for storage of worker's street clothes and clean protective equipment.

I. Clearance Inspection – Means visual examination and, as applicable, collection of environmental samples upon completion of the Work of this section.

J. Component – Means a structural element or fixture, including but not limited to, walls, floors, ceilings, doors, window molding, trim, trestles, tanks, stairs, railings, cabinets, gutters, or downspouts.

K. Curtained doorway – A device to allow ingress and egress from one room to another while permitting minimal air movement between the rooms, typically constructed by placing two overlapping sheets of plastic over an exiting or temporarily framed doorway, securing each along the top of the doorway, securing the vertical edge of one sheet along one vertical side of the doorway and securing the vertical edge of the other sheet along the opposite vertical side of the doorway. Other effective designs may be submitted for review.

L. Decontamination – The process of eliminating lead contamination from building surfaces, and property by cloths, mops, or other utensils dampened with water and disposed of as lead contaminated waste.

M. Decontamination Enclosure System – A minimum a two-stage Decontamination unit consisting of a compartment for Decontamination, and a Clean Room. Unless otherwise specified, it shall be adjacent to the Abatement area.

N. Demolition – The wrecking or taking out of any load supporting structural member of a facility together with any related handling operations.

O. Deteriorated Lead Based Paint – Means Lead Based Paint or a surface coating that is cracking, chalking, flaking, chipping, peeling, non-intact, failed, or otherwise separating from the substrate to which it is applied to.

P. CDPH– California Department of Public Health.

Q. CDPH-Approved Course – Means any lead construction course that satisfies the requirements specified in CCR Title 17, Sections 35056, 35061, 35066, or 35067 as determined by CDPH pursuant to Sections 35076 and 35078.

R. DOSH – California Division of Occupational Safety & Health or Cal/OSHA.

S. DOT – Department of Transportation.

T. DTSC – California Department of Toxic Substances Control.

U. Encapsulating Material – Are coatings or rigid materials adhesively applied to Lead Based Painted surfaces in the Encapsulation process.

V. Encapsulation – The application of an Encapsulating Material to Lead Based Paint to provide a barrier between the Lead Based Paint and the environment.

W. Enclosure – A rigid durable barrier mechanically attached to building Component, with edges and seams sealed with caulk or other sealant.

X. EPA; Renovation, Repair and Painting (RRP) – Means a lead-related construction course that satisfies the requirements specified in 40 CFR, Part 745, Section 745.90.

Y. FETU – Facilities Environmental Technical Unit.

Z. Firm – Means a company, partnership, corporation, sole proprietorship or individual doing business, association, or other business entity; a Federal, State, Tribal, or local government agency; or a nonprofit organization and satisfies the requirements specified in 40 CFR, Part 745, Section 745.89.

AA. Fixed Object – A piece of equipment, furniture, or improvement in the Work Area, which cannot be removed from the Work Area.

BB. Hazardous Waste – Means any waste stream determined by an Owner approved laboratory to exceed the regulatory thresholds for lead hazardous waste.

CC. HEPA Filter – Means a filtering system capable of trapping and retaining at least 99.97 percent of mono-dispersed particles 0.3 micrometers in diameter or larger.

DD. HEPA Vacuum – A vacuum system furnished with HEPA filtration.

EE. HUD – United States Department of Housing and Urban Development

FF. HVAC – Heating, Ventilation, and Air Conditioning system.

GG. ICP-AES – Means Inductively Coupled Plasma-Atomic Emission Spectroscopy used for heavy metal analysis, including lead.

HH. Lead Based Paint – Means paint or other surface coatings that contain an amount of lead equal to or greater than 0.7 milligrams per square centimeter (0.7 mg/cm^2) or equal to or greater than 0.5 percent by weight.

II. Lead Containing Paint – Means paint or other surface coatings that contain lead in an amount equal to or greater than 0.06 percent lead dry weight (600 ppm) but does not meet the definition of Lead Based Paint. In the absence of paint chip or surface coating bulk sample results, any surface coating shall be assumed to be above 0.06 percent lead dry weight (600 ppm) until surface coating samples are collected and analyzed that indicate otherwise. Lead concentration shall be determined by a method that has an accuracy of not less than plus or minus 25 percent at 0.06 percent lead dry weight, to a confidence level of 95 percent.

JJ. Lead Contaminated Dust – Means dust that contains an amount of lead equal to, or greater than, forty micrograms per square foot (40 $\mu g/ft^2$) for interior floor surfaces; two hundred and fifty micrograms per square foot (250 $\mu g/ft^2$) for interior horizontal window surfaces; and eight hundred micrograms per square foot (800 $\mu g/ft^2$) for exterior floor and exterior horizontal window surfaces.

KK. Lead Contaminated Soil – Means bare soil that contains an amount of lead equal to, or greater than, four hundred parts per million (400ppm).

LL. Lead Hazard – Means deteriorated Lead Based Paint, Lead Contaminated Dust, Lead Contaminated Soil, the disturbance of Lead Based Paint or Presumed Lead Based Paint without containment, or any other operation that may result in persistent and quantifiable lead exposure.

MM. Lead Inspection – Means a surface by surface investigation to determine the presence of Lead Based Paint as described in Chapter 7: Lead Based Paint Inspection, " Guidelines for the Evaluation and Control of Lead Based Paint Hazards in Housing," U.S. Department of Housing and Urban Development, 1997 Revision.

NN. Lead Related Construction Work – Means any construction, alteration, painting, Demolition, salvage, Renovation, repair, or maintenance of any residential or public building, including preparation and cleanup that, by using or disturbing lead-containing material or soil, may result in significant exposure of adults or children to lead.

OO. Lead Safe Schools Program – Means the training program for lead safe working practices as developed by the Labor Occupational Health Program at U.C. Berkley.

PP. Location Code (Maximo) – Refers to a unique four digit numeric code assigned by the Owner to each of its Project sites.

QQ. Member – A Component part of a structure complete in itself.

RR. Movable Object – A piece of portable equipment or furniture in the Work Area, which can be removed from the Work Area.

SS. NESHAP – The National Emission Standards for Hazardous Air Pollutants (40 CFR Part 50.12).

TT. NIOSH – The National Institute for Occupational Safety and Health.

UU. Owner Consultant (OC) – Refers to the firm, company or individual designated by the Owner.

VV. Painting Contract – For purposes of this section, a painting contract is a Contract with the Owner to perform painting on existing facilities where Lead Based Paint, Lead Containing Paint, Presumed Lead Based or Presumed Lead Containing Paint will be disturbed or abated.

WW. P.E.L. – Means permissible exposure limits as defined in Title 8, California Code of Regulations, Section 1532.1.

XX. Plasticize – To cover floors, walls, and equipment with plastic sheeting as specified herein.

YY. Portable Mechanical Ventilation System – A portable exhaust system furnished with HEPA filtration and capable of providing a constant air flow into regulated Work Area from adjacent areas and exhausted outside the regulated area.

ZZ. Presumed Lead Based Paint – Means paint or surface coating affixed to a Component in or on a structure, excluding paint or surface coating affixed to a Component in or on a residential dwelling constructed on or after January 1, 1979, or a school constructed on or after January 1, 1993.

AAA. Removal – Means operations where Lead Based Paint is removed or stripped from structures or substrates including Demolition.

BBB. Renovation – Means the modifying of any existing structure, facility, or portion thereof.

CCC. Replacement – Means Removal of an entire building Component coated with Lead Based Paint and replacing it with a lead free Component.

DDD. SCAQMD – South Coast Air Quality Management District.

EEE. STLC – Means Soluble Threshold Limit Concentration used in the State of California in conjunction with TTLC to determine lead hazardous waste limits. If the STLC result is equal to or exceeds 5 mg/L the waste is deemed to be hazardous.

FFF. Surfactant - A chemical wetting agent added to water.

GGG. TCLP – Means Toxicity Characteristic Leaching Procedure used to determine the federal Resources Conservation Recovery Act (RCRA) lead hazardous waste limits. If the results equal or exceed 5 mg/L the waste is deemed to be hazardous.

HHH. TTLC – Means Total Threshold Limit Concentration used in the State of California in conjunction with STLC to determine lead hazardous waste limits. If the results are equal to or exceeds 1000 mg/kg, the waste is deemed to be hazardous.

III. Visible Emissions – Any emissions from a known or suspected lead-containing material that is visually discernible.

JJJ. Wet Cleaning – The process of eliminating lead contamination from building surfaces and/or objects by cloths, mops, or other utensils dampened with amended water and afterwards being disposed of as hazardous waste.

KKK. Work Area – Means an area where known or Presumed Lead Based Paint is disturbed or Abatement is conducted.

LLL. X-Ray Fluorescense (XRF) Analyzer – Means a direct reading instrument that determines the lead content of the surface coatings in milligrams per square centimeter (mg/cm^2) using the principle of x-ray fluorescence.

1.03 POLICIES AND PROCEDURES

A. The Owner has a zero-tolerance policy for uncontrolled lead releases during Lead Related Construction Work, Lead Containing Paint disturbance, or Abatement activities. A lead release requiring an emergency response is any disturbance resulting in the uncontrolled release of lead containing materials. Upon observation of any visual emissions, immediately stop the Work, vacate the Work Area, and provide written notification to the Owner Consultant.

B. Pre-qualified Abatement Subcontractors are not permitted to subcontract any Abatement Work to a lower tier Subcontractor without the prior written approval of the Owner.

C. Do not furnish a reduced pressurization and filtration system in violation of, or in infringement upon, any patent.

D. Owner Consultant shall provide oversight for Projects that have the potential to disturb lead containing or Lead Based Paint. Prior to the commencement of such Work, provide written notification to the Owner Consultant.

E. The following paragraph regarding impacts to coated surfaces shall be part of the contract:

1. "Renovation, repair or painting work performed on buildings constructed prior to 1978 require special handling and environmental monitoring when coated surfaces including, but not limited to, painted, varnished, and glazed surfaces are impacted. Coated surfaces applied prior to 1978 are assumed to be lead-based. All work shall be performed in compliance with Specification, Section 02 8333, "Lead Abatement and Lead Related Construction Work." XRF testing methodology is not acceptable in determining negative for lead content for Cal/OSHA compliance purposes, except for notification requirements. XRF may be used in determining lead-based paint for compliance with the U.S.E.P.A. Renovator, Repair, and Painting Rule. Disturbance of coated surfaces by contractors will be monitored by qualified District staff or Environmental Consultant sufficient to ensure that proper training and work procedures, cleanup, and waste handling are employed."

1.04 COORDINATION

A. Coordinate the Work of this section directly with the Owner and/or Owner Consultant.

1.05 SITE SECURITY

A. The Work Area is restricted to authorized, trained, and protected personnel. A list of authorized personnel shall be established and posted at the entrance of the Work Area by the Owner Consultant prior to commencement of the Work.

B. Report to the Owner Consultant any unauthorized entry into the Work Area. Following notification, a written report of the incident shall be provided to the Owner Consultant.

C. A logbook shall be maintained at the entrance of the Work Area. Persons entering the Work Area shall record name, company affiliation, time in, and time out for each entry and exit.

D. Access to the Abatement Work Area shall be through the Decontamination Enclosure System only. Other means of access shall be blocked or locked so as to prevent entry to or exit from the Work Area. Emergency exits shall be operable from inside the Work Area.

E. Maintain Work Area security during Abatement and/or Lead Related Construction Work. Work Areas and ancillary equipment accessible to non-authorized personnel shall be protected from unauthorized access by constructing a minimum barrier of 3/8 inch CDX plywood supported by 2 by 4 studs, 16 inches on center. An access door shall be provided with hasp and padlock sufficient to prevent unauthorized entry. A key shall be provided to the Owner and Owner Consultant. Required barriers within an occupied building shall be furnished with sheathing as required by state and local fire protection regulations.

F. Remove barriers upon the completion of the Work of this section and unless otherwise specified, repair and/or replace to its original condition, damage resulting from installation, use, and removal of the barriers.

1.06 EMERGENCY PLANNING

A. Emergency planning and procedures shall be developed, submitted, reviewed, and agreed to by the Owner Consultant prior to the commencement of lead-related construction and/or Abatement Work.

B. Emergency procedures shall be provided in the written languages understood by employees working on the Project and shall be prominently posted at the entrance of the Decontamination Enclosure System. Prior to entering the Work Area, parties must read and sign these procedures to acknowledge receipt and understanding of the Work Area layout, location of emergency exits, and emergency procedures.

C. Emergency planning shall consider the effects of fire, explosion, toxic atmospheres, electrical hazards, slips, trips and falls, confined spaces, and heat related injury. Develop and provide written procedures and training to employees.

D. Employees shall be trained in evacuation procedures in the event of workplace emergencies.

E. In the event of non-life threatening situations requiring medical treatment, injured or otherwise incapacitated employees shall decontaminate following normal procedures with assistance from fellow workers if necessary, before exiting the Work Area.

F. In the event of life threatening injury or illness requiring immediate medical treatment, worker Decontamination shall be given minimum priority. Provide measures to stabilize the injured worker remove them from the Work Area and secure proper medical treatment.

G. Telephone numbers of emergency response personnel shall be prominently posted at the entrance of the Decontamination Enclosure System along with the location of the nearest telephone. In addition to the 911 emergency number, post the address and telephone number of the nearest emergency medical services provider.

H. Provide at least one employee on the Project site at times during progress of the Work that is trained and certified in first aid and cardiopulmonary resuscitation (CPR). This employee shall be identified by name and proof of training shall be provided to the Owner Consultant prior to the commencement of the Work of this section.

I. Provide at least one 4A/60BC dry chemical extinguisher in the Decontamination compartment. Workers shall be trained in the proper operation of fire extinguishers.

J. Emergency exits shall be provided and clearly marked with arrows or other clearly visible markings to permit easy identification from anywhere within the Work Area. Exits shall be secured to prevent access from uncontaminated areas while still permitting emergency egress. Exits shall be properly sealed with polyethylene sheeting, which can be cut to permit emergency egress. Emergency exits may lead through the Decontamination Enclosure System or other alternative exits as required by fire officials.

1.07 LICENSING

A. The Work of this section shall be performed by an entity duly licensed in the State of California in accordance with the provisions of Chapter 9 of Division 3 of the Business and Professions Code, as amended.

1.08 QUALIFICATIONS

A. Only safety pre-qualified bidders on the pre-approved bidders list are qualified to be awarded an Abatement Contract or Painting Contract be listed as a Subcontractor for lead Abatement Work or Painting Contract.

B. Where the scope of the Work includes the painting and/or refinishing of existing surfaces, only safety pre-qualified bidders on the pre-approved bidders list are qualified to be awarded a painting Contract or be listed as a Subcontractor for painting Work.

C. Before any workers perform Abatement Work or Work of this section where the P.E.L. is exceeded, submit proof of CDPH training and certification. No Work shall be performed until the Owner Consultant has reviewed and approved CDPH training and certifications.

D. Workers shall be in personal possession of a wallet CDPH certification card at times while they are performing Abatement Work on the Project site.

E. Workers performing lead Abatement, Lead Related Construction Work, or disturbance of Lead Containing Paint where the exposure level exceeds the P.E.L., shall possess current CDPH certification and at least one CDPH Certified supervisor shall be available as required by Title 17, CCR subsection 36100.

1.09 TRAINING

A. Lead Related Construction Work shall be performed by personnel with the following training, as applicable:

1. The Lead Related Construction Work, specified herein, shall be performed by individuals trained and qualified in the techniques of lead-related construction, handling, disposal of lead-based and Lead Containing Paint, and the subsequent cleaning of contaminated areas. These individuals must comply with the applicable Environmental Protection Agency (EPA), Renovation, Repair and Painting (RRP) programs lead-related construction course that satisfies the requirements specified in 40 CFR, Part 745, Section 745., and must be capable of and willing to perform the Work of this section.

2. The Lead Related Construction Work, specified herein, shall be performed by a company, partnership, corporation, sole proprietorship or individual doing business, association, or other business entity; a Federal, State, Tribal, or local government agency; or a nonprofit organization, shall satisfy the requirements specified in 40 CFR, Part 745, Section 745.89, as a Lead-Safe Certified Firm.

3. Lead Abatement Work, specified herein, shall be performed by individuals trained and qualified in the techniques of lead abatement and will receive CDPH accredited training and certification, and must be capable of and willing to perform the Work of this section.

2. Training specific to the performance of Lead Related Construction Work shall be provided to employees prior to performing the Work of this section.

3. Training specific to the operation and use of fire extinguishers.

1.10 EXPOSURE ASSESSMENT

A. Disturbance of Lead Containing Paint, as defined in this Specification, disturbed by tasks not included in Title 8, CCR Section 1532.1, Subsection (d)(2), shall require worker-exposure monitoring upon initiation of the Work. The workers performing these tasks shall be trained in accordance with the Hazard Communications Standard, Section 5194, including but not limited to, the requirements concerning warning signs and labels, Safety Data Sheets (SDS), and employee information and training.

B. Provide an exposure assessment where the workers are performing Lead Related Construction Work. If historical data, collected within the 12 months prior to the Work performed, indicates worker exposure is below the P.E.L. , and the Work being performed closely resembles the process, type of material, control methods, work practices, and environmental conditions, additional exposure assessment is not required.

C. For Lead Related Construction Work where there is objective data or an exposure assessment demonstrating that the Lead Based Paint, or a specific process, operation or activity other than Abatement involving lead cannot result in employee exposure to lead at or above the P.E.L. during the specific process or handling, employees trained as required by Title 8, CCR Section 1532.1, including the training topics of the Lead-Safe Schools Program, may perform the Lead Related Construction Work.

D. Where Work being performed indicates an exposure above the Action Level, each employee is required to have current blood lead level and Zinc Protoporphorin testing, medical clearance for negative pressure respirator use, and respirator fit testing.

E. If there is no objective data or a negative exposure assessment fulfilling the above requirements, Lead Related Construction Work identified as a trigger task by Title 8, CCR 1532.1 shall be performed by workers who have received training as required by Title 8 CCR, Section 1532.1. This training shall, at a minimum, include the training topics of the Lead Safe Schools Program. An exposure assessment is required to be performed upon initiation of Work.

F. The required exposure assessment shall not exceed 12 months from the date the samples were collected to the date the Lead Related Construction Work or disturbance of Lead Containing Paint is performed.

G. The submission and review by the Owner Consultant of the objective data or exposure assessment is required prior to performing Lead Related Construction Work.

1.11 SUBMITTALS

A. Provide in accordance with Division 01 and this section.

B. Prior to performing the Work of this section, submit the following procedures to the Owner Consultant:

1. An abatement plan including, but not limited to:

   a. A detailed written description of the measures and management procedures, including the containment that will be utilized during Abatement to prevent exposure to lead hazards. Shop Drawings shall indicate the containment locations.

   b. A detailed written description of the Abatement, including methods of Abatement, locations of rooms and building Component where Abatement is planned.

2. Required air monitoring procedures (Cal/OSHA mandatory and SCAQMD permits for air filtering equipment).

3. Decontamination procedures for personnel, Work Area, and equipment.

4. Procedures for handling and disposing of waste materials, including disposal facility.

5. Provide the procedures to be used for capturing debris while disturbing overhead materials.

6. Procedures for final Decontamination and cleanup.

7. Procedures for dealing with heat stress during Abatement.

8. Emergency procedures during Abatement.

C. Prior to performing Abatement Work of this section, submit the following Shop Drawings to the Owner Consultant:

1. Preparation of Work Area.

2. Layout and construction of Decontamination Enclosure System and barriers for isolation of the Work Area described in this Specification and required by applicable regulations.

D. Prior to performing the Work of this section, submit the following Product Data to the Owner Consultant:

1. Product Data relative to personal protective equipment including respiratory protection and protective clothing.

2. Material safety data sheets and technical specifications for proposed materials.

E. Prior to performing the Work of this section, submit the following notifications to the Owner Consultant:

1. Evidence of notification to Cal/OSHA as required by Title 8 CCR, Section 1532.1, where applicable.

2. Notify CDPHno less than five days in advance of Abatement by submitting an Abatement of Lead Hazard Notification, CDPHForm 8551.

F. Prior to performing the Work of this section, submit the following documentation to the Owner Consultant:

1. A list of employees who will participate in the Project, including delineation of experience, training, and assigned responsibilities during the Project.

2. Submit proof satisfactory to the Owner Consultant that required permits, site location, and arrangements for transport and disposal of lead containing waste has been performed in accordance with Federal, State, and local regulations.

3. Submit proof of training for each worker who will perform Abatement or Lead Related Construction Work.

4. Submit manufacturer's certification that HEPA Vacuums, air filtration units and other local exhaust ventilation equipment conform to ANSI Z9.2, as applicable.

5. When HEPA Vacuums are utilized on the Project, provide the maintenance and filter change log for these before they are brought onto the Project site.

6. Provide the current SCAQMD permit for each HEPA Vacuum and Portable Mechanical Ventilation System before they are brought onto the Project site.

7. Where biological monitoring is required, submit test result documentation verifying employees have completed blood lead level and Zinc Protoporphorin tests in accordance with Title 8 CCR, Section 1532.1.

8. Workers are required to submit a signed Code of Conduct form.

G. Prior to performing the Work of this section, submit the following Samples to the Owner Consultant:

1. Submit a Sample of forms to be used in documenting the Work of this section.

H. Prior to performing the Work of this section, submit the following schedule to the Owner Consultant:

1. An intended sequence of Work and construction schedule. Coordinate both the sequence and durations with the Owner.

I. Prior to performing the Work of this section, submit other required items to the Owner Consultant.

J. During the performance of the Work of this section, submit the following documentation to the Owner Consultant:

1. Submit documentation from a physician certifying that employees who wear a negative pressure respirator are medically cleared to do so without suffering adverse health effects as required by DOSH regulations. The certification shall state that the employee or agent may perform Lead Related Construction Work and wear a negative pressure respirator without restrictions. Provide information to the examining physician about unusual conditions in the workplace environment that may impact the employee's ability to perform Work activities.

2. During the performance of the Work of this section, and before additional supervisors or workers are permitted to perform the Work of this section, submit proof of CDPHtraining and certification, where applicable. No additional supervisors or workers are permitted upon the Project site until the Owner Consultant has approved the CDPHtraining and certifications, when required.

3. Submit weekly job progress reports detailing Abatement and Lead Related Construction Work activities for Projects that will exceed thirty days. Include review of progress with respect to previously established Milestones and schedules, major problems and action taken, injury reports, equipment breakdown, and air and/or wipe sampling results.

4. Within five workdays of transport and disposal, submit copies of transport manifests, disposal receipts, analytical data, and weight certificates for hazardous waste removed from the Work Area during the Lead Related Construction Work

and/or Abatement Work. Weight certificates shall indicate by pounds the net weight of waste disposed of from the Project site as indicated on the associated manifest.

5. Submit daily, copies of Abatement Work site entry logbooks with information on worker and visitor access.

6. Submit logs on a weekly basis documenting filter changes on respirators, HEPA vacuums, HEPA filtered ventilation units, water filtration units, and other approved engineering controls, as applicable.

7. Submit results of air and/or wipe sampling data (as applicable) collected during the course of the Abatement and Lead Related Construction Work including DOSH compliance air monitoring results.

K. During the performance of the Work of this section, submit other required items.

1.12 PRE-ABATEMENT MEETING

A. Attend a meeting to be held prior to the commencement of the Work of this section. Attending this meeting shall be representatives of the Owner, the Owner Consultant if applicable, and the testing and monitoring personnel who shall actually participate in the testing and monitoring program. Secure the attendance of the individual who will be the Project site competent person for the Abatement Work.

B. At this meeting provide required submittals except for those to be submitted during progress of the Work. In addition, provide detailed information concerning:

1. Preparation of Work Area and Shop Drawings.

2. Personal protective equipment, including respiratory protection and protective clothing.

3. Employees who will participate in the Project, including delineation of experience, training, and assigned responsibilities during the Work.

4. Decontamination procedures for personnel, Work Area, and equipment.

5. Abatement methods and procedures to be provided.

6. Required air monitoring procedures (pre-Abatement, Cal/OSHA mandatory, and SCAQMD requirement).

7. Procedures for handling and disposing of waste materials, including disposal facility.

8. Procedures for final Decontamination and cleanup.

9. A sequence of Work activities and performance schedule.

10. Procedures for dealing with heat stress.

11. Emergency procedures.

PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Products: The following products have been specifically approved for use ass encapsulants/lock-down or bridging agents for Owner asbestos abatement and asbestos related construction projects and lead abatement and lead abatement related construction projects. Products not approved by the Owner shall not be used.

1. L-B-C Lead Barrier Compound 5400 be Fiberlock Technologies, Inc.; coating encapsulant.

B. Materials:

1. Deliver materials in the original sealed packages, containers, or bundles bearing the name of the manufacturer and brand name.

2. Store materials, subject to damage off the ground, away from wet or damp surfaces, and under cover sufficient enough to prevent damage or contamination. Replacement materials shall be stored outside of the Work Area until area is cleared for normal occupancy.

3. Damaged, deteriorating, or previously used materials shall not be furnished and shall be removed from the Project site and legally disposed of.

4. A sufficient supply of disposable mops, rags, and sponges for Work Area Decontamination shall be provided.

5. Unless otherwise specified, the Owner will provide water for construction purposes. Connect to existing system as required.

6. Products brought onto the Project site shall be accompanied by their respective Material Safety Data Sheet, which shall be maintained on the Project site.

7. Plastic, polyethylene sheeting or visqueen shall be a fire retardant type. Provide documentation from the manufacturer verifying compliance with this requirement.

8. Polyethylene sheeting furnished for the Decontamination Enclosure System shall be opaque white or black in color and shall be a minimum of 6-mil thick.

9. Surfactant (wetting agent) shall be a material that, when tested, demonstrates a surface tension of 29 dynes/cm as tested in its properly mixed concentration, using ASTM method D1331-56-"Surface and Interfacial Tension of Solutions of Surface Active Agents." Where Work Area temperature may cause freezing of the Amended Water solution, the addition of approved antifreeze in a manufacturer recommended amount is permitted.

B. Equipment:

1. Disposal bags shall be of 6-mil polyethylene, pre-printed with labels as required by applicable Cal/OSHA and DOT requirements.

2. Provide labels as per DOT requirements for disposal containers.

3. Provide warning signs as required by Cal/OSHA.

4. Disposal containers shall meet requirements of Title 22, CCR.

5. Provide a sufficient supply of scaffolds, ladders, lifts, and hand tools, as needed to complete the Work.

6. Provide sprayers with pumps capable of providing amended water in sufficient quantity to adequately wet the material to be abated or for Lead Related Construction Work.

7. Provide a sufficient supply of HEPA filtered vacuums to maintain a clean environment in compliance with this section.

8. When an enclosure requiring negative pressure is specified, a sufficient quantity of air-filtration ventilation units furnished with HEPA filtration and operated in accordance with ANSI Z9.2and EPA guidance documents shall be utilized to provide one workplace air change every 15 minutes and creating a pressure differential of -0.02 inches of water everywhere within the enclosure when compared to the area outside the enclosure. A log documenting the filter change history of each unit shall be required before use, and any unit without this log shall have filters changed and the unit decontaminated.

9. When rental equipment is to be used in Abatement areas or to transport lead contaminated waste, a written notification concerning the intended use of the rental equipment shall be provided to the rental agency with a copy submitted to the Owner.

10. When performing chemical Removal, provide portable eyewash station(s) that meet ANSI standards and are accessible to workers within 10 seconds.

11. Additional safety equipment, as necessary, shall be provided to workers and authorized visitors.

12. Equipment delivered to the Project site shall be free of debris suspect of containing lead. No equipment with suspect debris in or on it shall be permitted on Owner properties and/or the Project site.

13. When roll-off disposal containers are delivered to a Project site, four wheels of each container shall be moved and rested upon a minimum size sheet of plywood of 4-foot by 4-foot by ¾ inch.

14. Lighting shall be provided in an amount sufficient to illuminate the Work Area for the purpose of safe visual working conditions and to permit examination of surfaces where Work is performed.

2.02 EMPLOYEE PERSONAL PROTECTIVE EQUIPMENT

A. Respiratory Protection:

1. Submit NIOSH approvals for respiratory protective devices utilized on the Project site. Include manufacturer certification of HEPA filtration capabilities for cartridges and filters. Filter cartridges shall be furnished with the NIOSH P-100 designation.

2. Provide respiratory protection to employees in compliance with CCR Title 8, Sections 1532.1 and 5144, as determined by the employee exposure assessment.

3. In the absence of an exposure assessment, base respiratory protection on the requirements of Title 8, CCR Section 1532.1, specifically subsection (d).

4. In addition to P-100 filters, provide the appropriate respirator filter cartridges for exposure to other airborne contaminants generated during the Abatement process.

5. Provide authorized visitors with a respirator and cartridges sufficient to protect individuals from exposure to hazardous environments generated during the Abatement activity.

B. Fit Testing:

1. Perform fit testing in accordance with Title 8 CCR, Section 5144.

2. Submit documentation of respirator fit testing for individuals entering the Work Area.

3. Maintain and submit to the Owner a copy of the written respiratory protection program.

C. Personal Protective Clothing and Equipment:

1. Provide eye protection to employees sufficient to protect employees from debris during work progress when full-face respirators are not being utilized.

2. Provide and require the use of eye protection when employees are working with a material that may splash or fragment, as specified by the Material Safety Data Sheet for a given product, or as required by Title 8, CCR.

3. Spectacle kits and eyeglasses must be provided for employees who wear glasses and who must wear full-face piece respirators. Provide respirators that have been tested and approved by the National Institute of Occupational Safety and Health for use in lead-contaminated atmospheres.

4. Provide full-body disposable protective clothing, including head, body, and foot coverings to workers and authorized visitors who enter the Work Area, in sizes adequate to accommodate movement without tearing. A new suit shall be provided and donned for each separate entry.

5. If washable clothing is to be worn underneath disposable protective clothing, it shall be provided to Abatement workers.

6. Provide a clean staging area for workers and others to store street clothes and personal protective equipment.

7. Disposal suits shall be collected in an appropriate disposal container at the entrance of the Abatement Work Area.

8. Abatement workers are required to wear nonskid footwear sufficient to protect them from workplace hazards. Disposable clothing shall be adequately sealed to the footwear to prevent body contamination.

9. Hand protection shall be provided, and workers shall be required to use lotion sufficient quantities to protect the worker when chemicals or other physical hazards exist.

10. As required by the Work site and applicable safety regulations, provide head protection and require the use thereof.

11. Worker protection equipment shall be ANSI approved.

PART 3 - EXECUTION

3.01 LEAD RELATED CONSTRUCTION WORK

A. Work Area Preparation and Work Practices:

1. Where exposure monitoring indicates Worker exposure is below the P.E.L., comply with the requirements of this section and the "Monitoring" section of this Specification.

2. Disturbance of lead containing materials shall be performed using wet methods.

3. Work requiring overhead disturbances shall require a means of capturing debris, thus preventing an uncontrolled release on the worker or the surfaces below.

4. For disturbances utilizing local exhaust dust collection devices the equipment shall be designed and furnished with a HEPA filtered vacuum attachment approved by the manufacturer.

5. Where Components are to be removed, loose Lead Based Paint and Lead Containing Paint shall be removed by manual means using wet methods.

6. Where a Component is attached and painted onto another surface and the Component is to be removed from the adjoining surface the paint shall be cut with a razor knife to reduce the potential of paint chip debris during Component removal.

7. If a Component being removed will be disposed of rather than reinstalled, manually cut the Component into manageable sections for disposal using wet

methods or mechanically cut using a manufactured approved HEPA filtered local exhaust dust collector.

8. If a Component is to be reused, loose paint or rough edges may require scraping or sanding. Scraping or sanding must be performed manually using wet methods or mechanically with a manufactured approved HEPA filtered local exhaust attachment.

9. For solid core surfaces where penetration or welding are required the lead containing material shall be removed from the area impacted using wet methods. Layers of Paint shall be removed before impact to the surface commences.

B. Clean Up Procedures:

1. During the entire process of Lead Related Construction Work, clean debris generated using wet methods and/or HEPA Vacuuming.

2. At the completion of the Lead Related Construction Work, clean surfaces within the impacted Work Area.

3. When HEPA filtered Vacuums are utilized, vacuum from the area of impact to the outer perimeter of the polyethylene sheeting to remove visible debris. If vacuuming cannot remove visible debris, wet wiping will also be required.

4. When wet wiping the Work Area, wipe from the area of impact to the outer perimeter of the polyethylene sheeting to remove visible debris.

5. Tools and equipment utilized in the Work Area shall be wet wiped to remove visible debris.

3.02 ABATEMENT

A. Work Area Preparation:

1. Clean areas to be isolated by HEPA Vacuum prior to installation of polyethylene sheeting.

2. Seal the Work Area with a layer of 6 mil thick polyethylene sheeting prior to any Lead Based or Lead Containing Paint Removal or disturbance by covering vents, windows, door openings, and any non-Moveable Objects such as lockers, etcetera.

3. Install a minimum of two layers of 6 mil thick polyethylene sheets on floors, fastened by waterproof tape and other means as necessary to secure the sheeting.

4. The covering on windows, exterior doors, and vents shall be installed from the outside to facilitate Work on them from the inside.

B. Decontamination Enclosure System:

1. At a minimum a two-stage Decontamination Enclosure System consisting of a compartment for Decontamination and a Clean Room shall be constructed and used.

2. Unless otherwise specified, the Decontamination Enclosure System shall be adjacent to the Abatement area.

3. Other enclosure methods may be used if submitted and approved by the Owner Consultant.

C. Removal and Replacement Substrates with Lead Based Paint:

1. Except as noted in the Specifications and Drawings, replace substrate with material of the same or better quality. Substrates include, but are not limited to doors, windows, moldings, casements, mantels, trims, skirting, baseboards, and associated hardware and fasteners.

2. Areas adjacent to substrate removal shall be protected from damage. Damages shall be repaired or replaced to original condition.

3. Substrates that are removed for replacement shall be wrapped and stored for disposal. Disposal shall be in accordance with the applicable codes and sections of this Specification.

4. After removal, the areas disturbed shall be cleaned and a Clearance Inspection performed in accordance with the procedures described in this Specification.

D. Abrasive Removers – Machine Sanders:

1. Machine sanders shall be furnished with a HEPA Vacuum system approved by the manufacturer.

2. Sanding shall only be performed on flat surfaces that allow the HEPA Vacuum dust collection attachment to come into tight contact with the surface being sanded.

3. Remove Lead Based Paint down to the bare substrate surface. If the pigment cannot be removed without damaging the substrate, submit a Request for Clarification to the Owner Consultant.

4. Protect adjacent surfaces from damage from machine sanding. Repair and/or replace damaged surfaces.

E. Chemical Removal-On-Site Chemical Removal:

1. No chemical Removal shall be performed on interior surfaces unless specifically called for and designed in the Specifications or the Abatement plan of the Project.

2. Owner approved chemical removers shall be compatible with and harmless to the substrate. On masonry surfaces chemical removers shall contain anti-stain formulation that inhibits discoloration.

3. Chemical Removal Agent Neutralizer: Use chemical Removal agent neutralizers on exterior surfaces only. Neutralizers shall be compatible with and not harmful to the substrate. Neutralizers shall be compatible with the Removal agent that has been applied to the surface substrate.

4. Apply chemical Removal agents and neutralizers in accordance with the recommendations of the manufacturer and the following:

   a. Adhere to health and safety regulations and other Specification section requirements. Stripping agents shall not be allowed to penetrate wood or other fibrous substrates.

   b. Remove the softened paint by scraping or wire brushing.

   c. Protect adjacent areas from damage from Removal agent during the course of Work.

F. Chemical Removal – Off-Site Chemical Removal – Structures of Historical Significance Only:

1. Remove and transport Lead Based Painted Component in accordance with this Specification. Transport the Component to an off-site location. Remove Lead Based Paint by chemical Removal. Neutralize and clean the Component. Return Component to the Project site free of lead-containing materials and reinstall.

2. Take extreme care in removing component to be taken off-site, to prevent damage. In addition:

   a. Component shall be marked and identified using an inconspicuous engraving, to insure reinstallation in original location.

   b. Hardware associated with a component shall be bagged and marked.

   c. If required, hardware shall be chemically stripped, cleaned, or reconditioned.

   d. Dispose of hazardous waste generated by the off-site stripping of Lead Based Paint as required by federal, state, and local regulations.

   e. Do not transport hazardous waste to Owner properties and/or facilities.

   f. Protect the component and the adjacent areas from which component are removed from damage by the removal and reinstallation procedures.

G. Water Jet Washing:

1. The purpose of the Water Jet Washing process is to remove Lead-Based and Lead Containing Paint from exterior masonry substrate.

2. If this procedure is selected, submit a Work plan to the Owner Consultant which includes, but is not limited to, interim controls, paint stabilization, and capture of waste water.

H. Encapsulation – Interior and Exterior - Coated Sealer System:

1. Materials: - Elastic acrylic coating shall be heavy bodied and warranted by the manufacturer to be compatible with the substrate. Elastic acrylic coating shall be long lasting and resist cracking, peeling, algae, and fungus.

2. Submittal: - Submit two Samples, 5 ½-inch by 8-inch of the encapsulation material to the Owner Consultant.

3. Encapsulation coatings shall be applied in accordance with the manufacturer's recommendations and the following conditions:

   a. Remove surface dust and debris by scrubbing with a non-residue detergent solution, and rinsing. Remove loose paint until a sound, intact edge is achieved. Remove and replace loose plaster prior to the coating application. Proper safety procedures and lead dust control method in this Specification must be utilized.

   b. Apply Encapsulation coatings to the substrate in a continuous coat to seal the surface being coated. The number of coats required and coverage rates shall be in accordance with the manufacturer's recommendations.

   c. Repair materials that lift and peel after the application of the Encapsulation coating by scraping until a sound surface is obtained. The edges shall be feathered, and a reapplication of an Encapsulation coating shall be applied.

   d. Remove, or cover as directed, existing fixtures located on surface to be coated, including but not limited to, electrical receptacles, switches, exhaust fans, and hardware.

   e. Protect adjacent surfaces and existing fixtures from damage by coating system. Damages to adjacent surfaces and existing fixtures due to lack of protection or improperly applied protection shall be repaired and/or replaced.

I. Encapsulation – Interior and Exterior - Flexible Wall Covering:

1. Materials: Wall covering shall be a reinforced fiber type that forms a secure bond with the substrate, resistant to peeling and formation of mold. The wall covering system shall form a seal over the substrate to which it is applied and not allow the passage of substrate dust into the environment.

2. Submittal: Prior to the start of Work, submit to the Owner Consultant for approval, manufacturer's descriptive literature, and two 5 ½-inch by 8-inch Samples of each wall covering system.

3. Install Encapsulation covering in accordance with manufacturer's installation instructions and the following provisions:

a. Remove foreign material by washing surfaces with a detergent solution. Remove loose plaster, loose paint, and loose wallpaper. Utilize dust control methods described in this Specification.

b. Repair larger damaged areas flush with surrounding wall surfaces prior to installation of wall covering system.

J. Enclosure Procedures - Gypsum Wallboard (interior surfaces only), plywood paneling, other enclosures of exterior substrate:

1. Surface preparation: Remove foreign material by wash-down with a non-residue detergent solution. Remove loose plaster, loose paint, and loose wallpaper in accordance with this Specification to stabilize the painted surfaces.

2. Affix warning labels stating surface contains "LEAD-BASED PAINT" to the surface prior to being enclosed. Labels shall be 3-inch by 5-inch and placed four feet apart at approximately five foot high on the surface being enclosed.

3. Install selected enclosure material in accordance with the relevant section of the Specification. Any disturbance to Lead Based Paint in the execution of this section shall comply with the Lead Related Construction Work section of this Specification.

K. Soil Abatement:

1. Surface Contamination:

a. Remove Lead Contaminated Soil from the locations and to a depth specified in the scope of Work.

b. In the absence of a specified depth of soil removal identified in the scope of Work, submit, prior to the bid, a Request for Clarification regarding the quantity of soil to be removed.

c. Submit a written soil abatement plan prior to initiation of the Project.

d. No soil abatement shall proceed until the Work plan has written approval by the Owner Consultant.

e. Refer to the waste handling and transportation section of this Specification for the handling, characterization, and disposal of waste.

L. Alternate Procedures:

1. If specified procedures cannot be utilized, a request must be made in writing to the Owner Consultant establishing details of the problem encountered and recommended alternatives.

2. Alternate procedures shall provide equivalent or greater protection than procedures that they replace.

3. Prior to implementation, alternative procedures shall be submitted and approved in writing by the Owner Consultant.

M. Clean Up Procedures

1. During the entire process of the Work of this section, perform continuous cleaning of debris generated using wet methods and/or HEPA filtered vacuuming.

2. At the completion of the Work of this section, clean surfaces within the impacted Work Area, including but not limited to, tools, equipment, and polyethylene sheeting to remove visible debris from the Work Area.

3. Tools and equipment utilized in the Work Area shall be thoroughly cleaned. Non-electrical tools and equipment shall be cleaned monthly and before Removal from the Work Area by HEPA vacuuming and washing using a lead specific detergent or other suitable cleaning agent.

4. Electrical tools and equipment shall be HEPA vacuumed and cleaned by wet wiping limiting the amount of water used to avoid electrical hazards.

5. Remove polyethylene sheeting, except for critical barriers, by folding it into itself beginning with the higher level polyethylene first.

6. Following Removal of polyethylene sheeting a final cleaning of surfaces in the Abatement workspace shall be performed by HEPA vacuuming, wet wiping, and a final HEPA vacuuming.

7. When HEPA vacuums are utilized, vacuuming shall be performed from the top down and from the area of impact to the outer edge of the polyethylene sheeting.

8. Apply no less than one continuous coat of approved paint or primer to abated surfaces, where applicable.

9. At the completion of the final clean up, the CDPHcertified supervisor shall inspect the Work Area for visible debris. If debris is identified, repeat the final cleaning process.

10. Wet wiping, washing, and cleaning required by this section shall include the Removal of visible debris by cleaning with a lead specific detergent or other suitable cleaning agent in clean water followed by a rinsing with clean water and clean rags, following the same sequence of cleaning as the vacuuming.

11. Refer to the waste handling and transportation section of this Specification for disposal of waste generated by this process.

3.03 WASTE HANDLING AND TRANSPORTATION

A. Characterization of Waste:

1. Until analytical results are available, waste materials (including water containing paint chips) shall be treated as hazardous. Visible paint chips shall be separated from waste water before characterization. Following removal of

solids the waste water shall be characterized to determine disposal requirements. The paint chips removed from the waste water may be disposed of as assumed RCRA hazardous waste or characterized to determine disposal requirements.

2. Characterize waste streams as follows:

   a. Collect a representative sample of the waste material.

   b. For a pile of waste take one sample of a proportionate combination of Component in the pile. If a large quantity of waste is generated no less than four samples may be required.

   c. For large wood Component, such as windows, doors, etcetera, a representative sample of each Component of similar characteristics, paint history, etcetera, shall be collected and tested. A full depth core sample, not less than one inch diameter, of the Component is to be collected. The core sample shall include the substrate and paint coatings on both sides of the Component, as applicable.

3. Analysis for the waste characterization samples shall be performed as follows:

   a. Waste generated by chemical stripping shall, in addition to the requirements for determining the solid and soluble lead concentrations, shall be tested for corrosiveness and other contaminants, as applicable, resulting from the chemical stripping process.

   b. Analyze samples for Total Threshold Limit Concentration (TTLC):

      1) If results are less than 50 mg/kg (milligrams/kilogram) the waste is not hazardous and shall be disposed as general construction waste.

      2) If sample results are 50 mg/kg or greater, the waste shall be tested for Soluble Threshold Limit Concentration (STLC).

   c. Where waste is required to be tested for STLC the following shall apply:

      1) If the STLC result is less than 5 mg/L (milligrams/liter) the material shall be disposed at a Class II waste landfill. Evidence of such results of the STLC testing will be required by the landfill before waste is accepted. No further testing is required.

      2) If the STLC results are 5 mg/L or greater, the waste is a California regulated waste and the material shall be tested using the federally mandated Toxicity Characterization Leaching Procedure (TCLP).

   d. Where waste is required to be tested by TCLP the following shall apply:

1) If the TCLP is less than 5 mg/L, the waste is a California regulated hazardous solid waste (non-RCRA). This material shall be disposed in a Class I hazardous waste landfill.

2) If the TCLP is equal to or greater than 5 mg/L, the waste is a federally regulated hazardous waste solid (RCRA). The waste shall then be disposed in a Class I hazardous waste landfill.

e. Personal and commercial wash water with lead contamination shall be handled as follows:

1) Filter the waste water through cheesecloth, or other similar filtering media, to remove the gross debris. Separate the waste streams and characterize these in compliance with this Specification.

2) If the waste water is identified as a RCRA or California regulated hazardous waste (Non-RCRA) by STLC and TCLP, filter the waste water by power pumping it through a 20 micron pore size filter. The filtered water shall be tested as described for waste in this Specification.

3) If test results categorize the filtered water as non-hazardous, it may be disposed of in the sewer system.

4) Wastewater, filtered or otherwise, shall not be discharged in storm drains, gutters or allowed to sheet flow over the surface of the ground.

B. Waste Handling:

1. Waste, hazardous and non-hazardous, shall be disposed of at an authorized site in accordance with provisions of this Specification and applicable Federal, State, and local laws.

2. Any waste determined to be hazardous, through analytical testing, shall be kept in a secured area or lockable container that is inaccessible to persons other than authorized personnel working on the Project. Hazardous waste containers shall be labeled "Hazardous-Waste – Contains Lead" and labeled with the date waste collection commenced.

3. Hazardous waste shall not remain on the Project site beyond 90 days of the date it was generated. It shall be removed from the Project site and transported to an approved landfill before the 90 days has elapsed.

4. Waste shall not be transported from the work are to the storage container or waste hauler's vehicle while students or staff are present in the path of travel. Where a path of travel cannot be cordoned off the transportation of waste must be completed prior to of after students and staff are not on site.

5. Once hazardous waste is removed from the Project site, ensure it is disposed of in an approved landfill within 6 days. The waste shall not be transported to

another site for commingling of waste from a source other than the site of original generation. This requirement shall be documented by the proper execution of a Uniform Hazardous Waste Manifest signed by the landfill operator.

6. Hazardous and non-hazardous waste shall be kept in different containers and stored in separate locations. Commingling of waste is not permitted.

7. As the Work progresses, to prevent exceeding available storage capacity on the Project site, sealed and labeled containers of lead waste shall be removed and transported to the prearranged disposal location.

8. Containers used for hazardous waste shall meet the requirements of EPA and DOT for hazardous waste storage and transport. At a minimum, disposal packaging of Lead Based Paint fragments, dust, and debris shall be in 6-mil polyethylene (plastic) bags that are airtight and puncture resistant.

9. Any debris or residue observed on containers or surfaces outside of the Work Area resulting from clean up or disposal activities shall immediately be cleaned using HEPA filtered vacuum equipment and/or wet methods as appropriate.

10. Materials not contained in bags or other appropriate disposal containers shall not be placed in lead waste storage containers, nor shall storage containers be used for non-lead waste. To avoid damage, packaged waste shall be placed, not thrown, into the storage containers.

11. Lead Contaminated Soil shall be transported in plastic lined containers.

C. Transportation of Non-Hazardous Waste:

1. Receipts from the disposal facility, trip tickets, transportation manifests, weight certificates or other documentation of disposal shall be delivered to the Owner Consultant within 48 hours of disposal. The waste manifest shall be signed by the generator, the transporter(s), and the disposal site operator each time the responsibility for the waste material is transferred. If a separate hauler is employed, the name, address, and signature of the transporter shall also appear on the manifest.

D. Transportation of Hazardous Waste:

1. Hazardous waste shall be transported by a RCRA/DOT/EPA certified hazardous waste transporter. Provide evidence that the hazardous waste transporter meets the requirements of this Specification.

2. The Work of this section includes responsibility for actions of the hazardous waste transporter as it pertains to waste Removal and disposal related to the Work of this Specification.

3. Identify the facility to which the waste generated by this Specification will be taken. Evidence shall be provided verifying the facility is licensed/permitted

to receive and handle non-hazardous lead containing waste and/or hazardous lead containing waste as applicable.

4. Waste disposed as hazardous shall be transported under a Uniform Hazardous Waste Manifest. The generator copy of this manifest shall be submitted to the Owner Consultant within five days of transport.

5. Dump receipts, trip tickets, transportation manifests, weight certificates or other documentation of disposal shall be delivered to the Owner Consultant within 48 hours of disposal. The Uniform Hazardous Waste Manifest shall be signed by the generator (or designee), the transporter(s), and the disposal site operator each time the responsibility for the waste material is transferred. If a separate hauler is employed, the name, address, U.S.E.P.A. ID number and signature of the transporter shall also appear on the manifest.

6. The enclosed cargo area of trucks or containers shall be free of debris and lined with 6-mil polyethylene sheeting to prevent contamination from leaking or spilled containers. Floor sheeting shall be installed first and extend up the walls. Wall sheeting shall be overlapped and taped into place.

7. During transport, drums and other containers shall be placed on level surfaces in the cargo area and packed tightly together to prevent shifting and tipping. Large structural Component shall be secured to prevent shifting and bags placed on top.

3.04 MONITORING

A. Project Management and Inspection:

1. Owner has the right to perform air, wipe, and visual monitoring at any time.

2. Owner shall proceed in accordance with the terms and conditions of the Contract Documents whenever the Work or protective measures are not in compliance with applicable governmental regulations, Contract requirements, and/or threatens the adjoining environment with lead contamination.

3. Where exposure monitoring indicates exposure is at or above the P.E.L. comply with Title 8, CCR Section 1532.1 (e) through (n).

B. Employee – Personal Air Monitoring:

1. Provide air monitoring as required by Title 8 CCR, Section 1532.1. Results shall be provided within ten working days of sampling. If the intent is to utilize such as exposure assessment documentation, and Work is to commence earlier than ten working days, submit results 24 hours in advance of the start of Work.

C. Clearance Inspection:

1. Clearance Inspection for Lead Related Construction Work shall include:

a. A visual inspection of the Work Area by the Owner Consultant prior to occupancy for normal activity.

b. Do not remove barriers designating a regulated Work Area until a written release from the Owner Consultant is provided.

c. The Owner Consultant has the right to collect wipe samples as part of the Clearance Inspection.

2. Clearance Inspection for Abatement shall include:

a. A visual inspection of the Work Area by the Owner Consultant prior to collection of environmental samples (dust, wipe, and/or soil samples, as applicable).

b. Owner Consultant shall collect environmental samples.

c. Results of samples shall comply with Title 17, CCR before the Work Area is released for normal occupancy.

d. Where samples fail to meet regulated clearance levels of Title 17, CCR, clean the Work Area as required for final cleaning in the Clean Up Procedures section of this Specification.

e. Following cleaning, the visual inspection and environmental sampling will be repeated as described above. This process shall continue until the clearance level of Title 17, CCR is provided.

3.05 RE-ESTABLISHMENT OF THE WORK AREA AND SYSTEMS

A. Re-establishment of the Work Area shall only occur following the completion of clean-up procedures and after a Clearance Inspection has been performed and documented to the satisfaction of the Owner Consultant.

B. Re-secure Moveable Objects removed from their former positions during area preparation activities.

C. Relocate Moveable Objects that were removed to temporary locations back to their original positions.

D. Reestablish HVAC, mechanical and electrical systems to the condition prior to commencement of the Project.

E. Repair areas of damage that occurred as a result of Abatement or Lead Related Construction Work.

3.06 PROJECT COMPLETION DOCUMENTATION

A. Provide to the Owner Consultant of the following close-out documentation:

1. Filter change logs for air filtration units, water filtration units and respirators

2. Foreman's daily job reports

3. Employee entry and exit logs for Work Areas

4. Visitor entry and exit logs for Work Area

5. Air sample results for personnel

6. Copies of hazardous and non-hazardous waste manifest

7. Hazardous waste weight tickets

8. Analytical data and chain of custody for waste characterization

9. Signed Daily Personnel Report Forms

B. Provide Owner Consultant with as-built drawings identifying surfaces where Lead Based Paint has been encapsulated or enclosed.

END OF SECTION

SECTION 03 1000

CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Formwork for cast-in-place concrete as indicated.

2. Installation of items to be embedded in concrete, such as anchor bolts, inserts, embeds, and sleeves.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 03 2000: Concrete Reinforcing.

3. Section 03 3000: Cast-In-Place Concrete.

1.02 REFERENCES

A. American Concrete Institute (ACI) Publication:

1. ACI 318 – Building Code Requirements for Structural Concrete, Chapter 6, Formwork, Embedded Pipes, and Construction Joints.

2. ACI 347 – Guide to Formwork for Concrete.

B. American Plywood Association (APA):

1. Form No. V345 - Concrete Forming Design/Construction Guide.

C. National Institute of Standards and Technology (NIST):

1. NIST Voluntary Product Standard PS 1.

1.03 SUBMITTALS

A. Submit detailed structural calculations and drawings approved and signed by a California registered Civil Engineer where the height of the falsework or vertical shoring, as measured from the top of the sills to the soffit of the superstructure exceeds 14 feet, or where individual horizontal span lengths exceed 16 feet, or where provision for vehicular traffic through falsework or shoring occurs. For all other falsework and shoring submit layout signed by California registered Civil Engineer, manufacturer's authorized representative or a licensed contractor experienced in the usage and

erection of falsework and vertical shoring. A copy of the plans and calculation shall be available at the jobsite at all times.

B. Shop Drawings: Submit Shop Drawings indicating locations of forms, construction and expansion joints, embedded items, and accessories.

C. Product Data: Submit manufacturer's Product Data for form materials and accessories.

1.04 REGULATORY REQUIREMENTS

A. California Building Code (CBC), Chapter 19A.

B. California Code of Regulations, Title 8, Division 1, Chapter 4, Subchapter 4, Construction Safety Orders, Article 6, Excavations, Sections 1713 and 1717.

1.05 DELIVERY, STORAGE AND HANDLING

A. Storage shall prevent damage and permit access to materials for inspection and identification.

PART 2 - PRODUCTS

2.01 GENERAL

A. Form materials may be reused during progress of the Work provided they are completely cleaned and reconditioned, recoated for each use, capable of producing formwork of required quality, and are structurally sound.

B. Form Lumber: WCLIB Construction Grade or Better, WWPA No. 1 or Better.

C. Plywood: NIST Voluntary Product Standard PS 1, Group 1, Exterior Grade B-B Plyform or better, minimum 5-ply and 3/4 inch thick for exposed locations and at least 5/8 inch thick for unexposed locations, grade marked, not mill oiled. Furnished plywood with medium or high density overlay is permitted.

D. Coated Form Plywood: For exposed painted concrete, plastic overlaid plywood of grade specified above, factory coated with a form coating and release agent Nox-crete", or equal.

E. Tube Forms: Sonoco "Seamless Sonotubes," Ceme-Tube, Quik-Tube, or equal, of the type leaving no marks in concrete, one-piece lengths for required heights.

F. Joist Forms: Code recognized steel or molded plastic types as required.

G. Special Forms: For exposed integrally-colored concrete, plywood as above with high density overlay, plywood with integral structural hardboard facing or fibrous glass reinforced plastic facing, providing specified finish.

H. For Exposed Concrete Finish:

1. Plywood: New, waterproof, synthetic resin bonded, exterior type Douglas fir or Southern pine plywood manufactured especially for concrete formwork and conforming to NIST Voluntary Product Standard PS 1, Grade B-B grade, Class I.

2. Glass-Fiber-Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to structural tolerances and appearance of finished concrete surfaces.

3. Steel: Minimum 16 gage sheet, well matched, tight fitting, stiffened to support weight of concrete, without deflection detrimental to tolerances and appearances of finished concrete surfaces.

4. Plywood: "Finland Form,," "Combi Form" by North American Plywood Corporation, "Plyform" by Roy O. Martin, "ProForm" by Pacific Wood Laminates, or equal. The material shall be furnished with hard smooth birch face veneers with phenolic resin thermally fused onto panel sides. Edges shall be factory sealed.

I. Form Ties: Prefabricated rod, flat band, wire, internally threaded disconnecting type, not leaving metal within 1 1/2-inch of concrete surface.

J. Form Coating: Non-staining clear coating free from oil, silicone, wax, not grain-raising, "Formshield" by A.C. Horn, Inc., "Release" by Edoco/Dayton Superior, "Cast-Off" by Sonneborn/BASF Building Systems or equal. Where form liners are furnished, provide form coatings recommended by form liner manufacturer.

K. Form Liner: Rigid or resilient type by L.M. Scofield, Symons, Greenstreak, or equal.

L. Void Forms: Manufactured by SureVoid Products, Inc., Sonotube, Void Form International, or equal. Forms shall be "WallVoid" for temporary support of concrete walls and grade beams spanning between supports, and "SlabVoid" for creating gaps between concrete slabs or steps and underlying soils. Void forms shall be fabricated of corrugated paper with moisture resistant exterior, and shall be capable of withstanding working load of 1,500 psf. Provide accessories as required.

PART 3 - EXECUTION

3.01 GENERAL

A. Forms shall be constructed so as to shape final concrete structure conforming to shape, lines and dimensions of members required by Drawings and Specifications, and shall be sufficiently tight to prevent leakage of mortar. They shall be properly braced or tied together to maintain position and shape. Forms and their supports shall be designed so that previously placed structures will not be damaged.

B. Use form coating at all surfaces in contact with concrete.

3.02 TOLERANCES

A. Permitted abrupt or gradual irregularities in formed surfaces as measured within a 5 feet length with a straightedge shall per ACI 347, Table 3.1:

Class of Surface			
A	B	C	D
1/8 inch	1/4 inch	1/2 inch	1 inch

1. Class A: Use for concrete surfaces prominently exposed to public view.

2. Class B: Use for coarse-textured concrete-formed surfaces intended to receive plaster, stucco or wainscoting.

3. Class C: Use as a general standard for permanently exposed surfaces where other finishes are not specified.

4. Class D: Use for surfaces where roughness is not objectionable and will be permanently concealed.

3.03 ERECTION

A. Plywood shall be installed with horizontal joints level, vertical joints plumb and with joints tight. Back joints by studs or solid blocking, and fill where necessary for smoothness. Reused plywood shall be thoroughly cleaned, damaged edges or surfaces repaired and both sides and edges oiled with colorless form oil. Nail plywood along edges, and to intermediate supports, with common wire nails spaced as necessary to maintain alignment and prevent warping.

B. Openings for Cleaning: Provide temporary openings at points in formwork to facilitate cleaning and inspection. At base of walls and wide piers, bottom form board on one face for entire length shall be omitted until form has been cleaned and inspected.

C. Chamfers: Provide 3/4 inch by 3/4 inch chamfer strips for all exposed concrete corners and edges unless otherwise indicated.

D. Reglets and Rebates: As specified in Section 03 3000: Cast-In-Place Concrete.

3.04 REMOVAL OF FORMS

A. Forms shall not be removed until concrete has sufficiently hydrated to maintain its integrity and not be damaged by form removal operations. Unless noted otherwise and/or permitted by the Architect, columns and wall forms shall not be removed in less than five days, floor slabs in less than seven days, beams and girders in less than 15 days, pan forms for joists may be removed after three days, but joist centering shall not be removed until after 15 days, and ramp, landing, steps and floor slabs shall not be removed in less than seven days. Shoring shall not be removed until member has

acquired sufficient strength to support its weight, load upon it, and added load of construction.

B. Compressive strength of in-place concrete shall be determined by testing field-cured specimens representative of concrete location or members, as specified in Section 03 3000: Cast-In-Place Concrete.

3.05 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.06 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 03 2000

CONCRETE REINFORCING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Concrete steel reinforcement.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 01 4523: Testing and Inspection.

3. Section 03 1000: Concrete Forming.

4. Section 03 3000: Cast-In-Place Concrete.

5. Section 04 2100: Clay Unit Masonry.

6. Section 04 2200: Concrete Unit Masonry.

1.02 REGULATORY REQUIREMENTS

A. Fabrication and placement of reinforcing shall be in accordance with requirements of CBC, Chapter 19A.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

2. ASTM A184 - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.

3. ASTM A185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

4. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.

5. ASTM A497 - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.

6. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

7. ASTM A706 - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

B. American Concrete Institute (ACI) Publication:

1. ACI SP-66 – ACI Detailing Manual.

2. ACI 318 – Building Code Requirements for Structural Concrete, as modified by CBC.

C. American Welding Society (AWS):

1. AWS D1.4 – Structural Welding Code – Reinforcing Steel.

1.04 SUBMITTALS

A. Shop Drawings: Submit steel reinforcement Shop Drawings in accordance with ACI 315. Include assembly diagrams, bending charts and slab plans. Indicate lengths and location of splices, size and lengths of reinforcing steel.

B. Closeout Submittals: Record exact locations of reinforcing that vary from Shop Drawings.

1.05 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice.

2. American Welding Society (AWS).

3. American Concrete Institute (ACI).

4. CBC, Chapter 19A, Concrete.

B. Source Quality Control: Refer to Division 01 Sections for general requirements and to the following paragraphs for specific procedures. Testing laboratory retained by the OWNER shall select test Samples of bars, ties, and stirrups from the material at the Project Site or from the place of distribution, with each Sample consisting of not less than two 18 inch long pieces, and perform the following tests according to ASTM A615, or ASTM A706, as applicable:

1. Identified Bars: If Samples are obtained from bundles as delivered from the mill, identified as to heat number, accompanied by mill analyses and mill test reports, and properly tagged with the identification certificate so as to be readily identified, perform one tensile and one bend test for each 10 tons or fraction thereof of each size of bars. Submit mill reports when Samples are selected.

2. Unidentified Bars: When positive identification of reinforcing bars cannot be performed and when random Samples are obtained; perform tests for each 2.5 tons or fraction thereof, one tensile and one bend test from each size of bars.

C. Certification of Welders: Shop and Project site welding shall be performed by welding operators certified by AWS.

1.06 DELIVERY, STORAGE AND HANDLING

A. Avoid exposure to dirt, moisture or conditions harmful to reinforcing.

B. Reinforcing steel bars, wire, and wire fabric shall be stored on the Project site to permit easy access for examination and identification of each shipment. Material of each shipment shall be separated for size and shape.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide reinforcing of sizes, gages and lengths indicated, bent to indicated shapes.

2.02 MATERIALS

A. Steel Reinforcing Bars: ASTM A615, or ASTM A706 deformed grade 60 billet steel unless otherwise specified or indicated.

B. Bars or Rod Mats: ASTM A184.

C. Welded Wire Fabric for Reinforcement: ASTM A185.

D. Tie Wire: ASTM A82, fully annealed, copper-bearing steel wire, 16 gage minimum.

E. Chairs, Spacers, Supports, and Other Accessories: Standard manufacture conforming to ACI 315 fabricated from steel wire of required types and sizes. For reinforcement supported from grade, provide properly sized dense precast blocks of concrete.

2.03 FABRICATION OF REINFORCING BARS

A. Comply with CRSI Manual of Standard Practice for Reinforced Concrete Construction for fabrication of reinforcing steel.

B. Bending and Forming: Fabricate bars of the indicated sizes and bend and form to required shapes and lengths by methods not injurious to materials. Do not heat reinforcement for bending. Bend bars No. 6 size and larger in the shop only. Bars with unscheduled kinks or bends are not permitted. Provide only tested and permitted bar materials.

C. Welding: Provide only ASTM A706 steel where welding is indicated. Perform welding by the direct electric arc process in accordance with AWS D1.4 and specified low-hydrogen electrodes. Preheat 6 inches each side of joint. Protect joints from drafts during the cooling process; accelerated cooling is not permitted. Do not tack weld bars. Clean metal surfaces to be welded of loose scale and foreign material. Clean welds each time electrode is changed and chip burned edges before placing welds. When wire brushed, the completed welds must exhibit uniform section, smooth welded metal, feather edges without undercuts or overlays, freedom from porosity and clinkers, and good fusion and penetration into the base metal. Cut out welds or parts of welds deemed defective, using chisel, and replace with proper welding. Prequalification of welds shall be in accordance with CBC requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Bars shall be bent cold. Bars partially embedded in concrete shall not be field bent except as indicated on reviewed Shop Drawings.

B. Before installation and just prior to placing concrete, clean reinforcing of loose scale, rust, oil, dirt and any coating that could reduce bond.

C. Accurately position, install, and secure reinforcing to prevent displacement during the placement of concrete.

D. Provide metal chairs to hold reinforcement the required distance above form bottoms. In beams and slab construction, provide chairs under top slab reinforcement as well as under bottom reinforcement. Space chairs so that reinforcement will not be displaced during installation. Provide metal spacers to secure proper spacing. Stirrups shall be accurately and securely wired to bars at both top and bottom. At slabs, footings, and beams in contact with earth, provide concrete blocks to support reinforcement at required distance above grade.

E. Install and secure reinforcement to maintain required clearance between parallel bars and between bars and forms. Lapped splices shall be installed wherever possible in a manner to provide required clearance between sets of bars. Stagger lapped splices. Dowels and bars extending through construction joints shall be secured in position

against displacement before concrete is installed and subsequently cleaned of concrete encrustations while they are still soft.

F. Do not install reinforcing in supported slabs and beams until walls and columns have been installed to underside of slabs and beams or until construction joints have been thoroughly cleaned. Reinforcing shall be inspected before placement of concrete and cleaned as required.

G. Use deformed bars unless otherwise indicated, except for spiral reinforcement.

3.02 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.03 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 03 3000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Cast-in-place normal weight and lightweight concrete, placement and finishing.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 32 1313: Site Concrete Work.

3. Section 03 1000: Concrete Forming and Accessories.

4. Section 03 2000: Concrete Reinforcing.

5. Section 07 2600: Vapor Barriers.

1.02 REFERENCES

A. American Concrete Institute (ACI) Publication:

1. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.

2. ACI 301 – Specifications for Structural Concrete.

3. ACI 302.1R – Guide for Concrete Floor and Slab Construction.

4. ACI 305R - Specification for Hot Weather Concreting.

5. ACI 306.1 – Standard Specification for Cold Weather Concreting.

6. ACI 308R – Guide to External Curing of Concrete.

7. ACI 318 - Building Code Requirements for Structural Concrete, as modified by CBC Sections 1903A and 1905A.

B. American Society for Testing and Materials (ASTM) Standards:

1. ASTM C31 – Standard Specification for Making and Curing Concrete Test Specimens in the Field.

2. ASTM C33 - Standard Specification for Concrete Aggregates.

3. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

4. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

5. ASTM C88 - Standard Test Method for Soundness of Aggregates by use of Sodium Sulphate or Magnesium Sulphate.

6. ASTM C94 - Standard Specification for Ready-Mixed Concrete.

7. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.

8. ASTM C150 - Standard Specification for Portland Cement.

9. ASTM C156 – Standard Test Method for Water Loss (from a Mortar Specimen) Through Liquid membrane-Forming Curing Compounds for Concrete.

10. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.

11. ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete.

12. ASTM C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

13. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.

14. ASTM C289 - Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method).

15. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

16. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.

17. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.

18. ASTM C567 - Standard Test Method for Determining Density of Structural Lightweight Concrete.

19. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

20. ASTM C845 - Standard Specification for Expansive Hydraulic Cement

21. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.

22. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

23. ASTM C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.

24. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.

25. ASTM C1315 – Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

26. ASTM D1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.

27. ASTM C1567 - Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method).

28. ASTM D1751 - Standard Test Method for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

29. ASTM D7234 – Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.

30. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

31. ASTM E1155 - Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers.

32. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.

33. ASTM E1745 - Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

34. ASTM F710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

35. ASTM F1869 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

36. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In Situ Probes.

37. ASTM F3010 – Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use under Resilient Floor Coverings.

1.03 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating locations of cast-in-place concrete Work and accessory items such as vapor barriers. Include details and locations of reinforcing, embedded items, and interfacing with other Work.

B. Mix Design Data: Submit concrete mix designs as specified herein and in Article 2.02.

1. Submit name, address and telephone number of the concrete production facility which the contractor intends to engage to design the concrete mixes. Submit name and qualifications of the proposed concrete technologist.

2. Mix Design: Submit a concrete mix design for each strength and type of concrete indicated in the drawings or specified. Include water/cement ratio, source, size and amount of coarse aggregate and admixtures. Predict minimum compressive strength, maximum slump and air content percentage. Clearly indicate locations where each mix design will be used.

a. Water/cement ration for concrete slabs on grade shall be 0.50 maximum.

3. Test Reports: Submit copies of test reports showing that the proposed mixes produce concrete with the strengths and properties specified. Include tests for cement, aggregates and admixtures. Provide gradation analysis.

C. Material Samples: Submit Samples illustrating concrete finishes and hardeners, minimum 12-inch by 12-inch.

D. Certificates: Submit certification that each of the following conforms to the standards indicated:

1. Portland cement: ASTM C150.

2. Normal weight concrete aggregates: ASTM C33.

3. Lightweight concrete aggregates: ASTM C330.

4. Aggregates: Submit evidence that the aggregate is not reactive in the presence of cement alkalis. In the absence of evidence, aggregate shall be tested by one of the methods in ASTM C33 Appendix XI, Methods for Evaluating Potential for Deleterious Expansion Due to Alkali Reactivity of an Aggregate. . Aggregates deemed to be deleterious or potentially deleterious may be used with the addition of a material that has been shown to prevent harmful expansion in accordance with Appendix XI of ASTM C33, when approved by the building official, in accordance to CBC Section 1903A5A.

5. Curing materials: ASTM C171.

E. Admixtures: Submit product data for proposed concrete admixtures.

1.04 QUALITY ASSURANCE

A. Continuous inspection shall be provided at the batch plant and for transit-mixed concrete to run check sieve analysis of aggregate, check moisture content of fine aggregate, check design of mix, check cement being used with test reports, check loading of mixer trucks, and certify to quantities of materials placed in each mixer truck.

B. Inspection shall be performed by a representative of a testing laboratory selected by the OWNER. OWNER will pay for inspection costs. Notify the laboratory 24 hours in advance of time concrete is to be mixed. Notify the laboratory of postponement or cancellation of mixing within at least 24 hours of scheduling time.

C. CONTRACTOR shall assist the testing laboratory in obtaining and handling samples at the project site and at the source of materials.

D. Continuous batch plant inspection requirement may be waived in accordance with CBC Section 1705A.3.3.1. Waiver shall be in writing, including DSA approval. When batch plant inspection is waived by DSA, the following requirements shall be met:

1. Approved inspector of the testing laboratory shall check the first batching at the start of work and furnish mix proportions to the licensed weightmaster.

2. Licensed weightmaster shall positively identify materials as to quantity and certify to each load by a ticket.

3. Tickets shall be transmitted to the Inspector by a truck driver with load identified thereon. The Inspector will not accept the load without a load ticket identifying the mix and will keep a daily record of placements, identifying each truck, its load and time of receipt and approximate location of deposit in the structure and will transmit a copy of the daily record to DSA.

4. At the end of the project, the weightmaster shall furnish an affidavit to DSA certifying that all concrete furnished conforms in every particular to proportions established by mix designs.

E. Special Inspections and Tests shall be in accordance with CBC Chapter 17A, Reinforcement and Anchor testing per CBC Section 1910A and Specification Section 01 4523.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store cement and aggregate materials so as to prevent their deterioration or intrusion by foreign matter. Deteriorated or contaminated materials shall not be furnished.

B. Packaged materials shall bear the manufacturers and brand name label, and shall be stored in their original unbroken package in a weather tight place until ready for use in the work.

1.06 PROJECT CONDITIONS

A. Cold Weather Requirements: Batching, mixing, delivering and placing of concrete in cold weather shall comply with the applicable requirements of ACI 306.1.

B. Hot Weather Requirements: Batching, mixing, delivering and placing of concrete in hot weather shall comply with the applicable requirements of ACI 305R.

C. Concrete temperature of freshly mixed concrete shall be determined per ASTM C1064.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cement: ASTM C150. Portland Cement.

B. Aggregates: Conform to the following standards:

1. Normal weight concrete: ASTM C33.

2. Lightweight concrete: ASTM C330, with fine aggregates per ASTM C33.

3. Aggregate shall be tested for Potential Alkali Reactivity of Cement-Aggregate Combinations per ASTM C289.

4. Nominal maximum size of coarse aggregate shall be no larger than:

a. 1/5 the narrowest dimension between sides of forms, nor

b. 1/3 the depth of slabs, nor

c. 3/4 the clear spacing between individual reinforcing bars or wires, bundles of bars, individual tendons, or ducts.

d. CONTRACTOR may request the ARCHITECT and DSA waiver of the above limitations reported per ACI 318, provided that the workability and methods of consolidation are such that the concrete can be placed without honeycombs or voids.

C. Water: Water for concrete mixes, curing and cleaning shall be potable and free from deleterious matter.

D. Admixtures: Shall be shown capable of maintaining essentially the same composition and performance throughout the work as the product used in establishing concrete proportions in accordance with ACI 318, Section 3.6.

1. Admixtures containing chlorides or sulfides are not permitted.

2. Air-entraining admixtures shall comply with ASTM C260. Air-entrained admixtures shall not be used for floor slabs to receive steel trowel finish.

3. Admixtures for water reduction and setting time modification shall conform to ASTM C494.

4. Admixtures for producing flowing concrete shall conform to ASTM C1017.

5. Fly ash, pozzolan and ground granulated blast-furnace slag: Modify ACI 318 Sections 3.6.6 and 3.6.7 as follows:

a. Fly ash or other pozzolan used as a partial substitution for ASTM C150 Portland cement shall meet the following requirements:

1) Shall conform to ASTM C618 for Class N or F materials (Class C is not permitted).

2) 25% percent maximum by weight of fly ash or other pozzolans shall substitute for ASTM C150 Portland cement provided the mix design is proportioned per ACI 318, Section 318 5.3.

b. Ground-granulated blast-furnace slag used as a partial substitution for ASTM C150 Portland cement shall meet the following requirements:

1) Shall conform to ASTM C989.

2) 25% percent maximum by weight of ground-granulated blast-furnace slag shall substitute for ASTM C150 Portland cement provided the mix design is proportioned per ACI 318, Section 5.3.

6. Admixtures containing ASTM C845 expansive cements shall be compatible with the cement and produce no deleterious effects.

7. Silica fumes used as an admixture shall conform to ASTM C1240.

E. Reinforcement Fibers: Chop strands of alkali-resistant polypropylene or nylon fibers added to the concrete mix for protection against shrinkage cracks.

F. Expansion Joint Fillers: Preformed strips, non-extruding and resilient bituminous type, of thickness indicated, conforming to ASTM D1751.

G. Curing:

1. Curing Paper: Shall conform to ASTM C171 and consist of two sheets of kraft paper cemented together with a bituminous material in which are embedded cords or strands of fiber running in both directions. The paper shall be light in color, shall be free of visible defects, with uniform appearance.

2. Elevated slabs and slabs on grade may be cured at CONTRACTOR's option with curing and proactive water vapor emission and alkalinity control system. Products shall be approved by OWNER's Office of Environmental Health and Safety.

a. VaporSeal 309, by Floor Seal Technology, Inc., or equal.

1)	ASTM C156:	0.39 kg/m².
2)	ASTM C309:	Exceeds requirements.
3)	ASTM C1315:	Exceeds requirements.
4)	ACI 308R-01	Compliant.

b. Remedial Treatment: Water vapor emission and alkalinity control treatment, MES 100 by Floor Seal Technology, Inc. or equal.

1)	ASTM E96:	<0.1 Perms.
2)	ASTM D1308:	14pH Resistant.
3)	ASTM D7234:	500+psi 100% concrete failure.
4)	ASTM F2170:	100%RH resistant.
5)	VOC Content:	<100 g/L, meets SCAQMD Rule #1113.
6)	ASTM F3010:	Meets Requirements.

c. Self-leveling Compounds: Ardex Engineered Cements, K15, Combimix; Leveler 720. Armstrong, S-194, or equal.

H. Floor Hardener: Water soluble, inorganic, silicate-based curing, hardening, sealing and dustproofing compound. Aquaseal W20 by Monopole Inc., Kure-N-Harden by BASF, Chem Hard by L&M, Liqui-Hard by W. R. Meadows, or equal.

I. Underlayment: Two component latex underlayment for filling low spots in concrete for both interior and exterior applications, from featheredge to a maximum of 3/8 inch in thickness. Underlayment shall be non-shrink and suitable for repairing exposed concrete surfaces and for underlayment of carpet, resilient, tile and quarry floor coverings. La-O-Tex by TexRite, Underlay C, RS by Mer-Krete Systems, Underlayment 962 by C-Cure, or equal.

J. Vapor Barrier: Refer to Section 07 2600, Vapor Barriers.

K. Stair Treads and Nosings: Two part stair tread and nosing with ribbed abrasive bars. Fabricated from 6063-T5 or 6063-T6 extruded aluminum, mill finish. Anti-slip abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Color shall extend uniformly throughout filler.

1. American Safety Tread: TP-311R.

2. Balco Inc.: DST-330.

3. Nystrom: STTB-P3.375E.

4. Wooster Products Inc.: WP-RN3SG.

5. Equal.

L. Grout: ASTM C1107, non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 7,000 psi at 7 days; of consistency suitable for application and a 30 minute working time.

2.02 CONCRETE MIX

A. Mix shall be signed and sealed by a Civil or Structural Engineer currently registered in the State of California.

B. Strength of Concrete: Strengths and types of concretes shall be as indicated in the Drawings. Unless otherwise indicated or specified, concrete shall be provided with minimum 28-day strength of 3000 psi (f'c).

C. Concrete mix shall meet the durability requirements of ACI 318, Chapter 4.

D. Concrete proportioning shall be determined on the basis of field experience and/or trial mixtures shall in accordance with ACI 318, Section 5.3. Proportions of materials shall provide workability and consistency to permit concrete to be placed readily into forms and around reinforcement under conditions of placement to be employed, without segregation or excessive bleeding.

E. Ready-Mixed Concrete: Mix and deliver in accordance with requirements of ASTM C94.

PART 3 - EXECUTION

3.01 GENERAL

A. Surfaces to receive concrete shall be free of debris, standing water, and any other deleterious substances before start of concrete placing.

B. Time of Placing: Do not place concrete until reinforcement, conduits, outlet boxes, anchors, hangers, sleeves, bolts, and other embedded materials are securely fastened in place. Contact the Inspector at least 24 hours before placing concrete; do not place concrete until inspected by the Project Inspector.

C. Pouring Record: A record shall be kept on the Project site of time and date of placing concrete in each portion of structure. Such record shall be maintained on the Project site until Substantial Completion and shall be available for examination by the ARCHITECT and DSA.

3.02 TOLERANCES

A. Concrete construction tolerances shall be as specified in ACI 117 and as modified herein.

B. Floor Flatness (F_F) and Floor Levelness (F_L) shall be as indicated below:

	Specified Overall Value		Minimum Local Value	
	F_F	F_L	F_F	F_L
Slabs on ground: mechanical and electrical rooms, parking structures and mortar bed set tile and quarry flooring.	20	15	15	10
Slab on ground: carpet.	25	20	17	15
Slab on ground: thinset tile and resilient flooring.	35	25	24	17

Suspended slabs: mechanical and electrical rooms, parking structures and mortar bed set tile and quarry flooring.	20	15	N/A	N/A
Suspended slabs: carpet.	25	20	N/A	N/A
Suspended slabs: thinset tile and resilient flooring.	35	20	N/A	N/A

C. Refer to ACI 302.1R, Tables 8.1 and 8.2 Slab on Ground and Suspended Flatness/Levelness Construction Guide, for recommended concrete placing and finishing methods.

D. Floor Flatness and Floor Levelness shall be tested in accordance to ASTM E1155. Floor measurements shall be made within 48 hours after slab installation, and shall precede removal of shores and forms.

3.03 PREPARATION

A. For installation of vapor barrier refer to Section 07 2600, Vapor Barriers.

B. Reglets and Rebates:

1. Form reglets and rebates in concrete to receive flashing, frames and other equipment as detailed and required. Coordinate dimensions and locations required with other related Work.

2. If concrete slabs on grade adjoin a wall or other perpendicular concrete surface, form a reglet in wall to receive and carry horizontal concrete Work. Reglet shall be full thickness of the slab and shall be 3/4 inch wide, unless otherwise indicated. Requirement does not apply to exterior walks, unless specifically indicated.

C. Screeds: Install screeds accurately and maintain at required grade or slab elevations after steel reinforcement has been installed, but before starting to place concrete. Install screeds adjacent to walls and in parallel rows not to exceed 8 feet on centers.

3.04 INSTALLATION

A. Conveying and Placing:

1. Concrete shall be placed only under direct observation of the Project Inspector. Do not place concrete outside of regular working hours, unless the Inspector has been notified at least 48 hours in advance.

2. Concrete shall be conveyed from mixer to location of final placement by methods that will prevent separation or loss of materials.

3. Concrete shall be placed as nearly as practicable to its final position to avoid segregation due to re-handling or flowing. No concrete that has partially hydrated or has been contaminated by foreign materials shall be placed, nor shall re-tempered concrete or concrete which has been remixed after initial set be placed.

4. In placing concrete in columns, walls or thin sections, provide openings in forms, elephant trunks, tremies or other recognized devices, to prevent segregation and accumulation of partially hydrated concrete on forms or metal reinforcement above level of concrete being placed. Such devices shall be installed so that concrete will be dropped vertically. Unconfined vertical drop of concrete from end of such devices to final placement surface shall not exceed 6 feet.

5. Concrete shall be placed as a continuous operation until placing of panel or section is completed. Top surfaces of vertically formed lifts shall be level.

6. Concrete shall be thoroughly consolidated by suitable means during placement, and shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms.

7. Where conditions make consolidation difficult or where reinforcement is congested, batches of mortar containing same proportions of cement, sand, and water as provided in the concrete, shall first be deposited in the forms to a depth of at least one inch.

B. Cold Weather:

1. Provide adequate equipment for heating concrete materials and protecting concrete during freezing or near-freezing weather. All ground with which concrete is to come in contact shall be free from frost. No frozen materials or materials containing ice shall be used.

2. The temperature of concrete at the time of placement shall not be below the minimum temperatures given in Table 3.1 of ACI 306.1.

3. Concrete shall be maintained at a temperature of at least 50° F. for not less than 72 hours after placing or until it has thoroughly hardened. Cover concrete and provide sufficient heat as required. When necessary, aggregates shall be heated before mixing. Special precautions shall be taken for protection of transit-mixed concrete.

C. Hot Weather:

1. Concrete to be placed during hot weather shall comply with the requirements of ACI 318, Section 5.13.

2. Maintain concrete temperatures indicated in Table 2.1.5 of ACI 305R to prevent the evaporation rate from exceeding 0.2 pound of water per square feet of exposed concrete per hour.

3. Cool concrete using methods indicated in ACI 305R Appendix B.

4. Place and cure concrete as specified in ACI 305R Chapter 4.

D. Compaction and Screeding:

1. Tamp freshly placed concrete with a heavy tamper until at least 3/8 inch of mortar is brought to surface. Concrete shall then be tamped with a light tamper and screeded with a heavy straightedge until depressions and irregularities are eliminated, and surface is true to finish grades or elevations. Remove excess water and debris.

2. Where slabs are to receive separate cement finish or mortar setting bed, continued tamping to raise mortar to surface is not performed. Laitance shall be removed by brushing with a stiff brush or by light sandblasting to expose clean top surface of coarse aggregate.

E. Floating and Troweling:

1. When concrete has hydrated sufficiently, it shall be floated to a compact and smooth surface. After floating, wait until concrete has reached proper consistency before troweling. Top surfaces shall receive at least 2 troweling operations with steel hand trowel. Prior to and during final troweling, apply a fine mist of water frequently with an atomizing type fog sprayer. Omit troweling for slabs to receive a separate cement finish.

2. For interior finish slabs, final troweling shall provide a hard, impervious, and non-slip surfaces, free from defects and blemishes. Finished surface shall be within tolerances indicated in Article 3.02. Avoid burnishing. Do not add cement or sand to absorb excess moisture.

   a. Floor of Walk-In Refrigerator: Finish as specified above, to a smooth finish.

   b. Floor of Gymnasium Locker Rooms: After floating, and while the surface is still plastic, provide a fine textured finish by drawing a fine fiber bristle broom uniformly over the surface in one direction only. Floors sloped for drainage should be brushed in the direction of flow.

3. Exterior Paving and Cement Walks: Finish as specified above, except surface shall be given a non-slip broom finish to match Sample reviewed by the ARCHITECT.

4. Vertical concrete surfaces shall be finished smooth and free from marks or other surface defects.

3.05 CURING

A. Length of time, temperature and moisture conditions for curing concrete shall be in accordance with ACI 318, Section 5.11.

B. Forms containing concrete, top of concrete between forms, and exposed concrete surfaces after removal of forms shall be maintained in a thoroughly wet condition for at least 7 consecutive days after placing.

C. If weather is hot or surface has dried out, spray surface of concrete slabs and paving with fine mist of water, starting not later than 2 hours after final troweling and continuing until sunset. Surface of finish shall be kept continuously wet until curing medium has been installed.

D. Immediately after finishing, monolithic floor slabs shall be covered with curing paper. Paper shall be lapped 4 inches at joints and sealed with waterproof sealer. Edges shall be cemented to finish. Repair or replace paper damaged during construction operations.

E. When curing slabs with proactive water vapor emission and alkalinity control system:

1. Coordinate and schedule application of curing compound with concrete pour schedule, while conforming to manufacturer's application instructions.

2. When the surface of the concrete has hardened sufficiently to sustain foot traffic pre-cure slabs with liquefied product application following manufacturer's written instructions. Application shall be by trained applicators.

3. Monitor Environmental Conditions: Set up weather station 20 to 30 inches above freshly placed concrete. Record temperature, humidity and wind velocity measurements at 15 minute maximum intervals.

4. Calculate Evaporation Rate: Use recorded weather information in combination with nomograph per ACI 308R, Figure 4.1, Guide to Curing Concrete, to evaluate relevant evaporation rate.

5. When the bleed water rate of the concrete is approximately equal to the surface water evaporation rate, spray curing compound material throughout surface of slabs and decks, following manufacturer's written instructions. Application shall be by trained applicators.

6. Perform the following tests at least 28 days after placement of concrete and prior to floor covering installation. Submit to OAR test results indicating locations that do not comply with scheduled flooring installation requirements.

a. Calcium chloride testing per ASTM F1869.

b. Relative humidity testing per ASTM F2170.

c. Alkalinity testing per ASTM F710.

d. Perform concrete bond layer humidity meter testing to determine substrate surface acceptability.

7. Areas emitting moisture and alkalinity at rates exceeding floor covering manufacturer's published ASTM F1869 limits, shall receive a corrective coating, at no cost to the OWNER, as follows:

a) Mask and protect adjacent walls and floor surfaces from effects of scarification and application of remedial treatment.

b) Scarify slab surface in area of application by shot blasting or other method acceptable to corrective coating manufacturer.

c) Prepare and fill cracks, control joints and cold joints.

d) Apply two-component modified epoxy penetrant and coating with roller and squeegee over required treatment area; saturate surfaces to ensure a through mechanical bond.

e) Clean and fill divots, chips, voids and other surface irregularities with one hundred percent Portland cement based patching compound or cementitious fill.

f) Apply cementitious surfacing over coating in areas to receive resilient and wood floor coverings to facilitate adhesion; apply to a thickness of 1/8 inch.

3.06 FILLING, LEVELING AND PATCHING

A. Concrete slabs exhibiting high or low spots and indicated to receive resilient floor covering or soft floor covering, shall have surfaces repaired. High spots shall be honed, or ground with power-driven machines to required tolerances. Low spots shall be filled with latex underlayment, installed in strict accordance with manufacturer's written recommendations.

B. Holes resulting from form ties or sleeve nuts shall be solidly packed, through exterior walls, by pressure grouting with cement grout, as specified. Grouted holes on exposed surfaces shall be screeded flush and finished to match adjoining surfaces.

C. Cement Base: Cement base shall be of the height, thickness, and shape detailed. Base shall be reinforced with one inch mesh, 18 gage, zinc-coated wire fabric. Base finish

mixture shall be one part Portland cement, 2 parts of fine aggregate and one part pea gravel. Colored cement base shall include a chemically inert mineral oxide pigment in the mix.

3.07 FINISHING

A. Soda and Acid Wash: Concrete surfaces to receive plaster, paint or other finish, and which have been formed by oil coated forms, shall be scrubbed with a solution of 1-1/2 pounds of caustic soda to one gallon of water. Surfaces where smooth wood or waste molds have been furnished shall be scrubbed with a solution of 20 percent muriatic acid. Wash with clean water after scrubbing.

B. Sacking: Exposed concrete curbs, walls, and other surfaces shall be sacked by an application of Portland cement grout, floated, and rubbed. Sacking shall not be performed until patching and filling of holes has been completed. Entire sacking operation for any continuous area shall be started and completed within the same day.

1. Mix one part Portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having consistency of thick paint. Wet surface of concrete sufficiently to prevent absorption of water from grout. Apply grout uniformly with a brush or spray gun, then immediately float surface with a cork or other suitable float, scouring wall vigorously.

2. While grout is still plastic, finish surface with a sponge-rubber float, removing excess grout. Allow surface to dry thoroughly, then rub vigorously with dry burlap to completely remove dried grout. No visible film or grout shall remain after rubbing with burlap.

C. Sandblasting: Exterior concrete surfaces to receive stucco dash coat finish, where plywood or other smooth forms have been furnished, shall be uniformly sand-blasted with sharp quartz sand under sufficient air pressure to remove dirt, form oil and other foreign materials, and roughen surface to provide a proper bond. Such surfaces shall be thoroughly washed with clean water after sandblasting.

D. Abrasive: Concrete stair treads, landings, ramps and steps on interior and exterior of buildings, and interior exposed concrete floors in shop buildings shall receive an abrasive finish.

E. Floor Hardener: Exposed interior concrete floors throughout shall be treated with floor hardener.

1. Protect adjacent surfaces. Clean surfaces to receive treatment in accordance with manufacturer's instructions, ensuring that all stains, oil, grease, form release agents, laitance, dust and dirt are removed prior to application.

2. Apply hardener in accordance with manufacturer’s instructions as soon as concrete is firm enough to work on after final troweling.

F. Cement Grout and Dry-Pack Concrete: Cement grout shall be mixed at the Project site and shall be composed of one volume of Portland cement and 2-1/2 volumes of fine aggregate. Materials shall be mixed dry with sufficient water added to make mixture flow under its own weight. When grout is used as a dry pack concrete, add sufficient water to provide a stiff mixture, which can be molded into a sphere.

G. Broom Finish: Exterior stair treads and landings shall be provided with a non-slip broom finish in addition to abrasive finish specified.

H. Abrasive Stair Nosing: Nosing shall be installed according to manufacturers written recommendations.

3.08 EXPANSION AND CONSTRUCTION JOINTS

A. Construction Joints: Details and proposed location of construction joints shall be as indicated on the Drawings, located to least impair strength of structure, in accordance with the following:

1. Thoroughly clean contact surface by sand blasting entire surface not earlier than 5 days after initial placement.

2. A mix containing same proportion of sand and cement provided in concrete plus a maximum of 50 percent of coarse aggregate shall be placed to a depth of at least one inch on horizontal joints. Vertical joints shall be wetted and coated with a neat cement grout immediately before placing of new concrete.

3. Should contact surface become coated with earth, sawdust, or deleterious material of any kind after being cleaned, entire surface shall be re-cleaned before applying mix.

B. Expansion Joints: Provide expansion joints where indicated in walks and exterior slabs. Space approximately 20 feet apart, unless otherwise indicated. Joints shall extend entirely through slab with joint filler in one piece for width of walk or slab. Joint filler shall be 3/8 inch thick, unless otherwise indicated.

C. Tooled Joints: Slabs, walks and paving shall be marked into areas as indicated with markings made with a V-grooving tool. Marks shall be round-edged, free from burrs or obstructions, with clean cut angles and shall be straight and true. Walks, if not indicated, shall be marked off into rectangles of not more than 12 square feet and shall have a center marking where more than 5 feet wide.

3.09 TESTING

A. Molded Cylinder Tests:

1. Inspector or testing lab personnel will prepare cylinders and perform slump tests. Samples for concrete strength shall be taken in accordance to ASTM C172. Each cylinder shall be dated, given a number, point in structure from which sample was obtained, mix design number, mix design strength and result of accompanying slump test noted.

2. Separate tests of molded concrete cylinders obtained at same place and time shall be made at age of three days, seven days, and 28 days. A strength test shall be the average of the compressive strength of two cylinders, obtained from the same sample of concrete and tested at 28 days or at test age designated for determination of f'c.

3. Test cylinders shall be prepared at the Project site and stored in testing laboratory in accordance with ASTM C31, and tested in accordance with ASTM C39.

B. Core Test: At request of the ARCHITECT, cores of hardened concrete shall be cut from portions of hydrated structures for testing, in accordance with CBC and ASTM C42.

1. Provide 4 inch diameter cores at representative places throughout the structure as designated by the ARCHITECT.

2. In general, provide sufficient cores to represent concrete placed with at least one core for each 4,000 square feet of building area, and at least 3 cores total for each Project.

3. Where cores have been removed, fill voids with drypack, and patch the finish to match the adjacent existing surfaces.

C. Concrete Consistency: Measure consistency according to ASTM C143. Test twice each day or partial day's run of the mixer.

D. Adjustment of Mix: If the strength of any grade of concrete for any portion of Work, as indicated by molded test cylinders, falls below minimum 28 days compressive strength specified or indicated, adjust mix design for remaining portion of construction so that resulting concrete meets minimum strength requirements.

E. Air Content Testing: Measure in accordance to ASTM C173 or ASTM C231, for each composite sample taken in accordance to ASTM C172.

F. Defective Concrete:

1. Should strength of any grade of concrete, for any portion of Work indicated by tests of molded cylinders and core tests, fall below minimum 28 days strength specified or indicated, concrete will be deemed defective Work and shall be replaced or adequately strengthened in a manner acceptable to the ARCHITECT and DSA.

2. Concrete Work that is not formed as indicated, is not true within 1/250 of span, not true to intended alignment, not plumb or level where so intended, not true to intended grades and levels, contains sawdust shavings, wood or embedded debris, or does not fully conform to Contract provisions, shall be deemed to be defective Work and shall be removed and replaced.

G. Concrete for Equipment Pads, Mechanical and Electrical Work: Unless otherwise indicated, strength shall have a minimum $f'c$ = 3,000 psi. Exposed concrete shall be provided with a hand trowel finish with radius corners and edges. Form and place concrete where necessary as described in Section 03 1000 Concrete Forming and Accessories, and reinforced as described in Section 03 2000 Concrete Reinforcing. Calcium chloride shall not be furnished in any concrete mix provided for the installation of underground electrical conduits. For concrete encasement of more than one conduit, furnish 3/4 inch maximum aggregate.

3.10 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.11 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 04 2200

CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Concrete masonry units.

2. Reinforcing steel.

3. Mortar, grout and grouting.

4. Bolts, anchors, hardware, metal frames, and other insert items.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 01 4523 - Testing and Inspection.

3. Section 03 1000 - Concrete Forming and Accessories.

4. Section 03 2000 - Concrete Reinforcing.

5. Section 03 3000 - Cast-In-Place Concrete.

6. Section 05 1000 - Structural Steel Framing.

7. Section 08 1113 - Hollow Metal Doors and Frames.

1.02 REFERENCES

A. American Society for Testing and Materials International (ASTM):

1. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.

2. ASTM C90 - Standard Specification for Load Bearing Concrete Masonry Units.

3. ASTM C94 - Standard Specification for Ready-Mixed Concrete.

4. ASTM C140 - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.

5. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.

6. ASTM C150 - Standard Specification for Portland Cement.

7. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.

8. ASTM C270 - Standard Specification for Mortar for Unit Masonry.

9. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.

10. ASTM C426 - Standard Test Method for Linear Drying Shrinkage of Concrete Masonry Units.

11. ASTM C476 - Standard Specification for Grout for Masonry.

12. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

13. ASTM C1019 - Standard Test Method for Sampling and Testing Grout.

14. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms.

15. ASTM C1586 – Standard Guide for Quality Assurance of Mortars.

B. Masonry Standards Joint Committee (MSJC), the Masonry Society (TMS), American Concrete Institute (ACI) and American Society of Civil Engineers (ASCE).

1. TMS 602/ACI 530.1/ASCE 6 – Specification for Masonry Structures.

2. TMS 402/ACI 530/ASCE 5 – Building Code Requirements for Masonry Structures.

1.03 SUBMITTALS

A. Mix Design: Submit grout and mortar mix designs. Mix designs shall be signed and sealed by a Civil or Structural Engineer registered in the State of California.

B. Product Data: Submit manufacturer's Product Data for assembly components, materials, and accessories. Submit certificates and data assuring that the proposed materials meet the specified ASTM standards.

C. Samples: Submit Samples for each type of required masonry unit, including reinforcement and accessories.

D. Shop Drawings: Indicate wall reinforcement, splice locations and bending diagrams.

E. Admixtures: Additives and admixtures to mortar and grout shall not be used unless approved by the enforcing agency. Submit product data for any proposed admixture.

1.04 REGULATORY REQUIREMENTS

A. Perform the Work in accordance with CBC, Chapter 21A.

B. Comply with requirements of TMS 602.

1.05 QUALITY ASSURANCE

A. Comply with the requirements of Section 01 4523 - Testing and Inspection.

B. Concrete Masonry Units:

1. Notify the testing laboratory a minimum of 45 days in advance of installing concrete unit masonry, to allow for preconstruction testing of the units.

a. Units will be sampled and tested in accordance with ASTM C140 for compressive strength, absorption and moisture content.

b. Units will be sampled and tested in accordance with ASTM C426 for linear drying shrinkage.

2. The material testing laboratory shall receive concrete masonry unit specimens for testing from masonry unit manufacturer. Number of specimens shall be as indicated in referenced ASTM standard tests. Testing laboratory will perform and send test results to the ARCHITECT and Project Inspector.

C. Portland Cement: Submit certification from the cement manufacturer that the cement proposed for use on the project has been manufactured in accordance with ASTM C150. Certification shall include test results made on cement samples during production.

D. Mortar and Grout Tests: Prior to the beginning of masonry work, mortar and grout will be tested, unless prism tests will be performed as indicated below.

1. Mortar: Shall conform to ASTM C270 Table 2 for Type S mortar.

a. Provide qualifications of mortar as meeting ASTM C270 at the beginning of the job and whenever mix design is changed.

b. Mortars will be evaluated during preconstruction and tested during construction for proportioning or compressive strength in accordance to ASTM C780.

2. Grout: Shall conform to ASTM C476, and will be tested in accordance with ASTM C1019. Compressive strength shall equal or exceed specified compressive strength (*f'm*) at 28 days, but not less than 2,000 psi.

   a. Ready-Mix Grout: Grout manufacturer shall furnish batch ticket information in accordance to ASTM C94.

E. Prism Test: The compressive strength of concrete masonry will be determined by the prism test method prior to the start of construction and during construction.

F. Masonry Core Testing: Core testing will be performed in accordance with CBC, Section 2105A.4.

G. Inspection During Installation: A special inspector will continuously observe the installation of reinforced masonry. The Project Inspector shall be responsible for monitoring the work of the special inspector and testing laboratories to ensure that the testing program is satisfactorily completed.

H. OWNER will be responsible for the costs of original tests and inspection.

1.06 DELIVERY, STORAGE AND HANDLING

A. Store units above grade on level platforms or pallets, in a dry location.

B. Store cementitious materials and aggregates in such a manner as to prevent deterioration or intrusion of foreign matter or moisture.

C. Handle units on pallets or flat bed barrows. Free discharge from conveyor units or transportation in mortar trays is not permitted.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete Unit Masonry: Modular **medium** weight conforming to ASTM C90, hollow load-bearing concrete unit masonry. Masonry units shall meet the minimum compressive strength requirements of ASTM C90, or as indicated on project drawings, whichever is greater.

1. Concrete masonry unit sizes shall be as indicated on the drawings.

2. Provide open-end units at walls to be fully grouted.

3. Provide closed-end units at walls and at openings where ends will be exposed in finish Work; provide bond beam blocks where horizontal reinforcement is indicated.

4. Provide special shapes and accessory units at locations indicated on Drawings.

5. Provide units in colors and textures as indicated in the drawings.

6. Masonry unit shall have been cured for a minimum of 28 days.

7. Masonry unit shall have maximum liner shrinkage of 0.065 percent from saturated to oven dry.

B. Portland Cement: ASTM C150, Type II, from one source.

C. Hydrated Lime: ASTM C207, Type S.

D. Aggregates: ASTM C144 for mortar and ASTM C404 for grout.

E. Mortar: ASTM C270, Type S, conforming to the property specifications of CBC Table 2103A.8 (2).

F. Grout: ASTM C476.

G. Admixture for Grout: Grout Aid, as manufactured by Sika Chemical Corp., or equal.

H. Water: Clean, potable, free from substances deleterious to mortar, grout or reinforcement.

I. Reinforcing Steel: Provide and install reinforcing steel in accordance with Section 03 2000 - Concrete Reinforcing.

J. Cleaning Materials: Sure Klean No. 600 detergent by ProSoCo.

K. Miscellaneous Materials: As required to complete the Work.

L. Anchor Bolts: Shall be hex headed bolts conforming to ASTM A307 Grade A with the dimensions of the hex head conforming to ANSI/ASME B18.2.1.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Discard units with cracks or other defects not complying with requirements of ASTM C 90.

3.02 CONSTRUCTION

A. Construct per applicable provisions of CBC and TMS 602.

B. Conform to TMS 602 for hot and cold weather masonry construction.

3.03 MORTAR AND GROUT MIXING

A. Mortar: Shall provide a minimum strength of 1,800 psi.

B. Grout: Shall provide a minimum strength of 2,000 psi or as indicated in the drawings, whichever is higher. Grout space requirements for coarse and fine grouts shall be per Table 7 of TMS 602. Add Sika Chemical Corp. Grout Aid per manufacturer's instructions.

C. Measurements: Measure in calibrated devices that can be checked at any time.

1. Add water for workable consistency.

2. Shovel measurements are not permitted.

D. Mixing: Mix in accordance to TMS 602.

1. Mortar: Mix cementitious materials and aggregates between three and five minutes in a mechanically operated mixer. Mix dry ingredients with a sufficient amount of water to provide a workable mix. Batches of less than one sack of cement, and fractional sack batches are not permitted.

2. Factory Blended Mortar: Mix in accordance with manufacturer's recommendations.

3. Grout: Add sufficient water for a workable mix that will flow into all voids of the masonry without separation or segregation. Grout slump shall be between 8 and 11 inches.

E. Re-tempering Time Limit: Use mortar within 2 ½ hours after mixing. Discard any mortar that has been mixed longer or that has begun to set. If necessary re-temper within this time limit, by replacing only water lost due to evaporation and by thoroughly remixing.

3.04 INSTALLATION OF MASONRY UNITS

A. Workmanship: Install masonry plumb and true to line with straight level joints of uniform thickness. Comply with TMS 602 tolerances. Maintain masonry clean during and after installation.

1. Lay-out and incorporate embedded hardware items.

2. Assist other trades with built-in items, which require cutting and fitting of masonry.

3. Cut block units with a diamond saw or carborundum wheel. Trowel or chisel cutting is not permitted.

4. Keep cavities clear of droppings and debris. Remove droppings prior to grouting.

B. Reinforcing Steel: Install as indicated on Drawings. Except as otherwise indicated, install reinforcement in accordance with standards of Concrete Reinforcing Steel Institute and to requirements specified in Section 03 2000 - Concrete Reinforcing. Do not splice vertical reinforcement except where indicated on the Drawings.

C. Shoring: Provide temporary shoring for lintels with sufficient strength to carry load without deflecting. Remove temporary shoring not less than 28 days after masonry has been installed.

D. Block Installation: Clean dirt and dust from surfaces before installation. Do not wet masonry units.

1. Foundation preparation: Clean top surface of concrete foundation of dirt, projections and laitance before starting masonry construction. Wet saw cutting of units immediately prior to laying is permitted.

2. Install masonry with mortar to required joint thickness. Install blocks with 3/8-inch mortar bed. Fill head joints solid, install tightly to adjoining units. Provide 3/8-inch joint thickness.

a. Hold racking to a minimum.

b. No toothing is permitted.

c. If it becomes necessary to move a unit after it has been installed, remove the unit, discard the mortar, and install the unit in fresh mortar.

3. Anchor Bolts: Provide 1/2-inch minimum grout space between bolts and masonry.

4. Bond: Unless otherwise indicated, install units in common running bond.

5. Finish Joint Treatment: Unless otherwise indicated, cut both interior and exterior joints flush, and tool slightly concave to a dense, uniform surface.

6. Grouting: Unless noted otherwise on Drawings, completely fill cells with grout.

E. Steel Door Frames:

1. Locate door frames accurately, install plumb, Set frames to floor with powder driven or expansion anchors to floor surface and brace in position before start of masonry installation.

    a. Frames are specified to be furnished with adjustable anchors.

    b. Fill interior of frames solid with mortar or grout as walls are constructed.

2. Provide temporary wood spreaders from jamb to jamb and from head to floor to ensure that jambs do not bow-in, distort from a straight line, or deflect from superimposed loads during construction.

3.05 GROUTING

A. Prior to grouting all cells shall be cleaned so that all spaces to be filled with grout do not contain mortar projections greater than 1/4 inch, loose mortar or foreign material.

B. Grout materials and water contents shall be controlled to provide adequate fluidity for placement without segregation of the constituents, and shall be mixed thoroughly. Reinforcement shall be properly positioned and solidly embedded in the grout.

C. The grouting of any section of wall shall be completed in one day with no interruptions greater than one hour.

D. Between grout pours, a horizontal control joint shall be formed by stopping all wythes at the same elevation and with the grout stopping at 1 ½ inches below a mortar joint, except at the top of the wall. Where bond beams occur, the grout pour shall be stopped a minimum of ½ inch below the top of the masonry.

3.06 LOW-LIFT GROUTING FOR HOLLOW MASONRY UNITS

A. Grouting shall meet the requirements of CBC Section 2104A.1.3.

B. After mortar joints have set, cells are cleaned of mortar and debris, and reinforcement is installed and inspected, grout cells in 4-foot maximum lifts. Horizontal and vertical reinforcement shall be held in place within permitted tolerances by suitable devices.

C. Grout may be installed by pump, tremie or bucket, using hoppers to avoid spilling on exposed surfaces.

D. All grout shall be consolidated and reconsolidated with a mechanical vibrator after placing so as to completely fill all voids and to consolidate the grout. Grouted walls shall be solid and without voids.

3.07 HIGH-LIFT GROUTING OPTION FOR HOLLOW MASONRY UNITS

A. Grouting shall meet the requirements of CBC Section 2104A.1.3 and DSA IR 21-2.

B. High-lift grouting shall apply only to cell sizes available with 8 inch and wider block units. This method is subject to approval of the Division of the State Architect (DSA).

C. Provide bond beam units, inverted for start course, and omit alternate blocks or remove entire face shell of every other unit to allow access to all cells on bottom course for cleanouts.

D. Plug each cleanout by setting a face shell in mortar into opening and securely bracing it in place to prevent displacement. If masonry is not exposed in finish Work, cleanouts may be formed.

E. Grouting: Grouting shall be done in a continuous pour in lifts not exceeding 5-foot in height. The grouting of any section of a wall between control barriers shall be completed in one day, with no interruptions greater than one hour.

F. Consolidating: Grout shall be consolidated by mechanical vibration only, and shall be reconsolidated after excess moisture has been absorbed, but before plasticity is lost. Vibrating of reinforcing steel is not permitted.

3.08 CURING

A. Remove efflorescence, stains, debris, excess grout, and foreign matter.

B. During curing, or for any other purpose, do not saturate masonry with water.

3.09 PARGE COAT

A. Apply parge coat to the earth side of surfaces that are to receive waterproofing.

B. A Portland cement and sand mix (1:3.5 by volume) or Type S mortar may be used for the parge coat.

C. Parging should be applied to damp (not saturated) concrete masonry in two 1/4 inch thick layers. The first coat should be roughened when partially set, hardened for 24 hours, and then moistened before second coat is applied. The second coat should be trowelled to a smooth, dense surface.

D. The parge coat should be beveled at the top to form a wash, and thickened at the bottom to form a cove between the base of the wall and the top of footing.

3.10 CLEANING

A. At completion of masonry Work, remove misplaced mortar, grout or other foreign substances, and clean surfaces which will be exposed in finish Work with specified cleaner, or with clean water and stiff fiber brushes.

B. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.11 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 05 0513

HOT-DIP GALVANIZING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Hot-dip galvanizing of structural steel articles.
2. Hot-dip galvanizing of steel stairs and railings.
3. Hot-dip galvanizing of fabricated steel assemblies.
4. Hot-dip galvanizing of fencing steel assemblies.
5. Preparation of galvanized steel assemblies for painting.

B. Related Sections:

1. Division 01 - General Requirements.
2. Section 05 1200: Structural Steel Framing.
3. Section 05 5000: Metal Fabrications.
4. Section 05 5100: Metal Stairs and Railings.
5. Section 09 9000: Painting and Coating.

1.02 REFERENCES

A. American Galvanizers Association (AGA):

1. Inspection of Products Hot-dip Galvanized after Fabrication.
2. The Design of Products to be Hot-dip Galvanized after Fabrication.
3. Recommended Details of Galvanized Structures.

B. ASTM International (ASTM):

1. ASTM A123 – Standard Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.
2. ASTM A143 – Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

3. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

4. ASTM A384 – Standard Practice for Safeguarding Against Warpage and Distortion during Hot-Dip Galvanizing of Steel Assemblies.

5. ASTM A385 – Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip).

6. ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

7. ASTM B6 – Standard Specification for Zinc.

8. ASTM D6386 – Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.

9. ASTM D7803 - Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Powder Coating.

10. ASTM E376 - Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Test Methods.

C. The Society for Protective Coatings (SSPC):

1. SSPC-SP1 – Solvent Cleaning.

2. SSPC-SP2 – Hand Tool Cleaning.

3. SSPC-SP3 – Power Tool Cleaning.

4. SSPC-SP5 – White Metal Blast Cleaning.

5. SSPC-SP7 – Brush-Off Blast Cleaning.

6. SSPC-SP10 – Near White Blast Cleaning.

7. SSPC-SP11 – Power Tool Cleaning to Bare Metal.

8. SSPC-SP16 - Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals.

1.03 COORDINATION WITH STEEL FABRICATOR

A. Prior to fabrication, steel fabricators shall submit approved fabrication shop drawings to the galvanizer. The Galvanizer shall review fabricator shop drawings for suitability of materials for galvanizing and coatings and coordinate any required fabrication modifications.

B. Steel Fabricator shall notify the galvanizer of steel fabrications that exceed the ASTM A385 recommended percentages for carbon, phosphorus, manganese and silicon, so special galvanizing processing techniques are used.

C. Coordinate with steel fabricator appropriate marking and masking materials.

1.04 QUALITY ASSURANCE

A. Coating Applicator: Company specializing in hot-dip galvanizing after fabrication following the procedures in the Quality Assurance Manual of the American Galvanizers Association.

B. Galvanizer shall have an in-plant inspection program designed to maintain the coating thickness, finish, and appearance within the requirements of this Section.

1.05 SUBMITTALS

A. Galvanizing Certificate of Compliance: Provide notarized Certificate of Compliance with ASTM standards and specifications herein listed. The Certificate shall be signed by the galvanizer and contain a detailed description of the material processed. The Certificate shall include information as to the ASTM standard used for the coating.

1.06 DELIVERY, STORAGE AND HANDLING

A. Package and handle galvanized material in a manner which will avoid damage to the zinc coating.

B. Store in dry, well-ventilated conditions until shipping.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Steel for Galvanizing: As specified in Sections:

1. Section 05 1200: Structural Steel Framing.

2. Section 05 5000: Metal Fabrications.

3. Section 05 5100: Metal Stairs and Railings.

B. Zinc for Galvanizing: Conform to ASTM B6, as specified in ASTM A123.

PART 3 – EXECUTION

3.01 PREPARATION

A. Remove welding slag, splatter, anti-splatter compounds and burrs remaining in steel articles.

B. Provide drainage and venting holes in tubular assemblies. In thicker material drill holes in place of punching. Holes shall have a relatively uniform circumference. Punched

holes or burned holes with a plasma torch shall be treated with a drill to even the diameter to appropriate size.

C. Masking installed by steel fabricator shall remain in place through galvanizing process completion.

D. Provide lifting lugs to allow for handling during galvanizing. Avoid the use of chains or wires directly connected to steel articles.

E. Safeguard against warpage or distortion of steel members in accordance with ASTM A384.

F. Pre-clean steel work in accordance with accepted methods to produce an acceptable surface for quality hot-dip galvanizing. Remove surface contaminants and coatings that are not removable by the normal chemical cleaning process in the galvanizing operation by grit-blasting, sand-blasting, or other mechanical means.

G. Follow the degreasing, pickling and fluxing steps to remove remaining oxides and to deposit a protective layer on the steel to prevent any further oxides from forming on the surface prior to immersion in the molten zinc.

3.02 COATING APPLICATION

A. Galvanize steel articles, fabrications and assemblies by the hot-dip process in accordance with ASTM A123. The bath chemistry shall be as specified by ASTM B6, and requires at least 98% pure zinc maintained at approximately 840 F.

B. Galvanize bolts, nuts, washers and iron and steel hardware components in accordance with ASTM A153.

C. Safeguard products against steel embrittlement in conformance with ASTM A143.

D. Once the fabricated items' coating growth is complete, withdraw slowly from the galvanizing bath, and remove the excess zinc by draining, vibrating, and/or centrifuging.

E. Prepare galvanized products for powder coating in accordance to ASTM D7803. Prepare galvanized products for painting in accordance to ASTM D6386.

F. Handle articles to be galvanized in such a manner as to avoid mechanical damage and to minimize distortion.

G. Apply a chromate passivation treatment to fabrications that will not be painted after galvanizing to minimize the wet storage staining which may occur on articles unable to be stored in dry, well-ventilated conditions.

3.03 COATING REQUIREMENTS

A. Conform to paragraph 6.1 of ASTM A123, or Table 1 of ASTM A153, as applicable.

B. Surface Finish: Continuous, adherent, as smooth and evenly distributed as possible and free from any defect detrimental to the stated end use of the coated article

C. Adhesion: Withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.

3.04 TESTS

A. Inspection and testing of hot-dip galvanized coatings shall be done under the guidelines provided in the AGA publication Inspection of Products Hot-dip Galvanized after Fabrication. Tests and inspections shall be performed immediately after the coating is applied and has cooled to ambient temperature, and before it leaves the galvanizing facility.

B. Include visual examination and test methods in accordance with ASTM A123, or A153, as applicable, to determine the thickness of the zinc coating on the metal surface.

C. During the visual inspection, if adhesion concerns are suspected, such as peeling or flaking of the galvanized coating, then adhesion testing using the stout knife method shall be conducted. Embrittlement testing is required when there is evidence of embrittlement and shall be conducted per the requirements of ASTM A143.

D. Upon completion of tests furnish notarized Certificate of Compliance with ASTM standards and specifications herein listed.

3.05 REPAIR OF DAMAGED COATINGS

A. Smooth out rough surfaces, bumpy or high spots and icicles by hand filing or power sanding the area without removing any more zinc coating than necessary. Repair damaged galvanized surface with a zinc rich coating.

B. Repair areas damaged during galvanizing process or handling by one of the approved methods in accordance with ASTM A780 whenever damage exceeds 3/16” in width. Minimum thickness requirements for the repair shall be per ASTM A123, Section 6.2.

C. Remove lifting lugs and repair coating with a zinc rich coating.

D. Surface preparation for application of zinc rich coating shall be in accordance to ASTM A780.

1. Clean areas in accordance to SSPC-SP2.

2. Prepare surface for zinc spray in accordance to SSPC-SP5, or zinc rich paint repair in accordance to SSPC-SP10.

3.06 PREPARATION FOR TOP COATING

A. Galvanized fabrications indicated on the drawings to be painted shall be prepared in accordance to ASTM D6836.

1. Surface cleaning prior to surface preparation in accordance to SSPC-SP1.

2. Removal of zinc high spots and cleaning of light deposits of zinc reaction products in accordance to SSPC-SP2 or SSPC-SP3.

3. Profile surface in accordance to SSPC-SP7 or SSPC-SP11.

B. Galvanized fabrications indicated on the drawings to be powder coated shall be prepared in accordance to ASTM D7803.

1. Surface cleaning and removal of oil and grease in accordance to SSPC-1.

2. Surface smoothing and removal of loose particles in accordance to SSPC-SP-2 or SSPC-SP3.

3. Sweep blasting and surface profiling in accordance to SSPC-SP16.

END OF SECTION

SECTION 05 5000

METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Metal fabrications:

1. Steel thresholds.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel Gates.
4. Gratings, frames and covers.
5. Steel bollards.
6. Miscellaneous steel framing, supporting angles, plates, brackets, clips, anchors and bolts for equipment, and other work which is not specifically included in Section 05 1200, Structural Steel Framing.
7. Miscellaneous fabrications, as indicated on the Drawings.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 4523: Testing and Inspection.
3. Section 03 3000 – Cast-in-Place Concrete.
4. Section 04 2200: Concrete Unit Masonry.
5. Section 05 5013: Hot-Dip Galvanizing.
6. Section 05 1200: Structural Steel Framing.
7. Section 05 5100: Metal Stairs and Railings.

1.02 REFERENCES

A. ASTM International (ASTM):

1. ASTM A27 – Standard Specification for Steel Castings, Carbon, for General Application.
2. ASTM A36 – Standard Specification for Carbon Structural Steel.

3. ASTM A47 - Standard Specification for Ferritic Malleable Iron Castings.

4. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

5. ASTM A123 - Standard Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.

6. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

7. ASTM A283 - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

8. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

9. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

10. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

11. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.

12. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

13. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

14. ASTM D1187 - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.

15. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

16. ASTM F2329 - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.

B. American Welding Society (AWS):

1. AWS D1.1 Structural Welding Code - Steel.

2. AWS D1.3 Structural Welding Code - Sheet Steel.

3. AWS D-19.0 Welding Zinc Coated Steel.

1.03 COORDINATION

A. Coordination between Steel Fabricator and Galvanizer:

1. Prior to fabrication, submit approved fabrication shop drawings to the galvanizer.

2. Notify galvanizer of steel fabrications that exceed the ASTM A385 recommended percentages for carbon, phosphorus, manganese and silicon, so special galvanizing processing techniques are used.

B. Coordinate installation of metal fabrications that are anchored to concrete or masonry, or that receive work specified by other Sections. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.

C. Field Measurements: Field verify dimensions prior to fabrication.

D. Coordinate selection of shop primers with galvanizing, and with paintings to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and paintings are compatible with one another.

1.04 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating provided materials, dimensions, anchoring detail, and details of termination or connection to adjacent construction. Indicate items that are purchased from a manufacturer and items that are shop fabricated. Indicate component parts requiring Project site fabrication or assembly.

B. Product Data: Submit Product Data for manufactured items. Submit Product Data for primers and finishes.

C. Material Samples: Submit Samples of primers and finishes on fabricated items.

D. Fabricator qualifications per Article “Quality Assurance”.

E. Welding:

1. Welder’s Certificates: Field welders shall be Project certified in accordance with AWS D1.1.

2. Welding Material Certification: Provide certificate that welding material complies with specifications.

F. Research/Evaluation Reports: ICC-ES for post-installed anchors.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm with a minimum five year experience in successfully producing metal fabrications similar to that shown on the drawings.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D-1.1– Structural Welding Code – Steel.

2. AWS D1.3 - Structural Welding Code - Sheet Steel.

C. Inspection of Welding: Refer to Section 01 4523: Testing and Inspection.

D. Field applied primers, paintings, sealers and adhesives shall be approved by the OWNER's Office of Environmental Health and Safety (OEHS).

E. Preassemble items in shop to greatest extent possible to minimize field welding. Mark units for reassembly and coordination of installation. Use marking method compatible with galvanizing.

1.06 DELIVERY, STORAGE AND HANDLING

A. Store miscellaneous metal items above grade on platforms, skids, or other required supports.

B. Protect from damage and from corrosion, dirt, grease and other foreign matter.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Structural Steel Shapes: ASTM A36.

B. Rolled Steel Plates: ASTM A36. Plates to be bent or cold-formed shall conform to ASTM A283, Grade C.

C. Round HSS: ASTM A500 Grade B or C.

D. Square and Rectangular HSS: ASTM A500 Grade B or C.

E. Steel Pipe: ASTM A53 Type E or S, Grade B, standard weight (Schedule 40), unless otherwise noted. Black finish.

F. Steel Sheet: ASTM A1008 or ASTM A1011.

G. Steel Bolts: ASTM A307, Grade A, or F3125 with hex steel nuts per ASTM A563 and washers. Galvanized in accordance with ASTM A153 for exterior locations.

H. Steel Bars: Conforming to ASTM A108 or ASTM A575.

I. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A47, or cast steel, ASTM A27. Provide bolts, washers, and shims, hot-dip galvanized per ASTM A153.

J. Nonshrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

K. Concrete Materials:

1. Concrete per Section 03 3000, Cast-in-Place Concrete.

2. Welded wire fabric and reinforcing per section 03 2000, Concrete Reinforcing.

2.02 FABRICATION

A. General:

1. Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces. Mark units for reassembly and installation.

2. Cut, drill, and punch metals cleanly and accurately. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated or specified. Remove sharp and rough areas on exposed surfaces. Form exposed work with accurate angles and surfaces and straight edges. Form exposed connections with hairline joints, flush and smooth. Locate joints where least conspicuous.

B. Welding:

1. Weld connections unless otherwise indicated.

2. Weld corners and seams continuously and in accordance with requirements of AWS D1.1 Structural Welding Code. Welds shall be inspected as required in Section 05 1200: Structural Steel Framing.

3. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.

2.03 PREPARATION FOR GALVANIZING

A. Fabricate to the largest size possible and whenever possible use slip joints to minimize field welding.

B. Fabricate structural steel in accordance with Class I, II, III guidelines as described in AGA's Recommended Details for Galvanized Structures, to facilitate galvanizing process. Corners of gussets, stiffeners, and bracing shall be cropped to allow free flow of zinc during galvanizing process.

C. Remove welding slag, splatter, anti-splatter compounds and burrs prior to delivery for galvanizing.

D. Marking for Identification: Avoid unsuitable marking paints for identification, such as oil based paints and markers and crayon markers. Use water soluble paints or markers acceptable to galvanizer or steel tags wired to the work.

E. Masking: Use masking materials recommended by the American Galvanizers Association (AGA) to produce ungalvanized areas for field welding and at slip critical bolts.

F. Galvanize fabrications per Section 05 5013, Hot-Dip Galvanizing, in accordance with ASTM A123 and ASTM A153.

2.04 SHOP FINISH

A. Metal fabrications shall be provided with a coat of primer, except those indicated to be hot-dip galvanized.

B. Primers:

1. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

2. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

3. Minimum dry film thickness of primer shall be 2.0 mils.

C. Preparation for Primer Painting: Miscellaneous ferrous metal, except items specified galvanized, shall be thoroughly cleaned and prepared for painting, including removal of shipping oils or protective coatings, mill scale, grease, dirt and rust. Prepare in accordance with SSPC recommendations. Deliver to Project site primed or galvanized as indicated, and ready to receive Project site applied finishes.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine the areas where metal fabrications are to be installed. Notify the OAR in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Provide anchorage devices and fasteners as indicated in the drawings and where necessary for securing miscellaneous metal fabrications to in-place construction.

B. Cut, drill, and fit as required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of hot-dip galvanized fabrications intended for bolted or screwed field connections.

D. Alignment: Verify alignment of items with adjacent construction. Coordinate related work.

E. Grout: Follow manufacturer's recommendations for substrate preparation and application.

F. Corrosion Protection: Coat concealed surfaces of metals that will come into contact with grout, concrete, masonry, or wood, with a heavy coat of bituminous paint or zinc chromate primer. Protect dissimilar metals from galvanic corrosion by pressure tapes, coating, or isolators.

3.03 FIELD WELDING

A. Preparation of Weld Area of Galvanized Fabrications: Remove masking from fabrications. Remove remaining zinc coating between one inch and four inches from both sides of members to be welded, by grinding back the zinc coating, burning the zinc away or pushing back the molten zinc from the weld area.

B. Welding: Comply with AWS Code for procedures of manual shielded metal-arch welding, appearance and quality of welds made, methods used in correcting welding work.

1. Weld in accordance to AWS D-1.1.

2. Weld galvanized fabrications in accordance to AWS D-19.0.

C. Remove welding flux immediately. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surfaces matches those adjacent.

D. Upon completion of welding plug vent, drainage and lifting holes of galvanized fabrications with appropriate diameter zinc plugs. Push in about half way by hand, and hammer to a tight fit. With a hand file or an abrasive tool, file away excess material. Repair scratches with a zinc rich coating.

1. Plug railing holes.

2. Plug visible holes of HSS members.

3.04 ADJUSTING AND CLEANING

A. Touch Up Damaged Surfaces:

1. Shop Painted Finishes: Comply with SSPC-PA-1 for touch-up; apply with brush to produce a minimum 2.0 mil dry film thickness.

2. Galvanized Surfaces: Clean field welds, connections and damaged areas. Apply two coats of Carbomastic 15, by Carboline or equal product approved by OWNER’s OEHS. Brush or roll to a 4 to 6 mil thickness.

3.05 CLEAN UP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.06 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 05 5100

GUARDS AND RAILINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Guards.
2. Ramp railings.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 4523: Testing and Inspection.
3. Section 03 2000 – Concrete Reinforcing.
4. Section 03 3000: Cast-in-Place Concrete.
5. Section 05 5000: Metal Fabrications.
6. Section 05 0513: Hot-Dip Galvanizing.
7. Section 09 9000: Painting and Coating.

1.02 REFERENCES

A. ASTM International (ASTM):

1. ASTM A27 - Standard Specification for Steel Castings, Carbon, for General Application.
2. ASTM A36 - Standard Specification for Carbon Structural Steel.
3. ASTM A47 - Standard Specification for Ferritic Malleable Iron Castings.
4. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
5. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
6. ASTM A123 – Standard Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.

7. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

8. ASTM A283 - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

9. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

10. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

11. ASTM A501 - Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

12. ASTM A513 - Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.

13. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.

14. ASTM A575 - Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.

15. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

16. ASTM A786 - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.

17. ASTM A1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

18. ASTM A1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

19. ASTM C1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

20. ASTM D1187 - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.

21. ASTM D6386 – Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.

22. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

23. ASTM F2329 - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.

24. ASTM F3125 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

B. American Welding Society (AWS):

1. AWS D1.1 Structural Welding Code - Steel.

2. AWS D1.3 Structural Welding Code - Sheet Steel.

3. AWS D-19.0 Welding Zinc Coated Steel.

C. The Society for Protective Coatings (SSPC):

1. SSPC-SP1 – Solvent Cleaning.

2. SSPC-SP3 – Power Tool Cleaning.

3. SSPC-SP10 – Near White Metal Blast Cleaning.

4. SSPC-SP11 – Power Tool Cleaning to Bare Metal.

5. SSPC-PA-1 – Shop, Field and Maintenance Coating of Metals.

D. Master Painters Institute (MPI):

1. MPI #20 - Primer, Zinc Rich, Epoxy.

2. MPI #79 - Primer, Alkyd, Anti-Corrosive for Metal.

1.03 COORDINATION

A. Coordination between Steel Fabricator and Galvanizer:

1. Prior to fabrication, submit approved fabrication shop drawings to the galvanizer.

2. Notify galvanizer of steel fabrications that exceed the ASTM A385 recommended percentages for carbon, phosphorus, manganese and silicon, so special galvanizing processing techniques are used.

B. Coordinate installation of metal fabrications that are anchored to concrete or masonry, or that receive work specified by other Sections. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.

C. Field Measurements: Field verify dimensions prior to fabrication.

D. Coordinate selection of shop primers with galvanizing, and with paintings to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and paintings are compatible with one another.

1.04 SUBMITTALS

A. Shop Drawings: Submit detailed Shop Drawings of metal stairs and railings, showing floor plans, elevations, sections and details. Indicate member sizes and thicknesses, methods of assembly, welding, locations of hardware, anchors, and accessories.

B. Product Data: Submit manufacturer's product data of stair type and corrosion-inhibitive finish system. Include treads, railing system, handrails, and handrail brackets.

C. Manufacturer's Mill Certificate: Submit, certifying that products meet or exceed specified requirements.

D. Fabricator and Installer qualifications per Article "Quality Assurance".

E. Welding:

1. Welder's Certificates: Field welders shall be Project certified in accordance with AWS D1.1.

2. Welding Material Certification: Provide certificate that welding material complies with specifications. Submit to OWNER's testing laboratory.

F. Research/Evaluation Reports: ICC-ES for post-installed anchors.

1.05 QUALITY ASSURANCE

A. Fabricator and Installer Qualifications: A firm with a minimum of five years' experience in supplying and installing steel work required by this Section. Submit fabricator and installer qualifications and list of projects with the contact information of owners and architects.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D-1.1– Structural Welding Code – Steel.

2. AWS D1.3 - Structural Welding Code - Sheet Steel.

C. Comply with the following as a minimum requirement:

1. Design, fabricate, and install miscellaneous metals in accordance with AISC - Design, Fabrication, and Erection of Structural Steel for Buildings.

2. AWS D-1.1 Code - Structural Welding Code – Steel and AWS D1.3 - Structural Welding Code - Sheet Steel.

3. Inspection of Welding: Refer to Section 01 4523: Testing and Inspection.

D. Field applied primers, paintings, sealers and adhesives shall be approved by the OWNER's Office of Environmental Health and Safety (OEHS).

E. Preassemble items in shop to greatest extent possible to minimize field welding. Mark units for reassembly and coordination of installation. Use marking method compatible with galvanizing.

1.06 DELIVERY, STORAGE AND HANDLING

A. Store components and materials above grade on platforms, skids, or other required supports.

B. Protect from corrosion or damage, cover with waterproof material.

C. Load, unload, and handle fabrications in a manner that will not damage metal or finishes.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Structural Steel Shapes: ASTM A36.

B. Rolled Steel Plates: ASTM A36. Plates to be bent or cold-formed shall conform to ASTM A283, Grade C.

C. Round HSS: ASTM A500 Grade B or C.

D. Square and Rectangular HSS: ASTM A500 Grade B or C.

E. Steel Pipe: ASTM A53 Type E or S, Grade B, standard weight (Schedule 40), unless otherwise noted. Black finish.

F. Steel Sheet: ASTM A1008 or ASTM A1011.

G. Steel Bolts: ASTM A307, Grade A, or F3125 with hex steel nuts per ASTM A563 and washers. Galvanized in accordance with ASTM A153 for exterior locations.

H. Steel Bars: Conforming to ASTM A108 or ASTM A575.

I. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A47, or cast steel, ASTM A27. Provide bolts, washers, and shims, hot-dip galvanized per ASTM A153.

J. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

K. Concrete Materials:

1. Concrete per Section 03 3000, Cast-in-Place Concrete.

2. Welded wire fabric and reinforcing per section 03 2000, Concrete Reinforcing.

2.02 GENERAL FABRICATION

A. Field verify dimensions before fabrication. Design units to allow for adjustment and fitting of components during field installation. Preassemble units at shop to minimize mechanical joints, splicing and field assembly of units.

B. Stair components shall be fabricated of metals and shapes indicated on the Drawings and conforming to the requirements of the referenced standards.

C. For fabrication of Work exposed to view, provide only materials smooth and free of blemishes. Remove blemishes by grinding or by welding and grinding, before cleaning, treating, and installation of surface finishes including zinc coatings. Exposed to view surfaces that exhibit pitting seam marks, roller marks, "oil-canning" stains, discoloration or other imperfections on finished units are not acceptable.

D. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

E. Cut, drill, or punch holes at right angles to the surface of the metal. Holes shall not be made or enlarged by burning. Holes in base or bearing plates shall be drilled.

F. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated or specified.

G. Bend metal corners to the smallest radius possible without causing grain separation or otherwise impairing the work.

H. Welding:

1. Weld connections unless otherwise indicated.

2. Weld corners and seams continuously and in accordance with requirements of AWS Code. Welds will be inspected as required in Section 05 1200: Structural Steel Framing.

3. Welds exposed to view shall be ground down and dressed smooth, so that the shape and profile of the item welded are maintained.

2.03 STAIR FABRICATION

A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

B. Fabricate stringers, risers, sub-treads and platforms to profiles indicated. Form each tread pan and riser in one continuous piece to receive finished tread. Weld or bolt risers and treads to carrier angles. Weld carrier angles to structural steel stringers. Fasten countersunk bolts, or stud weld clips, through pans and platforms to facilitate fastening of welded wire fabric for concrete fill. Provide welded-on clips for support of soffits. Close ends of channel or box stringers.

C. For items bearing on concrete, provide steel bearing plates and anchors. Base or bearing plates shall be leveled by means of adjustment nuts. The space below plates shall be packed solid with full bed of non-shrink grout.

D. At intermediate landings, provide metal bases formed of stringers. Miter and weld internal and external corners of metal bases.

E. Fabricate treads and platforms of structural-steel sheets shaped to configurations indicated. On exterior stairs accommodate slopes to drain

F. Provide uprights and posts of rectangular or round tubing as indicated. Provide members a special shop straightening to eliminate distortion and to provide straight alignment. Correct bends, distortions, and damage. Fill dents and grind smooth.

G. Fabricate railings of profile indicated, fastened to stair stringers.

H. Countersink bolt heads and screws on finished surfaces, or cut flush with surfaces.

I. Fit and securely fasten components together, with exposed tight-fitting joints. Cut, drill, punch and tap as required for installation.

J. Furnish joints as strong and rigid as adjoining sections. Weld continuously along entire line of contact, except where spot welding is indicated.

K. Nosing: Provide abrasive cast metal safety nosings along the length of the step. Equip each nosing with integral anchors for embedding in the concrete fill.

2.04 RAILING FABRICATION

A. Pipe Railing: Handrails, posts and pickets shall be fabricated of black ASTM A53 Type E or S, Grade B standard weight steel pipe.

B. Handrail Brackets: Wagner cast iron bracket Style D, or equal.

C. Form elbow bends and wall returns to uniform radius, free from buckles and twists. Close exposed ends of pipe and tubing by welding metal closure in place or by use of pre cased fittings.

D. Accurately miter and cope intersections of posts, pickets and rails and weld all around; grind welds smooth.

E. Connect posts to stair framing by direct welding, unless otherwise indicated. For posts set in concrete, furnish matching sleeves.

2.05 PREPARATION FOR GALVANIZING

A. Fabricate to the largest size possible and whenever possible use slip joints to minimize field welding.

B. Fabricate structural steel in accordance with Class I, II, III guidelines as described in AGA's Recommended Details for Galvanized Structures, to facilitate galvanizing

process. Corners of gussets, stiffeners, and bracing shall be cropped to allow free flow of zinc during galvanizing process.

C. Remove welding slag, splatter, anti-splatter compounds and burrs immediately after welding.

D. Remove oil, grease, dirt, mill scale, rust, corrosion products, oxides, paint or other foreign matter from steel surface in accordance with SSPC-SP3.

E. Marking for Identification: Avoid unsuitable marking paints for identification, such as oil based paints and markers and crayon markers. Use water soluble paints or markers acceptable to galvanizer or steel tags wired to the work.

F. Masking: Use masking materials recommended by the American Galvanizers Association (AGA) to produce ungalvanized areas for field welding and at slip critical bolts.

G. Galvanize fabrications per Section 05 5013, Hot-Dip Galvanizing, in accordance with ASTM A123 and ASTM A153.

2.06 SHOP FINISH

A. Metal fabrications, except those to be hot-dip galvanized, shall be provided with a coat of primer.

B. Primers:

1. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI# 79 and compatible with topcoat. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

2. Epoxy Zinc-Rich Primer: Complying with MPI# 20 and compatible with topcoat.

3. Minimum dry film thickness of primer shall be 2.0 mils.

4. Coordinate with Section 09 9000, Painting and Coating, for compatibility of the prime coat and finish coats of paint.

C. Surfaces of metal stairs and railings, including surfaces of pan-filled stairs, not scheduled for hot-dip galvanizing, shall be cleaned and treated to assure maximum paint adherence, prior to application of the shop prime coat, in accordance with SSPC-SP1, SSPC-SP3, SSPC-SP10, and SSPC-SP11 as applicable for the exposure and application.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Field check and verify that structural framing, enclosures, weld plates, blocking, size and location of pockets are as called for in the approved shop drawings. Notify the OAR in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Load, unload and handle material in a manner that will not strain, bend, deform or otherwise damage it.

B. Provide anchorage devices and fasteners as indicated in the drawings and where necessary for securing metal stair fabrications to in-place construction.

C. Set fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of hot-dip galvanized fabrications intended for bolted or screwed field connections.

E. Alignment: Verify alignment of items with adjacent construction. Coordinate related work.

F. Support bearing plates at the proper level by means of adjustment nuts on anchor bolts. Set bases and plates accurately using a high-strength, non-shrink grouting mortar to obtain uniform bearing. Follow grout manufacturer's recommendations for substrate preparation and application.

G. Place, compact, finish, and cure concrete poured in treads and landings in accordance with applicable requirements of Section 03 3000, Cast-in-Place Concrete.

H. Corrosion Protection: Coat concealed surfaces of metals that will come into contact with grout, concrete, masonry, or wood, with a heavy coat of bituminous paint or zinc chromate primer. Bituminous Paint shall be cold applied asphalt emulsion complying with ASTM D1187. Protect dissimilar metals from galvanic corrosion by pressure tapes, coating, or isolators.

3.03 FIELD WELDING

A. Preparation of Weld Area of Galvanized Fabrications: Remove masking from fabrications. Remove remaining zinc coating between one inch and four inches from both sides of members to be welded, by grinding back the zinc coating, burning the zinc away or pushing back the molten zinc from the weld area.

B. Welding: Comply with AWS Code for procedures of manual shielded metal-arch welding, appearance and quality of welds made, methods used in correcting welding work.

1. Weld in accordance to AWS D-1.1.

2. Weld galvanized fabrications in accordance to AWS D-19.0.

C. Remove welding flux immediately. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surfaces matches those adjacent.

D. Upon completion of welding plug vent, drainage and lifting holes of galvanized fabrications with appropriate diameter zinc plugs. Push in about half way by hand, and hammer to a tight fit. With a hand file or an abrasive tool, file away excess material. Repair scratches with a zinc rich coating.

1. Plug railing holes.

2. Plug visible holes of HSS members.

3.04 RAILING INSTALLATION

A. Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Secure brackets, posts and rails to steel by welds, and to masonry or concrete with expansion sleeves and bolts.

B. Set posts plumb and aligned. Set rails horizontal or parallel to rake of stairs.

C. Rails contacting a vertical surface shall be fitted with standard pipe rail flanges, secured to concrete or masonry surfaces with 3/8 inch 2-unit cinch anchor bolts and secured to wood frame surfaces with 3/8 inch lag screws, unless otherwise indicated.

D. Install posts into metal sleeves cast in concrete, and extending into it at least 9 inches. Wedge posts true, plumb, and fastened by packing with grout. Finish grout smooth and flush with adjacent surfaces.

3.05 ADJUSTING AND CLEANING

A. Do not cut or abrade finishes which cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing or provide new units as required.

B. Touch Up Damaged Surfaces:

1. Shop Painted Finishes: Comply with SSPC-PA-1 for touch-up; apply with brush to produce a minimum 2.0 mil dry film thickness.

2 Galvanized Surfaces: Clean field welds, connections and damaged areas. Apply two coats of Carbomastic 15, by Carboline or equal product approved by OWNER's OEHS. Brush or roll to a 4 to 6 mil thickness.

2.06 CLEAN UP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

2.07 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 06 1000

ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Rough carpentry Work.

2. Installation of glued laminated members, plywood web joists or wood chord metal web joists.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 01 4523: Testing and Inspection.

6. Section 09 2900: Gypsum Board.

1.02 SYSTEM DESCRIPTION

A. Regulatory Requirements:

1. Work of this Section shall comply with CBC Chapter 23.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. Douglas fir, larch or hemlock structural and framing lumber shall be graded in accordance with the Standard Grading Rules of the West Coast Lumber Inspection Bureau (WCLIB) or the Western Lumber Grading Rules of the Western Wood Products Association (WWPA).

2. Plywood shall conform to requirements of Product Standard PS 1, and shall be grade marked by a recognized grading agency (APA and PTL).

B. Lumber shall bear official grade mark of the association under whose rules it was graded or official grade mark of another recognized grading agency.

C. Structural and framing members 2-inch thick (nominal) and larger shall be air-dried to moisture content not to exceed 19 percent before installation.

D. Each piece of preservative treated lumber shall be identified by the Quality Mark of an approved inspection agency in accordance with CBC Chapter 23; refer to Section 01 4523: Testing and Inspection.

E. Lumber showing visible signs of mold growth:

1. Lumber showing visible signs of mold growth shall be removed from the project site or cleaned as outlined below.

2. The contractor is responsible for all costs associated with cleaning, post-cleaning testing, and reporting for lumber with mold.

a. Lumber that shows visible signs of mold growth prior to, or after installation, shall be cleaned pursuant to USEPA's guidance publication "Mold Remediation in Schools and Commercial Buildings dated March 2001 (EPA 402-K-01-001).

b. A minimum of 10 percent of the total locations cleaned must be sampled (tape lift method) post cleaning to ensure cleaning effort was successful. Cleaning will be considered acceptable when tape lift sample results evaluated by direct microscopic examination determine that the general abundance of mold is non-detect or rare (normal trapping to 1+).

c. A report prepared by a Certified Industrial Hygienist (CIH) that details the sampling and cleaning results shall be prepared and submitted to the OAR for review and approval.

d. Cleaned lumber shall not be installed or enclosed by finish materials until approval of test results. Cleaned lumber must meet moisture content requirements as required elsewhere in this specification prior to installation or application of finishes.

1.04 STORAGE, HANDLING AND PROTECTION

A. The materials supplied as part of the Work of this section shall be protected from exposure to inclement weather before being covered by other Work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Lumber: Structural and framing lumber shall be of following species and grades:

	INSTALLATION	SPECIES	GRADE
1.	Subfloor, wall sheathing, roof sheathing and ceiling furring	Douglas fir and larch	Construction Board, WCLIB; WWPA
2.	Posts, (5-inch by 5-inch and larger, width not more than 2 inches greater than thickness).	Douglas fir and larch	No. 1 or better Structural Posts and Timbers, WCLIB. No. 1 or better Post and Timbers, WWPA.

3.	Beams, girders and truss members (5-inch and thicker, rectangular, width more than 2-inches greater than thickness) where exposed as finish members.	Douglas fir and larch	No. 1 or better Structural Beams and Stringers, WCLIB; WWPA.
4.	Joists, rafters, lintels, posts, mullions and members (2 to 4-inch thick, 2 to 4-inch wide)	Douglas fir and larch	No. 1 or better; Structural Light Framing, WCLIB;
5.	Other lumber (2 to 4-inch thick, 2 to 4-inch wide) not specified in subparagraph 5 above.	Douglas fir and larch	Construction Light Framing WCLIB; WWPA
6.	Framing lumber (2 to 4-inch thick, 5-inch and wider).	Douglas fir and Larch	No. 1 or better Structural Joists and Planks, WCLIB; WWPA.
7.	Mudsills and plates in contact with earth.	Douglas fir and Larch Treated	Same as subparagraphs 5 and 6.
8.	Sills or plates installed on concrete or masonry surfaces 6 inches or less above earth or finish grade.	Douglas fir and Larch Treated	Same as subparagraphs 5 and 6.
9.	Sills, foundation plates and sleepers installed on concrete, masonry foundations, or installed on concrete slab in direct contact with earth.	Douglas fir and Larch treated	Same as subparagraphs 5 and 6.
10.	Miscellaneous nailing strips and blocks embedded in concrete or masonry.	Douglas fir and Larch treated	Same as subparagraphs 5 and 6.

B. Plywood: Plywood furnished for structural purposes, when exposed outdoors, shall be exterior type plywood. Other plywood furnished for structural purposes shall be exterior type, or Exposure 1.

C. OSB Board or Panels:

1. Oriented strand board or panels shall not be furnished as part of the Work of this section.

D. Preservative Treated Wood:

1. Wood and plywood specified; as treated wood shall be pressure treated wood in accordance with CBC requirements.

2. Seasoning: Treated lumber shall be air seasoned after treatment, for a minimum of two weeks before installation. Moisture content shall be 15 percent maximum.

3. Creosote or arsenic is not permitted for treating wood.

4. When treated wood member have been notched, dapped, drilled, or cut, such newly cut surfaces shall be painted with a heavy coat of the same preservative material originally provided for treatment of wood member.

E. Fire Retardant Protection: Wood and plywood specified as fire retardant protected wood shall be treated by approved methods and materials and shall be dried following treatment to maximum moisture content as follows:

1. Solid sawn lumber 2-inch thick or less: 19 percent.

2. Plywood: 15 percent.

F. Plywood Subflooring: Underlayment, Group 1, Exposure 1; of thickness indicated.

G. Mineral Fiber Panels: Asbestos-free, thickness as indicated.

H. Adhesive: Tec, Inc. Sturdi-Bond TA-175, Top Industrial Inc., Rainbuster 345, Liquid Nails LN-940, or equal elastomeric adhesive conforming to ASTM D 3498 and APA-AFG-01.

PART 3 - EXECUTION

3.01 FASTENINGS

A. Nails and Spikes:

1. Furnish only common wire nails or spikes whenever indicated, specified or required.

2. Whenever necessary to prevent splitting, holes shall be pre-drilled for nails and spikes.

3. Nails in plywood shall not be overdriven.

4. Machine Applied Nailing: Use of machine nailing is subject to a satisfactory Project site demonstration for each Project and approval by the Architect or structural engineer retained by the Architect as an Architect Consultant and DSA. Installation is subject to continued satisfactory performance. Machine nailing is not permitted for 5/16 inch plywood. Do not permit nail heads to penetrate outer ply. Maintain minimum allowable edge distances when installing nails.

B. Lag Screws:

1. When installing lag screws in a wood member, pre-drill hole as required by the CBC.

2. Lag screws, which bear on wood, shall be fitted with standard steel plate washers under head. Lag screws shall be screwed and not driven into place.

C. Bolts:

1. Lumber and timber to be fastened together with bolts shall be clamped together with holes for bolts bored true to line.

2. Bolts shall be fitted with steel plates or standard cut washers under heads and nuts. Bolts shall be tightened when installed and again before completion of the Work of this section.

D. Wood Screws: When installing wood screws, pre-drill holes as required by the CBC.

E. Metal Framing Devices: Framing anchors, joist hangers, ties, and other mechanical fastenings shall be galvanized or furnished with a rust inhibitive coating. Nails and fastenings shall be of the type recommended by manufacturer.

F. Powder Driven Fasteners:

1. Loads shall not exceed 75 pounds unless indicated on the Drawings or when reviewed by the Architect.

2. The operator, tool, and fastener shall perform the following as observed by the Inspector.

a. Observe installation of first 10 fasteners.

b. Test the first 10 fasteners by performing a pullout test. Load shall be at least twice the design load, or 150 pounds, whichever is greater.

c. Random testing:

1) Load less than 75 pounds - approximately 1 in 10 pins.

2) Load 75 pounds or greater - 1/2 of the pins.

3. Failure of any test will result in testing of all installed pins.

4. Nail heads shall not break the outer skin of sheathing.

5. Non-compliant pins shall be replaced.

3.02 INSTALLATION

A. Stud Walls, Partitions and Furring:

1. Wood stud walls, partitions and vertical furring shall be constructed of members of size and spacing indicated. Provide single treated plate at bottom and double plate at top unless otherwise indicated. Interior, nonbearing non-shear partitions may be framed with a single top plate, installed to provide

overlapping at corners and at intersections with other wall and partitions or by metal ties as detailed.

2. Walls and partitions shall be provided with horizontal staggered blocking at least 2 inch nominal thickness and same width as studs, fitted snugly, and nailed into studs. Blocking shall be installed at mid-height of partition or not more than 7 feet on center vertically. Install wood backing on top of top plate wherever necessary for nailing of lath or gypsum board.

3. Walls, partitions and furred spaces shall be provided with 2-inch nominal thickness wood firestops, same width as space to be firestopped, at ceiling line, mid-height of partition and at floor line. Firestops at floor line are not required when floor is concrete. If width of opening is such that more than one piece of lumber is necessary, provide two thicknesses of one inch nominal material installed with staggered joints.

4. Firestops shall be installed in stud walls and partitions, including furred spaces, so the maximum dimension of any concealed space is not over 10 feet.

5. Corners, and where wood stud walls and wood vertical furring meet, shall be constructed of triple studs. Openings in stud walls and partitions shall be provided with headers as indicated and a minimum of 2 studs at jambs, one stud of which may be cut to support header in bearing.

6. Where wood and masonry or concrete walls intersect, end stud shall be fastened at top, bottom and mid-height with one 1/2 inch diameter bolt through stud and embedded in masonry or concrete a minimum of 4 inches. Bolts shall be provided with washers under nuts.

7. Sills under bearing, exterior or shear walls shall be bolted to concrete with 5/8 inch diameter by 12-inch long bolts with nuts and washers, spaced not more than 4 feet on center unless noted otherwise. There shall be a bolt within 9 inches of each end of each piece of sill plate. Sills shall be installed and leveled with shims, washers, with nuts tightened to level bearing. Space between sill and concrete shall be dry packed with cement grout.

B. Floor Joists, Roof and Ceiling Framing:

1. Wood joists shall be of the size and spacing indicated, installed with crown edge up, and shall have at least 4-inch bearing at supports. Provide 2-inch solid blocking, cut in between joists, same depth as joists, at ends and bearings, unless otherwise indicated.

2. Floor joists of more than 4 inches in depth and roof joists of more than 8 inches in depth shall be provided with bridging. Floor joists shall be bridged every 8 feet with solid blocking or metal cross bridging. Roof joists shall be bridged every 10 feet.

3. Joists under and parallel to bearing partitions shall be doubled and nailed or bolted together as detailed. Whenever a partition containing piping runs parallel to floor joists, joists underneath shall be doubled and spaced to permit

passage of pipes and blocked with solid blocking spaced at not more than 4 feet intervals.

4. Trimmer and header joists shall be doubled, when span of header exceeds 4 feet. Ends of header joists more than 6 feet long shall be supported by framing anchors or joist hangers unless bearing on a beam, partition, or wall. Tail joists over 12 feet long shall be supported at header by framing anchors or on ledger strips at least 2 by 4.

5. Provide solid blocking between rafters and ceiling joists over partitions and at end supports where indicated.

C. Beams, Girders and Joists:

1. Ends of wood beams, girders and joists which are 2 feet or less above finished outside grade and which abut, but do not enter concrete or masonry walls, as well as wood blocking used in connection with ends of those members shall be treated with wood preservative.

2. Where wood beams, girders and joists enter masonry or concrete walls 2 feet or less above outside wall, metal wall boxes or equivalent moisture barriers shall be provided between wood and masonry or concrete.

D. Subflooring:

1. Floor sheathing: Plywood of thickness and nailing indicated. Install with the face grain across supports, end joints staggered and centered over supports. Provide solid blocking under plywood edges where indicated. In addition to nailing, sheets of plywood flooring shall be secured in place with elastomeric adhesive, installed at beams, joints, perimeter supports and panel edges.

E. Roof and Wall Sheathing:

1. Plywood roof sheathing shall be Structural I, Grade C-D, Exposure 1, thickness as indicated.

2. Where exposed roof sheathing is indicated, area shall be sheathed solid with dressed and center matched, V-jointed boards of sizes indicated. Boards shall be installed perpendicular to supports.

3. Soffits of overhanging eaves, where indicated, shall be boxed-in using Group I, Exterior Type, Grade A-C, plywood, thickness as indicated.

4. Plywood for shear walls shall be Structural I, Grade C-D Exterior Type, thickness as indicated. Install with the long dimension parallel or perpendicular to the supports. Blocking shall be provided behind edges not located over supports. Shear wall construction, nailing, and top and bottom anchorage shall be as indicated.

5. Provide and install metal H-clips of required size, midway between rafters at unsupported edge joints of plywood roof sheathing where rafters are spaced at

24 inches on center. Clips shall be Plyclips, by Timber Fasteners Inc., Panel Clips by Simpson Co., USP Structural Connectors, or equal.

F. Furring:

1. Rafters or ceiling joists indicated to be furred for support of materials other than acoustical tile shall be furred with 2 by 4 wood members installed at right angles to supports, spaced as indicated and nailed in place. Furring shall be aligned, and bottoms shall be leveled by installing wood shims as required, and nailed as indicated.

2. Furring for protective wall padding in gymnasium shall be 1 by 3 Douglas fir, Construction Boards, S1S1E; applied horizontally to concrete walls at top and bottom of padding panels; and at uniform intermediate spacing not more than 18 inches on center. Stripping shall be shimmed where required, aligned to a true plane, and secured to concrete walls with concrete nails at not more than 18 inches on center.

G. Furring: Where metal furring is not indicated or specified, provide wood furring at points indicated and required for concealing conduit, piping, structural framing or other unfinished materials. Wood furring shall be 2-by studs of required width. Vertical members contacting concrete or masonry shall be attached as specified for anchoring interior wood stud partitions.

H. Grounds:

1. Provide and set wood grounds at points where wood trim occurs and work is to be plastered. Grounds at 3/4 inch metal lath shall be 5/8 inch thick, net, 1 ½-inch wide Douglas Fir, S1S. Grounds shall be doubled where trim member exceeds 5-inch width, or wherever indicated. Grounds shall be applied after lath has been installed set plumb, level and true to line.

2. Apply grounds over wood framed surfaces and lath and securely nail to wood backing at each stud or bearing. Grounds applied over steel channel studs and lath shall be securely nailed at each stud or bearing to nail-blocks provided and installed in metal studs.

3. Grounds applied to concrete surfaces shall be securely nailed to woodblocks provided and built into concrete.

I. Nailing Strips and Plates:

1. Provide wood nailing strips, plates and blocking indicated or required. Nailing strips in connection with metal work shall be bolted to metal. Wood nailing blocks for securing grounds shall be built into concrete, or masonry.

2. Nailing schedule shall comply with CBC requirements.

3. Treated wood nailing strips for lightweight insulated concrete roof decks at eaves, ridges, rakes, base of curbs and wherever else indicated, shall be provided and installed. Strips shall be treated Douglas fir, 4 inches (nominal) width by thickness of insulated concrete.

J. Wood Backing: Provide wood backing as indicated and as required to receive plumbing, electrical fixtures and equipment, cabinets, door stop plates and other fixed equipment.

3.03 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.04 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 07 1400

FLUID APPLIED WATERPROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Elastomeric waterproofing on planter and retaining walls not part of building walls.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 33 4000 - Storm Drainage Utilities.

3. Section 03 3000 - Cast-in-Place Concrete.

4. Section 04 2200 - Concrete Unit Masonry.

1.02 SUBMITTALS

A. Certificates: Submit a certificate stating applicator is certified by the elastomeric waterproofing material manufacturer, and upon completion, submit a certificate stating that elastomeric waterproofing systems have been installed in conformance with reviewed submittals and manufacturer's recommendations.

B. Product Data: Submit manufacturer's Product Data including complete installation instructions.

C. Shop Drawings: Submit Shop Drawings indicating each condition of the Work. Indicate all adjoining Work, and indicate methods of adhesion, attachment, and related conditions.

D. Samples: Submit Samples of elastomeric membrane waterproofing on flat plywood board, not less than 12 inches square, illustrating color and texture.

E. Experience Record: Submit a list of at least five installations on which each of the materials and systems proposed for installation have been in satisfactory service for at least three years.

1.03 QUALITY ASSURANCE

A. References:

1. ASTM D6506, Standard Specification for Asphalt Based Protection for Below-Grade Waterproofing.

B. Qualifications of Manufacturer: Elastomeric waterproofing system shall be manufactured by a firm with a minimum of 20 years experience in the production of elastomeric waterproofing.

C. Qualifications of Installer: A firm which has at least three years experience in work of the type required by this section, and is recommended by manufacturer to install the specified products.

D. Pre-Installation Conference and Inspection: After review of submittals but before starting installation of the Work of this section, conduct a meeting at the Project site attended by the Project Inspector, Architect, OAR, Contractor, waterproofing applicator, and a technical representative of the elastomeric waterproofing material manufacturer. The waterproofing applicator and material manufacturer's technical representative shall inspect the substrates to receive Work of this section and report defective conditions to Project Inspector, Architect, OAR and Contractor.

E. Manufacturer's Representative: Provide arrangements necessary to have a trained representative of the manufacturer visit the Project site on a weekly basis during elastomeric waterproofing Work to review installation procedures.

F. Materials shall comply with current State of California and local Air Quality Management District requirements for volatile organic compounds of not over 350 grams per liter.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's unopened containers fully identified with manufacturer's name, trade name, type, class and grade. Each container shall be identified with material name, date of manufacturer and batch number.

B. Store materials at the Project site under cover and maintain in dry condition. Protect from damage from excessive temperature and construction operations. Do not double-stack containers. Protect mastic and adhesive from moisture and excessive heat.

C. Store drainage composite or protection board flat and above grade. Provide cover on top and all sides of pallets and provide for adequate ventilation. Protect surface conditioner from freezing.

1.05 PROJECT CONDITIONS

A. Install suitable impervious type masking to preclude staining of surfaces to remain exposed wherever elastomeric waterproofing abuts or laps on to other finish surfaces, and provide additional protection as necessary to supplement masking; cover entire area of building subject to damage or staining.

B. Protect adjacent Work during installation of Work of this Section.

C. Install Work of this section, only in dry weather and when outside temperature is within the limits established by the manufacturer of the materials and products used.

D. Do not install any materials when water in any form is present on the surface or if materials are wet.

1.06 WARRANTY

A. Manufacturer shall provide a three year material warranty.

B. Installer shall provide a three year labor warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Elastomeric waterproofing shall be a two-component, unmodified polyurethane waterproofing: Comply with ASTM C836.

1. Pacific Polymers, Inc. Elasto-Deck B.T. 100 percent solids.

2. Gaco Western, Inc.LM-60.

3. Carlisle Coatings & Waterproofing Inc., CCW 703 Liquiseal.

4. Tremco Inc., Temproof 201.

2.02 MATERIALS

A. Pacific Polymers, Inc., Elasto-Deck B.T. 100 percent solids System, as a standard of quality, conforming to the following:

1. Application:

a. 60 mils thick – smooth surfaces.

b. 90 mils thick – rough surfaces.

2. Material Types:

a. Type I: For horizontal surfaces.

b. Type II: For vertical surfaces.

c. Elasto-Deck B.T. Knifegrade: For cracks, voids and other surface irregularities.

2.03 RELATED MATERIALS

A. Sealants: Compatible with waterproofing materials as recommended by manufacturer.

B. Backer Rod: Closed-cell Polyethylene rod.

C. Flashing Tape: Woven glass cloth tape.

D. Protection Course: Minimum 1/8 inch thick complying with ASTM D6506, semirigid sheets of fiberglass or mineral-reinforced asphaltic core, pressure laminated between two asphalt-saturated fibrous liners.

E. Cleaning Materials: Solvent recommended by manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Surfaces must be clean and free of any oil, dirt, grease, and other contaminants, which will interfere with adhesion of the coatings. Surfaces shall be left broom clean.

B. Concrete:

1. Concrete surfaces shall be trowel finished followed by a light brooming, left free of loose particles, ridges, projections, voids and droppings that would interfere with the application of the coatings.

2. Concrete surfaces shall be water cured in lieu of curing compounds for a minimum of 28 days. If curing compounds are furnished, they shall be compatible with the provided waterproofing system.

C. Substrate conditions and surfaces shall be subject to inspection by the manufacturer and installer. Do not proceed with Work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protect building from damage resulting from spillage, dripping and dropping of materials. Prevent materials from entering and clogging drains and waterways.

B. Concrete

1. Surfaces to receive elastomeric waterproofing system shall be cleaned by sandblasting or acid etching. If acid etching is provided, a 10 percent to 15 percent muriatic acid solution applied by mop or broom, shall be allowed to remain on the surface approximately 10 minutes or until bubbling ceases. Surfaces shall then be washed with clean water to remove residues and shall be allowed to dry.

C. Cracks and Control Joints

1. Except for non-moving shrinkage cracks, all other cracks and joints must be sealed with a single component sealant of the same manufacturer as the elastomeric membrane waterproofing and installed according to manufacturer's recommendations.

2. Large cracks, 1/16 inch and over, shall be routed out as required by the manufacturer and sealed with an elastomeric sealant. Apply sealant to inside area of cracks only. Do not install on concrete deck surfaces.

3. Seal secondary control and expansion joints with sealant and backer rod as recommended in the installation specifications of the elastomeric membrane waterproofing.

3.03 INSTALLATION

A. Install Elastomeric membrane waterproofing in accordance with manufacturer's printed instructions except as hereinafter specified. Coordinate the Work so the complete membrane is installed in a continuous operation, and that all areas where installation has started, per coat, are completed the same working day.

B. Elastomeric Membrane Waterproofing - 60 mils thickness, Smooth Surface Installation:

1. Cracks 1/16 inch and over shall be routed or saw cut and filled with joint filler of the same manufacturer as the elastomeric membrane waterproofing and installed according to manufacturer's recommendations.

2. At intersections of membrane and vertical walls, columns, pipes, and other penetrations, install a ¾ inch fillet bead at the meeting angle using a joint filler of the same manufacturer as the elastomeric membrane waterproofing and installed according to manufacturer's recommendations.

3. Install the first coat of the elastomeric membrane waterproofing at a rate of 50 square feet per gallon by airless spray, roller, brush, or squeegee according to the manufacturers installation procedures for smooth surfaces.

4. After a 24 hour curing period, install a second coat of elastomeric membrane waterproofing at the same 50 square feet per gallon rate to provide a total dry film thickness of 60 mils.

C. Elastomeric Membrane Waterproofing -- 90 mils thickness, Rough Surface Installation:

1. Cracks 1/16 inch and over shall be routed or sawcut and filled with joint filler of the same manufacturer as the elastomeric membrane waterproofing and installed according to manufacturer's recommendations.

2. At intersections of membrane and vertical walls, columns, pipes and other penetrations, install a ¾ inch fillet bead at the meeting angle using a joint filler

of the same manufacturer as the elastomeric membrane waterproofing and installed according to manufacturer's recommendations.

3. Install the first coat of elastomeric membrane waterproofing at a rate of 35 square feet per gallon by airless spray, roller, brush, or squeegee according to the manufacturers installation procedures for rough surfaces.

4. After a 24 hour curing period, install a second coat of elastomeric membrane waterproofing at the same 35 square feet per gallon rate to provide a total dry film thickness of 90 mils.

3.04 INSPECTION

A. The wet film thickness of each coat shall be checked during application by averaging numerous measurements taken with a film gage and thickness shall be sufficient that when cured the dry film thickness will be as specified herein.

B. Surfaces coated shall be visibly checked to insure areas have not been missed and all holidays in the film are repaired.

C. Coating Work shall be subject to inspection at any time to insure compliance with the manufacturer's recommendations. Test areas shall be cut whenever requested by the manufacturer's technical representative to verify conformance to the Specifications. Unsatisfactory area shall be remedied by the applicator.

3.05 PROTECTION COURSE

A. Install protection board on cured membrane after testing, without delay, so that the period of exposure shall be minimized.

3.06 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.07 CLEAN UP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 07 2100

THERMAL INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Thermal batt insulation for exterior walls and under roof decks.
2. Thermal batt insulation in furring at concrete or masonry walls.
3. Extruded polystyrene board at horizontal waterproofing.
4. Continuous insulation at exterior walls.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 07 1400 - Fluid Applied Waterproofing.
3. Section 06 1000 –Rough Carpentry.
4. Section 09 2423 – Cement Plaster and Metal Lath.

1.02 SUBMITTALS

A. Product Data:

1. Material List: Provide a list of materials for installation under this section.
2. Provide manufacturer's printed Product Data for each type insulation and accessory.

B. Manufacturer's Instructions: Submit manufacturer's printed installation instructions.

C. Certification: Provide certification that insulation materials conform to requirements of CBC Chapter 26.

D. Recycled Content: Provide certification that insulation materials contain a minimum 30 percent recycled materials.

1.03 QUALITY ASSURANCE

A. Surface Burning Characteristics: Flame spread rating shall not exceed 25 and smoke density shall not exceed 50 when tested in accordance with ASTM E84.

B. Combustion Characteristics: Rated as non-combustible when tested in accordance with ASTM E136.

C. Comply with following as a minimum requirement:

1. ASTM C209 – Standard Test Methods for Cellulosic Fiber Insulating Board.

2. ASTM C553: Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

3. ASTM C578: Specification for Rigid, Cellular Polystyrene Thermal Insulation.

4. ASTM C1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus.

5. ASTM D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics.

6. ASTM D1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics.

7. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

8. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

D. CHP Low-Emitting Materials Table: Materials submitted for building insulation must be listed as low emitting on the CHPS website, www.CHPS.net, or must be tested by an independent laboratory to meet CHPS requirements. Components of an assembly must meet CHPS requirements individually or in an assembly.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to Project site and store in a safe, dry place, with labels intact and legible at time of installation.

B. Protect building insulation materials from damage.

1.05 PROJECT CONDITIONS

A. Avoid exposure to humidity and moisture. Protect from exposure to sunlight.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Owens Corning.

B. Johns Manville.

C. CertainTeed Corporation.

D. The DOW Chemical Company.

E. DiversiFoam Products.

2.02 MATERIALS

A. General:

1. Provide Unfaced, friction-fit batt insulation where both sides of installation are enclosed.

2. Provide batt insulation with integral vapor barrier when one side of installation will be unenclosed.

3. Provide batt insulation with integral vapor barrier where at least one side of installation will be exposed to high humidity, such as showers.

4. Recycled content shall be a minimum of 30 percent.

B. Mineral Fiber Batt Insulation:

1. Unfaced Mineral Fiber Batt Insulation: Provide friction-fit, unfaced mineral fiber batts. Insulation shall consist of mineral fibers, glass or slag, and thermosetting resins complying with ASTM C665, Type I.

2. Faced Mineral Fiber Batt Insulation: Provide mineral fiber batts with vapor barrier consisting of mineral fibers, glass or slag, and thermosetting resins complying with ASTM C665, Type III, Class A, with vapor-retardant membrane facing.

3. Fasteners for Attaching Insulation to Wood Framing:

a. For faced batt insulation provide one of following types of staples: Stainless steel, monel, or copper-coated steel, size as required by manufacturer or applicable code.

b. For unfaced batt insulation provide 18 gage, minimum, galvanized steel wire where required to maintain proper insulation placement.

4. Fasteners for Attaching Insulation to Underside of Metal Roof Decks:

a. Spindle Anchors: Stic-Klip Mfg. Co., Type A or B as required, with Type S adhesive; Miracle Adhesives Corp. "Miracle StukUps" with Type HT994 adhesive; or Goodloe E. Moore Gemco or Tuff-Weld with G-P Improved or Tuff-Bond Quik-Set Type Adhesive as applicable; or equal. Provide adhesives of correct type for substrates and type of anchor.

b. String Wires: Minimum 18 gage galvanized steel wire.

C. Extruded-Polystyrene (XPS) Board Insulation: ASTM C578, Type X, thickness as indicated on drawings.

1. Manufacturers:

a. DiversiFoam Products, Certifoam.

b. Dow Chemical Company, Thermax.

c. Owens Corning, Foamular.

2. Physical Properties:

a. Density, ASTM D1622: Not less than 1.35 pounds per cubic foot.

b. Surface Burning Characteristics, ASTM E84: Flame spread less than 25, smoke developed no greater than 50.

c. Compressive Strength, ASTM D1621: 25 psi minimum.

d. Thermal Resistance, ASTM C1363: R 5 minimum per inch of thickness.

e. Water Vapor Transmission, ASTM E96: Less than 0.03 perms.

f. Water Absorption by Volume, ASTM C209: Maximum 0.10 percent.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine Work to verify suitability to receive insulation. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General:

1. Fit batt insulation, of R-value indicated on Drawings, snugly between framing members.

2. Maintain total insulation integrity over entire area to be insulated, including areas between closely spaced members.

3. Extend full thickness insulation over entire area to be insulated. Furnish manufacturer's recommended clips to tightly fit batts at joints.

4. Cut and fit batt insulation tightly around pipes, conduits and penetrations.

5. Do not compress batt insulation in excess of 10 percent (R-19 may be installed in 2 by 6 stud walls).

6. Prevent batt insulation from sagging during and after installation by installing adequate wire.

7. Metal door and window frames in acoustically insulated walls shall be filled with insulation, unless otherwise indicated.

8. Where vapor barrier is provided, install with vapor barrier facing room.

   a. Batts in Metal Framing: Provide friction-fit batts tightly fitted to stud webs and to metal furring.

   b. Batts under Metal Roof Decks where underside of insulation will be exposed install foil-faced flanged-type insulation batts and staple flanges together at maximum 4-inch centers and seal joints at abutting vertical surfaces with a pressure-sensitive plastic tape. Where underside of insulation will be inaccessible, install secure with spindle anchors. Provide 18 gage galvanized string wires under batts wherever necessary to prevent sagging. Stretch wire taut.

   c. Batts in Horizontal or Sloped Applications: Provide tightly stretched string wires along center of horizontal or sloping batts where support spacing exceed 16 inch on centers.

   d. Batts in Ceiling Framing: Install batts between joists, so top of insulation is level with top of framing members. Do not install insulation over recessed lighting fixtures, speakers, or other heat producing elements in ceilings. At junction boxes, access panels, and other items requiring access from above or below ceiling, cut insulation on each side to fit item and install loosely on top. Fit insulation snugly around ducts, conduits, pipes, and other items projecting through ceiling construction.

9. Install polystyrene board as required by Section 07 1326.

B. Continuous Insulation:

1. Continuous insulation shall be installed in accordance to manufacturer instructions. Fasten the insulation board to the exterior face of the steel stud wall framing using preassembled screw/stress plate fasteners, of type and length as recommended by the manufacturer. Fastener pacing shall be 12" on center at the board perimeter and 16" on center in the field of the board.

2. Bottom row of insulation panels shall be mounted on foundation casing "J" mold, refer to Section 09 2423, Cement Plaster and Metal Lath. Fasten insulation boards with corrosion resistant fasteners through sheathing into studs. Use 3/8 inch head roofing nails for wood studs, and self-drilling tapping screws for metal studs, or to "Z" channels, as applicable. Fastener penetration into studs shall be not less than 3/4 inch.

3. Stagger vertical joints at least one stud from adjacent courses.

3.03 PROTECTION

A. Protect Work of this section until Substantial Completion.

3.04 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

END OF SECTION

SECTION 07 25 00

ROOF PATCH & REPAIR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Install new roofing where removed for installation of new equipment and penetrations.

2. Flash in new curbs and penetrations.

3. Flash in existing curbs where equipment is removed.

4. Install new main and overflow drains.

5. Complete Maintenance of Existing Roof System, including but not limited to:

a. Seal all coping seams and top of coping.

b. Resurface all areas that pond water.

c. Seal all penetrations.

d. Seal all base flashing corners and laps with modified mastic and fiberglass reinforcement.

e. Rust proof all existing equipment.

B. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather

without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

C. Flashings and Fastening: Provide base flashings, perimeter flashings, detail flashings and component materials and installation techniques that comply with requirements and recommendations of the following:

1. NRCA Roofing and Waterproofing Manual (Fifth Edition) for construction details and recommendations.

2. SMACNA Architectural Sheet Metal Manual (Fifth Edition) for construction details.

1.4 ACTION SUBMITTALS

A. Product Data and MSDS Sheets: For each type of product specified.

1.5 INFORMATIONAL SUBMITTALS

A. Contractor's Product Certificate: Submit notarized certificate, indicating products intended for Work of this Section, including product names and numbers and manufacturers' names, with statement indicating that products to be provided meet the requirements of the Contract Documents.

B. Qualification Data: For Installer and Roofing Inspector. Include letter from Manufacturer written for this Project indicating approval.

C. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of compliance with performance requirements.

2. Indicate that proposed system components are compatible.

D. Warranties: Sample of special warranties.

E. Inspection Reports: Daily reports of Roofing Inspector. Include weather conditions, description of work performed, tests performed, defective work observed, and corrective actions taken to correct defective work.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For built-up roofing to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of five years experience.

1. Installer must acquire five inspection service days utilizing manufacturer's technical inspectors..

B. Manufacturer Qualifications: A qualified manufacturer that is UL listed for built-up roofing identical to that used for this Project. Or, if the roof is under pre-existing warranty, all products used to be that of the same manufacturer.

C. Source Limitations: Obtain roofing system components from or approved in writing by roofing system manufacturer.

D. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.

1. Meet with Owner, roofing Installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.

2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.

3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review structural loading limitations of roof deck during and after roofing.

5. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.

6. Review governing regulations and requirements for insurance and certificates if applicable.

7. Review temporary protection requirements for roofing system during and after installation.

8. Review roof observation and repair procedures after roofing installation.

E. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, roofing Installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.

2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.

3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review structural loading limitations of roof deck during and after roofing.

5. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.

6. Review governing regulations and requirements for insurance and certificates if applicable.

7. Review temporary protection requirements for roofing system during and after installation.

8. Review roof observation and repair procedures after roofing installation.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.9 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

B. Field measurements and material quantities:

1. Contractor shall have sole responsibility for accuracy of all measurements, estimates of material quantities and sizes, and site conditions that will affect work.

C. Waste Disposal:

1. Do not re-use, re-cycle or dispose of material manufacturers product containers except in accordance with all applicable regulations. The user of manufactured products is responsible for proper use and disposal of product containers.

D. Safety requirements:

1. All application, material handling, and associated equipment shall conform to and be operated in conformance with OSHA safety requirements.

2. Comply with federal, state, local and Owner fire and safety requirements.

3. Maintain a crewman as a floor area guard whenever roof decking is being repaired or replaced.

4. Maintain fire extinguisher within easy access whenever power tools, roofing kettles, fuels, solvents, torches, and open flames are being used.

1.10 WARRANTY

1. Warranty Period: 2 years Contractor Warranty from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL

A. Basis of Design: materials, manufacturer's product designations, and/or manufacturer's names specified herein shall be regarded as the minimum standard of quality required for work of this Section. All products are also 'or equal'. Comply with all manufacturer and contractor/fabricator quality and performance criteria specified in Part 1 and performance requirements in Part 2.

B. If any work to be completed is to a roof under a pre-existing warranty, all products used are to be furnished by the manufacturer of the existing warranty.

2.2 MANUFACTURERS

Garland Company, Inc.

3800 East 91st Street

Cleveland, Ohio 44105

Telephone: (310) 367-7655

Miles Taylor

2.3 BASE-SHEET MATERIALS

A. Base Sheet: Fiberlass reinforced SBS modified base sheet used as a base ply for torch applied membranes:

1. HPR Torch Base Sheet or equal.

2. Breaking Strength, minimum, ASTM D 146: machine direction, 210 lbf/in (22.5 kN/m);

3. Tear Strength, minimum, ASTM D 4073: machine direction, 250 lbf (880 N); cross machine direction, 200 lbf (880 N).

2.4 ROOFING MEMBRANE PLY SHEETS

A. Ply Sheet: Dual fiberglass reinforced SBS modified membrane for torch applied

1. Stressply IV Mineral or equal.

2. Breaking Strength, minimum, ASTM D 146: machine direction, 210 lbf/in (22.5 kN/m);

3. Tear Strength, minimum, ASTM D 4073: machine direction, 250 lbf (880 N); cross machine direction, 200 lbf (880 N).

2.5 FLASHING MATERIALS

A. Base Flashing Sheet: Dual fiberglass reinforced SBS modified membrane for torch applied

1. Stressply IV Mineral or equal.

2. Breaking Strength, minimum, ASTM D 146: machine direction, 210 lbf/in (22.5 kN/m);

3. Tear Strength, minimum, ASTM D 4073: machine direction, 250 lbf (880 N); cross machine direction, 200 lbf (880 N).

B. Primer: Primer capable of providing solid adhesion over monolithic emulsion existing coating.

1. Garla Prime VOC or equal.

C. Asphalt Roofing Mastic:

1. Flashing Bond or equal.

D. Urethane Coating: Applied for ponding areas and over coping cap seams.

1. White Star or equal.

2. Tensile: 2300 psi

3. Tear: 230 lbs/in

4. Elongation: 300%

E. Rust Proof Coating: Applied over all equipment to properly rustproof equipment

1. Rust Go VOC Top Coat White or equal.

F. Metal Roof Seam Tape:

1. Butyl Tape or equal.

G. Silicone sealant: manufacturer's low modulus, high performance, one part moisture curing silicone joint sealant.

1. Tuff Stuff Natural White or equal.

2.6 AUXILIARY ROOFING MEMBRANE MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.

B. Fasteners: Factory-coated steel fasteners and metal plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roofing membrane components to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.

C. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

2.7 METAL FLASHINGS

A. Termination bar:

1. Aluminum bar:

a. 1/8 x 1 inch (3.2 x 25.4 mm).

B. Counterflashing and counterflashing extensions:

1. Twenty two (22) gauge galvanized.

C. Piping through roof box:

1. Galvanized Steel: ASTM A 526-85, sheet steel with 1.25 oz./sq. (3.82 g/m^2) Galvwash surfacing.

a. Gauge: Twenty- two (22).

b. Solder: ASTM B32-89, alloy grade 50A. Neutralize flux after soldering.

D. Work shall be in accordance with Architectural Sheet Metal Manual, as issued by Sheet Metal and Air Conditioning Contractors' National Association, Inc., (SMACNA).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Substrate inspection:

1. The Applicator shall inspect the substrate for defects such as excessive surface roughness, contamination, structural inadequacy, or any other condition that will adversely affect the quality of work.

2. The substrate shall be clean, smooth, dry, free of flaws, sharp edges, loose and foreign material, oil and grease. Roofing shall not start until all defects have been corrected.

3. Verify that roof openings and penetrations are in place and braced and that roof drains are securely clamped in place.

4. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that the nailers match thicknesses of insulation.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Protection:

1. Contractor shall be responsible for protection of property during course of work. Lawns, shrubbery, paved areas, and building shall be protected from damage. Repair damage at no extra cost to Owner.

2. Roofing, flashings, membrane repairs, and insulation shall be installed and sealed in a watertight manner on same day of installation or before arrival of inclement weather.

3. At start of each work day drains within daily work area shall be plugged. Plugs to be removed at end of each work day or before arrival of inclement weather.

4. Preparation work shall be limited to those areas that can be covered with installed roofing material on same day and before arrival of inclement weather.

5. Arrange work sequence to avoid use of newly constructed roofing for storage, walking surface, and equipment movement. Move equipment and ground storage areas as work progresses.

6. Protect building surfaces at set-up areas with tarpaulin. Secure tarpaulin. Spilled or scattered debris shall be cleaned up immediately. Removed material to be disposed from roof as it accumulates.

7. At end of each working day, seal removal areas with water stops along edges to prevent water entry.

8. Provide clean plywood walkways and take other precautions required to prevent tracking of aggregate/debris from existing membrane into new work area where aggregate/debris pieces can be trapped within new roofing membrane. Contractor shall instruct and police workmen to ensure that aggregate/debris is not tracked into new work areas on workmen's shoes or equipment wheels. Discovery of entrapped aggregate/debris within new membrane is sufficient cause for its rejection.

3.3 INSTALLATION, GENERAL

A. Install roofing system in accordance with manufacturer's recommendations. Have specification and product data sheets on the job site.

B. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.

C. Cooperate with testing and inspecting agencies engaged or required to perform services for installing built-up roofing system.

D. Coordinate installing roofing system components so insulation and roofing membrane sheets are not exposed to precipitation or left exposed at the end of the workday or when rain is forecast.

1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation with a course of coated felt set in roofing mastic with joints and edges sealed.

2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.

3. Remove and discard temporary seals before beginning work on adjoining roofing.

E. Details not addressed in specification shall be in accordance with NRCA Manual Plates and recommendations, and the Architectural Sheet Metal Manual, as issued by Sheet Metal and Air Conditioning Contractors' National Association, Inc., (SMACNA).

F. Repair all deficiencies in the roof membrane and flashings including splits, holes, delaminated plies, and open corners with a five-course application of aluminum mastic and fiberglass reinforcement.

3.4 ROOFING MEMBRANE INSTALLATION OVER PONDING AREAS

A. Heat with a torch gun any reflective coating and peel away.

B. Prime cleaned roof areas and base flashings to be reinforced at a rate of 1 gal/200 sq ft and allow to dry.

C. Prior to application of surface treatment system, contractor shall inspect roof with manufacturer's representative.

1. Apply urethane coating at 4 gal per sq in two separate coats (2 gal per sq each coat). Embed 400 lbs of Title 24 gravel into the coating.

3.5 ROOFING MEMBRANE INSTALLATION WHERE ROOFING IS REMOVED

A. Cut a clean edge and prime the roof system around the area removed. Install new deck supports and plywood as necessary to provide a sound substrate for the installation of new roofing.

B. Mechanically fasten a Type II base sheet.

C. Prime the existing roof 1’ in all directions around the area. If a reflective coating is present on the roof field, heat and remove the coating prior to applying the torch flashing.

D. Torch apply a base sheet and extend onto the roof field 9”. Torch apply a cap sheet and extend onto the roof 12”.

E. Coat the new flashing area with White Knight Plus WC or equal at 2 gal per sq.

F. Allow the material to dry for 24 hrs.

G. Coat the new flashing area with White Knight Plus WC or equal at 2 gal per sq.

3.6 FLASHING

A. General flashing requirements:

1. Base flashing height:

    a. Not less than 8 inches without manufacturer's written approval. If height of base flashing exceeds 24 inches, a battan bar with TF tape must be installed at the midpoint of the sheet. Heat weld a strip of TPA over the batten bar.

B. Curb flashings (new):

1. Curbs must be a minimum of 18" from any other flashing detail.

    a. Secure substrate board to metal curbs

2. Install new roofing and cant strip around curb. Torch apply base sheet and cap sheet.

3. Extend onto the roof field 1'. Prime existing roof field prior to torch application. If a reflective coating is present on the roof field, heat and remove the coating prior to applying the torch flashing.

4. Coat the new flashing area with White Knight Plus WC or equal at 2 gal per sq.

5. Allow the material to dry for 24 hrs.

6. Coat the new flashing area with White Knight Plus WC or equal at 2 gal per sq.

7. Seal all holes, screws, and penetrations on equipment with polyurethane sealant.

C. Wall flashings

1. Adhere cant strip to flashing base in a continuous application of adhesive.

2. Install new roofing. Torch apply base sheet and cap sheet.

3. Extend onto the roof field 1'. Prime existing roof field prior to torch application. If a reflective coating is present on the roof field, heat and remove the coating prior to applying the torch flashing.

4. Coat the new flashing area with White Knight Plus WC or equal at 2 gal per sq.

5. Allow the material to dry for 24 hrs.

6. Coat the new flashing area with White Knight Plus WC or equal at 2 gal per sq.

7. Secure top edge of flashing membrane to vertical substrate with termination bar and butyl tape. Where possible extend over the top of parapet wall.

8. Caulk top of bar with polyurethane sealant.

9. Seal corners and any kick-holes over all flashings with a five-course application of Aluminum mastic and fiberglass reinforcement.

10. Re-secure any loose base flashing using skirt metal counterflashing secured at 8" o.c..

D. Plumbing vents and pipe penetrations

1. Penetrations must be a minimum of 18" from any other flashing detail.

2. Install new lead flashing for the penetration. Set in mastic.

3. Prime the surface of the flashing. Torch apply new cap sheet 1' in all directions of the penetration. If a reflective coating is present on the roof field, heat and remove the coating prior to applying the torch flashing.

4. Coat the new flashing area with White Knight Plus WC or equal at 2 gal per sq.

5. Allow the material to dry for 24 hrs.

6. Coat the new flashing area with White Knight Plus WC or equal at 2 gal per sq.

7. Clamp and caulk the penetration. Install umbrellas to counterflash.

8. Five-course edge the base of the penetration.

E. Coping:

1. Wire brush coping seams, top of coping that terminates on the horizontal, and rusted areas to remove contaminants.

   a. Remove loose or failed self-adhering membrane.

2. Prime the metal.

3. Coat with urethane White Star at 2 gal per sq.

F. Drains:

1. Contractor is to complete a water test of all drain plumbing prior to new roof installation. If any drainage problems are discovered, notify the Architect in writing prior to installing roof system.

2. Remove existing roof drain assemblies and overflow pipes and install new 12" Zurn, or equivalent, cast iron roof drain and overflow drain bowl assemblies with outlets matching existing plumbing. Construct new sumps for drain and overflow drain. Connect to existing or install new plumbing per architect's plan.

3. Install new clamping ring and cast iron drain screen. Follow drain manufacturer's installation instructions.

4. Test all drains for proper flow and water tightness. Correct defects.

G. Install walkway strips set in solvent free mastic under any new duct supports.

H. New Pipe/conduits sitting on roofs shall be set on and clamped to new rubber blocks with steel channels.

1. Support lines every 10 feet on pipe runs along with support on each side of every union, junction, and direction change.

3.7 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Owner.

B. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07 6000

FLASHING AND SHEET METAL

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Sheet metal flashings in connection with roofing.
2. Reglet and counter flashing assemblies.
3. Miscellaneous metal flashing and counter flashing as required, except where provided under Divisions 22, Plumbing, 23, HVAC, or 26, Electrical.
4. Coping caps.
5. Gravel stops and metal edging.
6. Gutters and downspouts.
8. Splash pans where downspouts empty onto roofing.
7. Conductor heads.
8. Drip flashings.
9. Sheet metal covering at outside storage units.
10. Sheet metal wall coverings.
11. Roof pipe flashings.
12. Roof expansion joint covers.
13. Other sheet metal items, not necessarily specified herein or in other sections, but required to prevent penetration of water into building.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 07 5419.13 - Polyvinyl-Chloride Roofing (Mechanically Attached)
3. Section 07 9200 - Joint Sealants.
4. Section 09 2423 - Cement Plaster and Metal Lath
5. Division 22 –- Plumbing.
6. Division 23 - HVAC.
7. Division 26 - Electrical.

1.02 SUBMITTALS

A. Shop Drawings: Submit for fabricated sheet metal indicating shapes, details, methods of joining, anchoring and fastening, thicknesses and gages of metals, concealed reinforcement, expansion joint details, sections, and profiles.

B. Samples: Submit Samples for materials or assemblies as requested.

C. Product Data: Submit brochures of manufactured items.

1.03 QUALITY ASSURANCE

A. Drawings and requirements specified govern. Provide the Work of this section in conformance with the Architectural Sheet Metal Manual published by SMACNA for conditions not indicated or specified and for general fabrication of sheet metal items.

B. Materials shall conform to following standards:

1. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

2. ASTM A653 - Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

3. ASTM B370 - Copper Sheet and Strip for Building Construction.

C. Pre-installation Meetings: Refer to Division 07 roofing sections as appropriate. Attend the pre-installation and inspection meetings for roofing Work.

1.04 DELIVERY, STORAGE AND HANDLING

A. Do not install bent or otherwise damaged materials.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Galvanized Sheet Steel: ASTM A653, coating designation G90, hot-dip galvanized.

B. Copper Plate, Sheet and Strip: ASTM B370, cold-rolled, tempered. Copper sheet and strip shall be cold-rolled-temper.

C. Stainless Steel: Plate, sheet and strip shall conform to ASTM A167, Type 304 or Type 316, No. 4 finish on exposed surfaces and No. 2 finish on concealed surfaces unless otherwise specified or indicated. Furnish Type 304 for general applications and Type 316 where exposed to acidic or alkaline conditions.

D. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.

1. As-Milled Finish: Mill

E. Fastenings:

1. Galvanized Steel: Nails, rivets, and other fastenings furnished in connection with galvanized sheet steel Work shall be sealed with rust resistive coating. Rivets shall be tinned. Nails and other fastenings shall be zinc-coated.

2. Copper: Nails, rivets, and other fastenings furnished in connection with copper sheet metal Work, shall be manufactured from hard-temper copper or hard brass.

3. Stainless Steel: Nails, rivets and other fastenings furnished in connection with stainless steel Work, shall be 300 series alloy to match alloy of stainless steel being fastened.

F. Soldering Flux: Raw muriatic acid for galvanized steel; rosin for tin, lead and tinned copper; non-corrosive soldering salts for uncoated copper and acid-type flux formulated for soldering stainless steel.

G. Solder: ASTM B32, Grade 5A, composed of 95-5 tin-antimony. Name of product manufacturer and grade designation shall be labeled, stamped or cast onto each coil or bar.

2.02 FABRICATION

A. General:

1. Accurately form sheet metal Work to dimensions and shapes indicated and required. Cope finish molded and brake metal shapes with true, straight, sharp lines and angles and, where intersecting each other, to a precise fit. Unless otherwise specified, all galvanized sheet steel shall be 22 gage. Exposed edges of sheet metal shall have a ½ inch minimum hemmed edge.

2. Soldering of sheet steel or copper shall be performed with well-heated copper soldering iron or soldering torch, joints full flowing, neat and consistent. Fill joint completely with solder. Clean materials at joints before soldering, and tin coppers before soldering. Exposed soldering on finished surfaces shall be scraped smooth. Lock seam work shall be fabricated flat and true to line and soldered along its entire length. Acid-fluxed Work shall be neutralized after fabrication.

3. Form and install sheet metal Work to provide proper allowances for expansion and contraction, without causing undue stresses in any part of completed Work. Installation shall be water and weathertight.

B. Gutters and Downspouts:

1. Gutters: Fabricate from 22 gage galvanized steel to match existing size and design unless otherwise indicated. Maximum length of gutter shall be 40 feet between end or expansion joints unless the system is specially designed to accommodate the greater expansion, the larger flow and the need for special supports. Drain gutter towards nearest downspout and provide an expansion joint at mid-point between downspout outlets, but not to exceed 40 feet on center. Gutters shall not pond water. Rivet joints and ends with a minimum of 6 rivets per joint or maximum rivet spacing not to exceed 1 ½-inch on center and ½ inch from the edge of the metal, consisting of 3-inch overlap. Sweat solder from inside of gutter and in horizontal position where possible. Neatly fit downspouts to gutter using a slip joint. Provide expansion joints, consisting of 3-inch lap joints at not over feet.

2. Form and install sheet metal Work to provide allowance for expansion and contraction without causing undue stresses in the completed Work.

3. Downspouts: Fabricate downspouts from 3-inch round, or 3-inch by 4-inch rectangular shapes, 16 gage steel tubing with butt joints and mitered elbows, sized as indicated. Downspouts shall be constructed with conductor heads every 40 feet to admit air and prevent vacuum. Keep downspouts offsets to a maximum of 10 feet. Downspout shall be fabricated with elbows at bottom discharge or connected to drains as indicated. Joints, except expansion joints shall be sealed with a continuous weld. Galvanize downspouts after fabrication.

4. Outlets: Fabricate outlets of 22 gage galvanized sheet steel with a 1/4 inch rolled flanged soldered continuously to gutter. Outside diameter shall be 1/8 inch less than the inside diameter of the downspout and extend into downspout 4 inches. Install a removable wire "bulb type" strainer to outlet opening. Strainer shall be fabricated of 22 gage galvanized steel and ½ inch hardware cloth.

C. Conductor Heads:

1. Fabricate conductor heads and outlets from 22 gage galvanized sheet steel. Cover tops of the conductor heads with 22 gage galvanized ¼ inch wire mesh soldered securely to separately fabricated frame and mechanically fastened to top conductor head with a minimum of two fasteners.

D. Gravel Stops: Provide 24 gage galvanized sheet steel gravel stops wherever roof area drops to a lower level; at the eaves and rake of roof, where roof comes to an abrupt edge, and where indicated. Stops shall be of height indicated and shall be fabricated with two flanges. Horizontal flange shall be not less than 4 inches wide, and vertical flange shall extend down over vertical surfaces of trim or gutter. Gravel stops shall lap 4 inches at ends and corners, and shall be fabricated by notching and interlocking vertical face flanges. Contact surfaces of lapped flanges, including raised areas, vertical face and corners, shall be completely covered with flashing compound. Fabricate lap joints so that they will be in the direction of water flow. Where flanges are over five inches wide, provide 20 gage continuous cleats fastened at 24 inches on center.

E. Overflow Outlets: Provide galvanized sheet steel overflow outlets at locations and of sizes indicated. Outlets shall extend through full thickness of wall in one continuous piece and completely line the opening. On outside face of wall, top and sides of outlet shall finish 1/2 inch on surface of wall. Bottom of outlet shall project 1 ½ inches beyond face of wall, and shall be bent down slightly. Outlets shall be sealed on the surface of the building. On inside face, side and bottom flanges shall extend not less than 8 inches beyond edge of opening, and not less than 6 inches at top. Outlets shall be installed at time roof is being installed.

F. Reglet Type Counterflashing: Where roof comes in contact with vertical surfaces, provide counterflashing. Set top of counter flashing 8 inches above roof deck unless otherwise indicated, and extend down at least 5 inches or to top of cant strip. Counterflashing and reglet shall be 22 gage galvanized sheet steel. Lap counter flashing and reglet 3 inches minimum at splices and miter at angles, or supply special metal corner fittings. Reglet and method of securing flashing shall be so constructed that flashing is firmly locked in place, but may be readily removed for replacement.

G. Splash Pans: Provide splash pans for all downspouts, which empty onto lower roofs. Pans shall be galvanized sheet steel 12-inch by 18-inch, unless otherwise indicated, and turned up 2 inches on at least three sides.

H. Roof Expansion Joint Covers: Fabricate of 22 gage galvanized sheet steel, as detailed. One side of joint shall be zee shaped, with 3-inch standing leg extended over the joint and turned down. The other side shall be box shaped, fabricated to extend over the joint, over the standing leg, and turn down to form a water barrier. Prefabricated bellows type joint covers are not permitted.

I. Miscellaneous Flashing: Unless otherwise indicated, miscellaneous flashing shall be fabricated of galvanized steel. Exterior doors and windows, unless covered by overhangs shall be provided with 22 gage galvanized steel drip flashing as detailed. At wood construction, nail flashing to framing before paper backed lath is installed.

J. Roof Pipe Flashings: Provide PVC flashings or prefabricated welded or seamless flashings.

PART 3 - EXECUTION

3.01 PREPARATION

A. Concrete and masonry materials in contact with sheet metal shall be painted with alkali resistant coating, such as heavy-bodied bituminous paint. Wood in contact with sheet metal shall be painted with two coats of aluminum paint or one coat of heavy-bodied bituminous paint.

3.02 INSTALLATION

A. General: Coordinate with installation of underlayment indicated in the Drawings and specified in Section 09 2423.

B. Gutters and Downspouts:

1. Anchor gutters to structure with 10 gage steel straps, galvanized after fabricating. Secure straps with galvanized fasteners at 3 feet on center. Drill pilot holes and use 12 by 2-inch pan head screws.

2. Install 1/4 inch galvanized wire mesh continuous cover on gutter.

3. Secure downspouts to walls with 1/8 inch by 2-inch galvanized steel straps. Straps shall be located at top, bottom, and at not over 10 feet on center. Block downspouts out ½ inch from the finish wall surfaces and 1 inch from the bottom of downspout grade. Secure straps to wall framing with 1/4 inch by 2-inch long galvanized anchors. Expansion type anchors shall be provided when anchoring to concrete and masonry. Provide toggle bolts for attachment to masonry or plaster. At steel columns, provide fasteners as indicated. Plastic anchors are not permitted.

4. Anchor conductor heads to walls with 1/4 inch diameter by 2 ½-inch long galvanized lag screws or 1/4 inch expansion type anchors.

C. Reglets: Install reglets at constant height above cant or as indicated. Provide minimum 3-inch lap at end splices of reglets. Seal laps watertight.

D. Counterflashing:

1. Install at constant horizontal elevation across roof slope and slope at constant height above cant or as indicated.

2. Provide minimum 3-inch lap at all end splices of counterflashing.

E. Galvanized sheet steel parapet coping and flashing shall be continuous over top of parapet to form a watertight cap, with waterproof seams at approximately 10 feet on center, or as indicated. Anchor coping to outside of wall with a continuous cleat face nailed at 24 inch centers. Coping shall be fastened on inside wall with hex head screws and bonded sealing washers through oversized holes in the back of the coping. Corners and angles shall be lapped and soldered; do not install joint sealant.

3.03 TESTING

A. Perform field water testing to demonstrate installation is watertight. Continue testing with a continuous hose stream applied at base of installation for at least 30 minutes. If leaking is observed, discontinue test and repair installation, then test until satisfactory results are obtained.

3.04 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.05 CLEANING

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 07 9200

JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Joint sealants.

2. Preparation for application of sealants.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Division 08 - Openings.

3. Division 09 - Finishes.

1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating sealant joint locations, with full-size sealant joint details.

B. Product Data: Submit manufacturer's literature for each sealant material.

C. Material Samples: Submit Samples indicating color range available for each sealant material intended for installation in exposed locations.

D. Certifications: Submit manufacturer’s certification materials comply with requirements specified.

E. Site Samples: At locations required, provide a Sample of sealant for each typical installation, approximately 24 inches long, including joint preparation, backing, sealant and tooling. Allow backing to extend 6 inches beyond end of sealant for inspection of substrate.

F. Test Reports: Submit manufacturer's adhesion compatibility test reports according to ASTM C794 for each substrate.

1.03 QUALITY ASSURANCE

A. Qualifications of Installer: The Work of this section shall be installed by a firm which has been in the business of installing similar materials for at least five consecutive years; and can show evidence of satisfactory completion of five projects of similar size and scope. Installer shall have applicators trained and approved by manufacturer for performing this Work.

1.04 DELIVERY, STORAGE AND HANDLING

A. Store in accordance with manufacturer's recommendations. Provide a uniform ambient temperature between 60 and 80 degrees F.

1.05 WARRANTY

A. Manufacturer: five year material warranty.

B. Installer: two year installation/application warranty.

PART 2 - PRODUCTS

2.01 GENERAL

A. Furnish sealants meeting following in-service requirements:

1. Normal curing schedules are permitted.

2. Non-staining, color fastness (resistance to color change), and durability when subjected to intense actinic (ultraviolet) radiation are required.

B. Furnish the products of only one manufacturer unless otherwise required, sealant colors as selected to match the adjoining surfaces.

2.02 MATERIALS

A. Sealants:

1. Sealant 1: Acrylic latex, one-part, non-sag, mildew resistant acrylic emulsion compound complying with ASTM C834, Type S, Grade NS, formulated to be paintable.

a. Tremco Inc., Acrylic Latex Caulk.

b. Pecora Corporation, AC-20.

2. Sealant 2: Butyl sealant, one-part, non-sag, solvent-release-curing sealant complying with ASTM C1311, gun grade and formulated with a minimum of 75 percent solids.

a. Tremco Inc., Tremco Butyl Sealant.

b. Pecora Corp., BC-158.

3. Sealant 3: Silicone sealant, one-part non-acid-curing silicone sealant complying with ASTM C920, Type S, Grade NS, Class 25.

a. Dow Corning Corp., Dow Corning 790, 791, 795.

b. General Electric Co., Silpruf.

c. Tremco, Inc., Spectrem 1.

d. Pecora Corp., 864.

4. Sealant 4: One-part mildew-resistant silicone sealant, complying with ASTM C920, Type S, Grade NS, Class 25.

a. Dow Corning Corp., Dow Corning 786.

b. General Electric Co., Sanitary 1700.

c. Tremco, Inc., Proglaze White.

5. Sealant 5: One-part non-sag urethane sealant, complying with ASTM C920, Type S, Grade NS, Class 25.

a. Sika Corporation, Sikaflex -221e.

6. Sealant 6: Multi-part pouring urethane sealant, complying with ASTM C920, Type M, Grade P, Class 25.

a. Sika Corporation, Sikaflex 2C NS/SL.

7. Sealant 7: Acoustical sealant, non-drying, non-hardening permanently flexible conforming to ASTM D217.

a. Pecora Corp., BA-98 Acoustical Sealant.

B. .Joint Backing: ASTM D1056; round, closed cell Polyethylene Foam Rod; oversized 30 to 50 percent larger than joint width, reticulated polyolefin foam.

C. Primer: Non-Staining Type. Provide primer as required and shall be product of manufacturer of installed sealant.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer.

E. Sealants shall have normal curing schedules, shall be nonstaining, color fast and shall resist deterioration due to ultraviolet radiation.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that joint openings are ready to receive Work and field tolerances are within the guidelines recommended by sealant manufacturer.

3.02 SURFACE PREPARATION

A. Joints and spaces to be sealed shall be completely cleaned of all dirt, dust, mortar, oil, and other foreign materials which might adversely affect sealing Work. Where necessary,

degrease with a solvent or commercial degreasing agent. Surfaces shall be thoroughly dry before application of sealants.

B. If recommended by manufacturer, remove paint and other protective coatings from surfaces to be sealed before priming and installation of sealants.

C. Preparation of surfaces to receive sealant shall conform to the sealant manufacturer's specifications. Provide air pressure or other methods to achieve required results. Provide masking tape to keep sealants off surfaces that will be exposed in finished Work.

D. Etch concrete or masonry surfaces to remove excess alkalinity, unless sealant manufacturer's printed instructions indicate that alkalinity does not interfere with sealant bond and performance. Etch with 5 percent solution of muriatic acid; neutralize with dilute ammonia solution, rinse thoroughly with water and allow to dry before sealant installation.

E. Perform preparation in accordance with ASTM C804 for solvent release sealants, and ASTM C962 for elastomeric sealants.

F. Protect elements surrounding Work of this section from damage or disfiguration.

3.03 SEALANT APPLICATION SCHEDULE

	Location	Type	Color
A.	Exterior and Interior joints in horizontal surfaces of concrete; between metal and concrete masonry and mortar.	Sealant 6	To match adjacent material
B.	Exterior door, entrance and window frames. Exterior and interior vertical joints in concrete and masonry metal flashing.	Sealant 3 or 5	To match adjacent material
C.	Joints within glazed curtain wall system. Skylight framing system. Aluminum entrance system glass and glazing.	Sealant 3	Translucent or Black
D.	Interior joints in ceramic tile and at plumbing fixtures.	Sealant 4	Translucent or White
E.	Under thresholds.	Sealant 2	Black
F.	All interior joints not otherwise scheduled	Sealant 1	To Match Adjacent Surfaces

G.	Heads and sills, perimeters of frames and other openings in insulated partitions	Sealant 7	Match Adjacent Surfaces

3.04 APPLICATION

A. Provide sealant around all openings in exterior walls, and any other locations indicated or required for structure weatherproofing and/or waterproofing.

B. Sealants shall be installed by experienced mechanics using specified materials and proper tools. Preparatory Work (cleaning, etc.) and installation of sealant shall be as specified and in accordance with manufacturer's printed instructions and recommendations.

C. Concrete, masonry, and other porous surfaces, and any other surfaces if recommended by manufacturer, shall be primed before installing sealants. Primer shall be installed with a brush that will reach all parts of joints to be filled with sealant.

D. Sealants shall be stored and installed at temperatures as recommended by manufacturer. Sealants shall not be installed when they become too jelled to be discharged in a continuous flow from gun. Modification of sealants by addition of liquids, solvents, or powders is not permitted.

E. Sealants shall be installed with guns furnished with proper size nozzles. Sufficient pressure shall be furnished to fill all voids and joints solid. In sealing around openings, include entire perimeter of each opening, unless indicated or specified otherwise. Where gun installation is impracticable, suitable hand tools shall be provided.

F. Sealed joints shall be neatly pointed on flush surfaces with beading tool, and internal corners with a special tool. Excess material shall be cleanly removed. Sealant, where exposed, shall be free of wrinkles and uniformly smooth. Sealing shall be complete before final coats of paint are installed.

G. Comply with sealant manufacturer's printed instructions except where more stringent requirements are indicated on Drawings or specified.

H. Partially fill joints with joint backing material, furnishing only compatible materials, until joint depth does not exceed 1/2 inch joint width. Minimum joint width for metal to metal joints shall be 1/4 inch. Joint depth, shall be not less than 1/4 inch and not greater than 1/2 inch.

I. Install sealant under sufficient pressure to completely fill voids. Finish exposed joints smooth, flush with surfaces or recessed as indicated. Install non-tracking sealant to concrete expansion joints subject to foot or vehicular traffic.

J. Where joint depth prevents installation of standard bond breaker backing rod, furnish non-adhering tape covering to prevent bonding of sealant to back of joint. Under no circumstances shall sealant depth exceed 1/2 inch maximum, unless specifically indicated on Drawings.

K. Prime porous surfaces after cleaning. Pack joints deeper than 3/4 inch with joint backing to within 3/4 inch of surface. Completely fill joints and spaces with gun applied compound, forming a neat, smooth bead.

3.05 MISCELLANEOUS WORK

A. Sealing shall be provided wherever required to prevent light leakage as well as moisture leakage. Refer to Drawings for condition and related parts of Work.

B. Install sealants to depths as indicated or, if not indicated, as recommended by sealant manufacturer but within following general limitations:

1. For joints in concrete walks, slab and paving subject to traffic, fill joints to a depth equal to 75 percent of joint width, but not more than 3/4 inch deep or less than 3/8 inch deep, depending on joint width.

2. For building joints, fill joints to a depth equal to 50 percent of joint width, but not more than 1/2 inch deep or less than 1/4 inch deep.

3.06 CLEANING

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.07 CURING

A. Sealants shall cure in accordance with manufacturer's printed recommendations. Do not disturb seal until completely cured.

3.08 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 08 1113

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Hollow metal doors and frames or hollow metal doors as indicated.

2. Hollow metal window frames or hollow metal door and window frames.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 07 9200 - Joint Sealants.

3. Section 08 1416 - Flush Wood Doors.

4. Section 08 7100 - Door Hardware.

5. Section 08 8000 - Glazing.

6. Section 09 9000 - Painting and Coating.

7. Section 28 1600 - Intrusion Detection Systems.

1.02 DESIGN REQUIREMENTS

A. Door-and-frame assemblies or frames shall include reinforcing and provisions for hardware as shown and specified. Drawings indicate profile and general details of steel frame fabrication and installation.

1.03 SUBMITTALS

A. Shop Drawings: Submit composite Shop Drawings indicating detailed relationships of installation including Work of adjacent construction, finish hardware, security, fire and life safety devices, glazing, sealing, and requirements for field installation. Include elevations of each hollow metal door type, details of each frame type, location schedule of doors and frames indicating same reference for details and openings as indicated on Drawings, conditions of openings of various wall sections and materials, typical and special details of construction, methods of assembling sections, location and installation requirements for hardware, material size, shape, and thickness, and joints and connections.

B. Product Data: Submit manufacturer's Product Data indicating composition and construction for each fabricated item including louvers, coatings, finishes, and other components demonstrating compliance with referenced standards.

C. Certification: Submit certification of compliance with referenced standards and specified criteria, including but not limited to fire ratings in accordance with UL 10C, Physical Endurance in accordance with ANSI A250.4 and Prime Paint performance in accordance with ANSI A250.10.

D. Samples:

1. Hollow Metal Frame: Corner section of typical exterior and interior frame, of sufficient composite size to illustrate corner joint construction, hinge reinforcement, closer re-enforcement, floor anchor, dust cover, and jamb anchors, and showing galvanizing and prime coat finishes.

2. Hollow Metal Door: Section of typical interior door of sufficient composite size to illustrate edge, top, bottom, and core construction, hinge reinforcement and face stiffening, closer reinforcement and kick plate reinforcement, and corner of vision opening construction with glazing beads.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum documented experience of more than five years in work of this section.

B. Installer Qualifications: Minimum documented experience of more than five years in work of this section

C. Coordinate with hardware supplier for fabrication of doors and frames to receive hardware items.

D. Coordinate with intrusion alarm supplier for fabrication of doors and frames to receive intrusion detection devices.

E. References: Work shall comply with physical and performance requirements of following standards, including standards referenced in them, except for more stringent provisions specified herein or required by regulatory agencies:

1. ANSI/SDI A250.8, SDI 100 Recommended Specifications for Standard Steel Doors and Fames.

2. ANSI/NFPA 252, Fire Tests of Door Assemblies.

3. ANSI/UL 10B, Fire Tests of Door Assemblies.

4. ANSI/UL 10C, Positive-Pressure Fire Tests of Door Assemblies.

5. ANSI/NFPA 80, Fire Doors and Fire Windows

6. HMMA, Guide Specifications for Commercial Hollow Metal Doors & Frames (Standard of National Association of Architectural Metal Manufacturers).

7. ANSI/SDI A250.4, Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcings.

8. ANSI A250.10, Test Procedure and Acceptance Criteria for Prime Painted Steel Doors and Frames.

9. ANSI A250.6, Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.

F. Standards of Fabrication and Installation:

1. Finished Work shall be of uniform profile, accurately fabricated, rigid and strong, square and true, neat in appearance, smooth and free from dents, waves, warps, buckles, open joints, tool marks and/or other defects.

2. Steel sheet shall be clean with smooth surfaces free of scale, pitting or other defects.

3. Construction joints shall be flush, tight and welded their full length, ground flush and smooth on exposed surfaces.

4. Frame and door reinforcing and hardware provisions shall be performed in fabrication shop. Provide cuts, welds, and other fabrications before galvanizing or shop priming.

5. Lines and molded members shall be straight and true with angles as sharp as practical for thickness involved, surfaces flat, and fastenings concealed.

1.05 DELIVERY, STORAGE AND HANDLING

A. Frames: Before shipment, install temporary spreaders at bottom of bucks and do not remove until frames are installed.

B. Doors: Provide protection as required to protect doors during shipping and storage. Damaged doors will be rejected.

C. Inspect hollow metal Work upon delivery for damage. Remove and replace damaged items with new Work as required.

D. Store doors and frames in an upright position at Project Site under cover and protected from weather-related elements. Store units on minimum 4-inch high wood blocking with ½ inch air spaces between stacked doors to provide circulation. Do not store

doors and frames under plastic or canvas shelters that can create a humidity chamber. If shipping packaging becomes wet, immediately remove packaging.

1.06 WARRANTY

A. Manufacturer shall provide a five year material warranty.

B. Installer shall provide a two year fabrication and installation warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Doors and frames shall be products of a single manufacturer.

B. The following are acceptable manufacturers, as are others that can demonstrate their products are equivalent in quality, performance and compliance with these specifications.

1. Security Metal Products Corp.

2. Curries Manufacturing, Inc.

3. Steelcraft.

4. Amweld Metal Doors and Frames.

5. Stiles Custom Metal, Inc.

6. Door Components Inc.

7. CECO Door.

C. Materials, fabrication and installation must comply with requirements of standards referenced in Section 1.04, Quality Assurance.

2.02 MATERIALS

A. Steel:

1. Exterior Doors and Frames: Galvanized Carbon Sheet Steel, Commercial Quality, A60 zinc coating (0.30 ounces per square foot per side), ASTM A653.

2. Interior Doors and Frames: Cold-Rolled Steel Sheets, Commercial Quality Carbon Steel, ASTM A1008.

3. Steel shall be free of scale, pitting, coil breaks or other surface blemishes, and free of buckles, waves or other defects.

4. Steel thicknesses expressed in steel gages (MSG) is for reference only. Actual steel thicknesses must meet minimum requirements of ASTM standards and as described in ANSI/SDI A250.8.

B. Supports and Anchors: Fabricate from a minimum 16 gauge galvanized sheet steel unless noted otherwise.

C. Fasteners: Provide as shown on Drawings and to suit conditions of secure installations. Furnish 304 Grade stainless steel types at exterior doors.

D. Door Louvers:

1. Louver free air flow shall be 50% free area.

2. Louvers for exterior doors shall be galvanized and furnished with not less than 12 gage frame and security grille welded to 18 gage steel blades, fully galvanized, with removable galvanized or bronze insect screen on inside. Install louver with tamperproof-head through-bolts. Anemostat PLSL, Air Louvers Inc. Model 1500-A, L & L Louvers, or equal.

3. Fusible link louvers: Listed by State Fire Marshal, UL labeled and installed with tamperproof fasteners.

4. Lightproof louvers (at dark rooms): DRDL by Anemostat, Air Louver Model 1000, L & L Louvers, or equal.

5. Louvers shall be comply with SDI 111C and be furnished with factory primer.

E. Vision panels: Manufacturer's standard, U.L. approved, finished flush with door face, with no visible fasteners on either door face.

F. Shop Paint:

1. Conform to Steel Structures Painting Council (SSPC) for steel components.

2. Pretreatment/priming coatings shall be compatible with Project site finish painting system in accordance with Section 09 9000.

3. At frames to be grouted, surfaces that are inaccessible after installation shall be coated with bituminous or asphaltic base paint.

2.03 FABRICATION GENERAL

A. General: Fabricate hollow metal units to be rigid, neat in appearance, and free from defects including warp or buckle.

1. Accurately form metal to required sizes and profiles. Fit and assemble units in manufacturer's plant. Where practical, factory or shop fit and assemble units for shipment.

2. Weld joints continuously; grind, dress, and make smooth, flush, and invisible. Filler to conceal manufacturing defects or damage is not permitted.

3. Corner Joints: Finish corner joints by mitering, or coping and butting, or a combination of both. Trim and backbend shall be continuous around corner.

4. Continuously weld joints for full depth and width of frame, trim, and backbends.

5. Clearances for Fire-Rated Doors: As required by NFPA 80.

2.04 FRAMES

A. General: Provide fully welded steel frames with integral stops and trim for doors, transoms, sidelights, borrowed lights, and other openings, and with details indicated for type and profile. Use concealed fastenings, unless otherwise indicated.

B. Metal Thickness of Frames (minimum):

1.	Interior hollow metal frames up to 4-foot wide	16 gage
2.	Interior hollow metal frames wider than 4-foot	14 gage
3.	Exterior hollow metal frames	14 gage
4.	Borrowed lights up to 4-foot wide	16 gage

C. Supports and Anchors: Fabricate from at least 16-gage, galvanized steel sheet. Frame anchors shall comply with fire rated label requirements of opening.

1. Floor Anchors:

a. Minimum thickness: 12 gage galvanized steel sheet or bent steel plate, securely fastened inside each jamb, with two holes in anchor at each jamb for 3/8 inch floor anchorage fasteners. For preframed wood stud walls provide and additional wood stud anchor located as close to the bottom of the jamb as is practical.

b. Where required at sloping and uneven floor conditions, or to coordinate adjustments for trim alignments, provide adjustable floor anchors, providing at least 2-inch height adjustments.

2. Jamb Anchors:

a. Locate anchors near top and bottom and at intermediate points not to exceed 24 inches on center. Provide two anchors per head for openings up to 48 inches wide; over 48 inches wide provide anchors at 24 inches on center maximum.

b. Anchors in masonry construction: Provide manufacturers standard jamb anchors. Steel wire complying with ASTM A510, 0.177 inch in diameter, may be furnished.

c. Anchors in Stud Partitions: Provide steel anchors, 16 gage minimum sheet steel, of design to suit partition construction, securely welded inside each jamb.

d. Through-Frame Anchors: At frames indicated to be anchored with bolts through frame, provide countersunk holes for bolts with 16 gauge minimum sheet steel stiffeners full thickness of frame, and securely welded inside each frame at each hole.

D. Inserts, Bolts, and Fasteners: Provide manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A153 Class C or D as required.

E. Head Reinforcing: Refer to Detail #2 of this section. Reinforcing shall not act as lintel or load-carrying member and shall comply with fire rating requirements. Provide at frames regardless of whether a closer is called for.

F. Hardware Reinforcement and Accessories:

1. Butt Hinge: 7 gage minimum.

2. Head assemblies: Reinforced internally with, full length, 10 gage angles on each side of frame and bar at bottom of stop for closer reinforcement in frames as shown in Detail #2 of this section.

3. Reinforcing for other items of finish hardware shall be accomplished according to ANSI A250.6.

4. Plaster Guards: Provide 26 gage galvanized steel plaster guards or dust cover boxes, welded to frame, at back of finish hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

G. Mullion and Transom bars: Furnished and fabricated as specified for frames.

H. Glazed Openings: Applied stops with mitered or butted corners, of minimum 18 gage galvanized steel, one-piece lengths, secured within 3” of ends and at 12” centers with oval head countersunk tamper resistant screws. Corner joints shall be furnished with contact edges closed tight, with trim faces mitered and continuously welded. Frames

for multiple openings shall be provided with mullion and/or rail members, fabricated of closed tubular shapes with no visible seams or joints. Joints between faces of abutting members shall be securely welded and finished smooth. Provide condensate weeps 4 inches on centers, maximum.

I. Door Silencers: Except for exterior doors, drill and punch frames for three silencers at lock jamb of single swing doors or in double doors with astragal and one silencer per leaf in heads of doubled door frames.

J. Where frames are installed in walls sitting on a concrete curb, provide a closure plate or extend backbends to provide closure where frame abuts concrete curb.

2.05 DOORS

A. General: Custom-made, flush-panel "seamless type" with one-piece face panels; continuous weld, seamless edge construction with no visible seams or joints on faces or on vertical edges.

1. Provide type and size of doors shown with louvers and openings for glazing where indicated.

2. Door thickness: 1 ¾ inches.

3. Face Sheet Minimum Gage: 16 gage.

4. Stiffeners: Stiffen door face sheets with continuous vertical-formed steel (rib) sections or back to back hat sections, minimum 20 gage, full thickness of interior space between door faces, spaced 6" on center maximum, and spot welded to both faces 4" on center maximum.

5. Acoustical Insulation: Provide sound deadening and insulating material through entire core of door (full height, width, and thickness of door). Provide STC ratings where indicated on Drawings, scheduled, or for partition ratings indicated on Drawings.

a. Doors shall have a minimum STC of 28 as tested under ASTM E90 and ASTM E413, unless noted otherwise..

6. Thermal Insulation: Exterior doors shall be insulated to R values scheduled or indicated on drawings.

7. Labeled Doors: Where fire-rated openings and conditions are indicated.

a. Labeled doors shall be provided with fire-resistance rating indicated and shall be constructed as tested and approved by Underwriters' Laboratories (UL) for installation in labeled frame and door assemblies.

b. Gaskets: Gaskets are supplied under Section 08 7100 - Door Hardware. Gaskets and installation shall conform to requirements of NFPA 105, "Installation of Smoke and Draft Control Door Assemblies."

c. Fabricate labeled doors with same finished appearance as specified for non-labeled hollow metal doors; with welded door edges, filled and ground smooth; with label affixed to door.

d. Where fire labels are required and continuous hinge is specified, install label on top of door within 6" of hinge side of door.

8. Door Edges: Join door face sheets at vertical edges of door with continuous weld full height of door. Grind, fill, and dress welds smooth to provide invisible seam with smooth, flush surface.

a. Close ends of doors with continuous recessed channels, 16 gage steel minimum, spot welded to both face sheets. Close top and bottom edges of doors with a internal steel channel, screw attached into top and bottom of door. Channel shall be galvanized at exterior doors. No screws are allowed on visible faces of door. Provide openings in bottom closure of exterior doors to permit escape of entrapped moisture.

b. Profile of Door Edges:

1) Single-acting swing doors: Bevel both vertical edges 1/8" in 2".

2) Pairs of single-acting swing doors: Bevel hinge edge 1/8" in 2". Provide surface mounted astragals for labeled or unlabeled doors unless otherwise shown on Drawings or required.

3) Double-acting swing doors: Round both vertical edges on 2" minimum radius.

9. Door Louvers: Install according to manufacturers recommendations.

10. Glass Stops:

a. Furnish fixed stops integral with and welded at security side of door.

b. Finish: Factory primer.

11. Transom: Fabricate to requirements specified for flush doors.

B. Hardware Reinforcement and Accessories:

1. Provide sheet steel or plate reinforcement for finish hardware items wherever necessary. Mortise, drill and tap to template requirements for mortise type hardware.

2. Butt reinforcing: 7 gage minimum, of length 4" longer than length of butt. Minimum 3 spot welds at top and bottom.

3. Door closer reinforcement: 14 gage minimum steel channel, 6" high on each side of door. Reinforcement to extend full width of door in accordance with Detail #1 of this section.

4. Kick plate reinforcement: 14 gage minimum steel plate, 10" high on each side of door. Reinforcement to extend full width of door in accordance with Detail #1 of this section.

5. Other Hardware Requirements: Cut, reinforce, drill, and tap doors and frames for other hardware, including energy management switches or contacts and security devices, in accordance with furnished hardware templates for accessory items. Thickness and size of reinforcement shall be as required by ANSI A250.6.

2.06 SHOP PRIMING

A. Exposed and concealed metal surfaces of hollow metal doors, frames and other hollow metal Work of this Section shall be bonderized and then shop primed.

B. Exposed surfaces of doors, frames and accessories shall be filled, sanded smooth and cleaned before painting.

C. Exposed surfaces shall be shop primed after assembly.

PART 3 - EXECUTION

3.01 FRAME INSTALLATION

A. Install steel frames accurately in location, perfect alignment, plumb, straight and true. Brace frames to prevent displacement.

B. Anchor frames in concrete and concrete unit masonry with galvanized anchor bolts; 3/8 inch diameter, counter-sunk at 24 inches on center at head and jamb unless noted otherwise.

C. Anchor frames in steel and wood frame partitions with manufacturer recommended anchors.

D. Install frame at fire rated openings in accordance with NFPA Standard No. 80.

E. Furnish filler for anchor attachment screws, and sand smooth.

3.02 DOOR INSTALLATION

A. Install steel doors in accordance with manufacturer's instructions and as indicated on Drawings and in Finish Hardware Specifications. Coordinate with Work of other trades.

B. Ensure that door and jamb clearances comply with requirements of ANSI/NFPA 80. When wood doors are being installed in metal frames constructed pursuant to this section, allowable door and jamb clearances shall be as specified in Specification Section 08 1416.

C. Adjust operable parts for correct function.

D. Remove hardware, except primer-coated items, tag, box and install after finish painting has been completed.

3.03 PRIME COAT TOUCH-UP

A. Immediately after installation, remove rust, repair damaged surfaces to new condition, sand smooth, and install touch-up primer.

3.04 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off Project site.

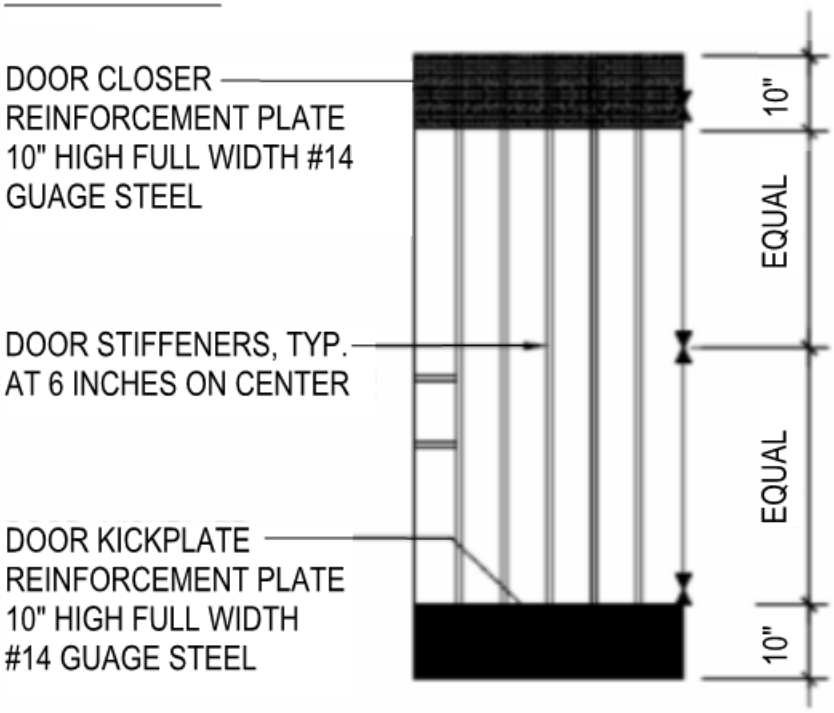
3.05 PROTECTION

A. Protect Work of this section until Substantial Completion.

END OF SECTION

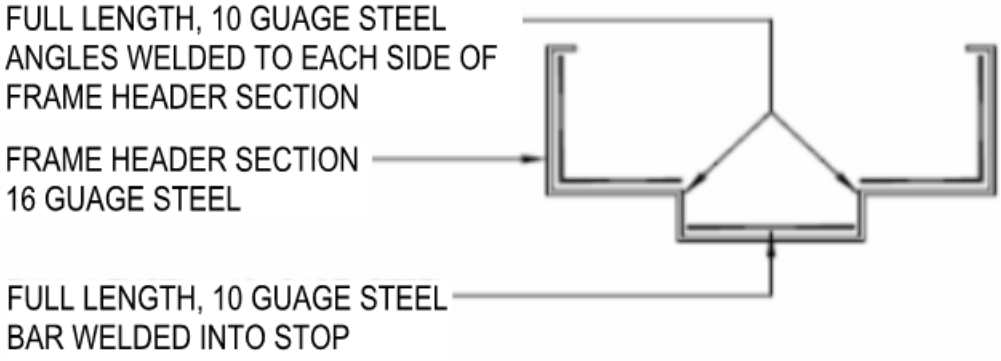
DETAIL #1 - DOOR REINFORCEMENT

ELEVATION



DETAIL #2 - DOOR HARDWARE REINFORCEMENT

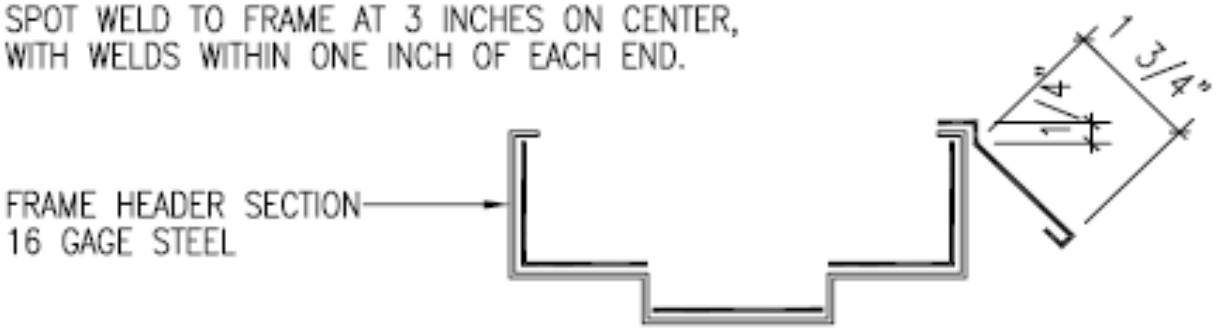
DOOR CLOSER REINFORCEMENT FOR ALL STEEL DOOR FRAMES



DETAIL # 3 – CONCRETE WALL CONDITION

DETAIL FOR EXTERIOR DOOR WHERE RAIN DRIP IS REQUIRED.
EXTERIOR SIDE WITH 22 GAGE GLAVANIZED SHEET METAL OR PAINT LOCK RAIN DRIP WELDED IN PLACE.

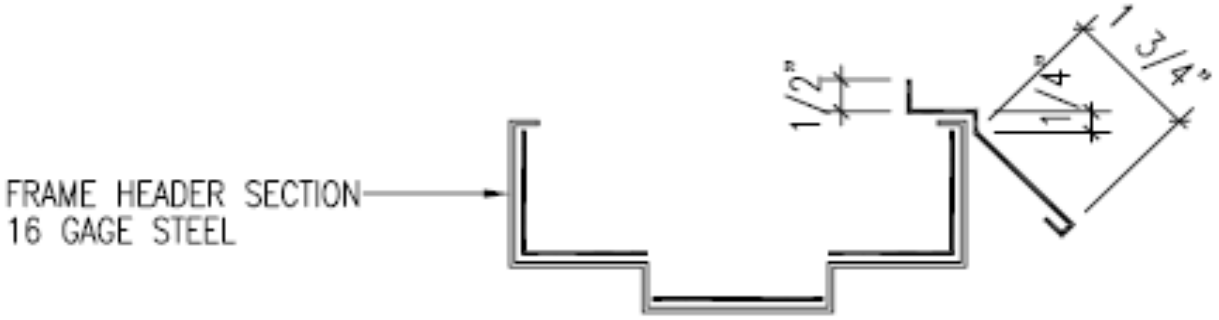
SPOT WELD TO FRAME AT 3 INCHES ON CENTER, WITH WELDS WITHIN ONE INCH OF EACH END.



DETAIL # 3A – PLASTER WALL CONDITION

DETAIL FOR EXTERIOR DOOR WHERE RAIN DRIP IS REQUIRED.
EXTERIOR SIDE WITH 22 GAGE GLAVANIZED SHEET METAL OR PAINT LOCK RAIN DRIP WELDED IN PLACE.

SPOT WELD TO FRAME AT 3 INCHES ON CENTER, WITH WELDS WITHIN ONE INCH OF EACH END.



SECTION 08 3116

ACCESS PANELS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Steel access panels, except those specified under Divisions 22 - Plumbing, 23 - HVAC, or 26 - Electrical.

B. Related Sections:

1. Division 01 - General Requirements.

2. Section 06 1000 - Rough Carpentry.

3. Section 09 2423 - Cement Plaster and Metal Lath.

4. Section 09 2900 - Gypsum Board.

5. Section 09 3000 - Ceramic Tiling.

6. Section 09 9013 - Painting of Existing Facilities

7. Division 22 - Plumbing.

8. Division 23 - HVAC.

9. Division 26 - Electrical.

10. Division 27 - Communications.

1.02 SUBMITTALS

A. Shop Drawings:

1. Indicate sizes, materials, thickness, fabrication methods, panel door and frame reinforcement, anchorage, and installation details.

2. Provide layout drawings, indicating dimensioned locations of proposed access panels, size of each panel, and installation details. Determine and indicate required access panels in finished surfaces, whether furnished under this section or as part of Work of Divisions 22-Plumbing, 23- HVAC, and 26-Electrical.

1.03 QUALITY ASSURANCE

A. Panels shall be provided with UL listings and labels.

B. Access panels and frames shall be products of one manufacturer.

C. Coordinate access panels with plumbing, HVAC, and electrical work.

1.04 DELIVERY, STORAGE AND HANDLING

A. Panels and Frames: Provide protection as required by manufacturer to protect panels from damage during storage.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Access Panels:

Non-Rated	Milcor	Karp	Nystrom
Ceramic Tile	MS	DSC214M	NT
Plaster	K	DSC214M	NP
Drywall, Plaster Veneer	DW	DSC214M	NW
Fire Rated			
Ceramic Tile	MS	KRP150FR	IT
Plaster	M	KRP150PR	IP
Drywall, Plaster Veneer	M	KRP150FR	IW

B. Unless otherwise indicated, provide brushed stainless steel finish for panels installed in ceramic tile. Provide prime coat finish suitable for field painting for panels installed in other finishes.

C. Access Panels shall be 18 gage minimum with vandal-proof lock operated by Allen wrench or other special tool. Exposed fastenings shall be secured with vandal-proof screws.

PART 3 - EXECUTION

3.01 GENERAL

A. Provide access panels in finish construction, where indicated on Drawings, wherever required for access to concealed mechanical and electrical equipment, and where required by codes. Panels indicated on architectural Drawings shall be furnished under this section. Required panels for access to equipment, but not indicated on architectural Drawings, shall be furnished as part of Work requiring access.

3.02 INSTALLATION

A. Install panels accurately in location, perfect alignment, plumb, straight and true. Brace to prevent displacement by adjacent Work.

B. Examine panels after installation for proper opening, closing and clearances. Replace damaged or defective panels.

3.03 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off Project site.

3.04 PROTECTION

A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 08 3473

SOUND CONTROL DOOR ASSEMBLIES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes
   1. Steel sound-control doors and frames rated for not less than 40 STC as indicated on schedule.

1.2 SECTION REQUIREMENTS

A. Acoustical Reference: Noise Audit and Sound Insulation Recommendations of Nine Schools within the Inglewood Unified School District; revised final WR12-01 April 2012; Wyle Laboratories.

B. Acoustical Testing Agency Qualifications: An independent agency accredited as an acoustical laboratory according to the National Voluntary Laboratory Accreditation Program of NIST.

C. Sound Rating: Provide sound-control door assemblies equal to those of assemblies tested as sound-retardant units by an acoustical testing agency, with a minimum STC rating as determined by ASTM E 413 when tested in an operable condition per ASTM E 90 and ASTM E 1408.

D. Fire-Rated Door Assemblies: Comply with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire protection ratings required, based on testing at positive pressure per NFPA 252 or UL 10C.

E. Labeling: Ensure all positive pressure door assemblies carry a fire label for the complete opening, clearing identifying the:
   1. Manufacturer.
   2. Third party testing and certification agency.
   3. Fire door rating.
   4. Installation limitations.
   5. Compatible frame, hardware component ratings.
   6. Compatible lite or vision panel component ratings.
   7. Required building code information, including temperature and smoke rating.

F. Manufacturer: Manufacturer of sound control door assemblies shall have at least five years' experience prior to the start of this work.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Submit product data and identify applicable details of design, construction, and STC rating of steel doors and frames.
   2. Submit manufacturer's printed instructions covering installation of the specified work. Include details of each frame type, sound seals, door bottom, threshold, and reinforcements.

B. Shop Drawings:
   1. Submit shop drawings and list the location in building and identification mark for each steel door and frame.
   2. Indicate door hardware requirements.

1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Provide documented test results from a qualified testing agency indicating sound and fire ratings compliance with this specification.

B. Material Certificates: Certify that all sound control door assemblies comply with the specification requirements. Certification shall be signed by the proposed manufacturer.

C. Test Reports: Document field test results for compliance with specification requirements for all sound-control door assembly installations.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Five copies (per Master Agreement), for sound control door assemblies, to include in maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver sound control door assemblies wrapped, placed in cartons, and crated as required to provide protection during transit and job site storage.

B. Inspect sound control door assemblies upon delivery for damage. Repair and/or replace damaged items as required, at no cost to the Owner.

C. Store doors on raised platforms in a vertical position. Keep stored material loosely covered and protect from damage. Refer to NAMM-HMMA 840 "Installation and Storage of Hollow Metal Doors and Frames".

PART 2 – PRODUCTS

2.1 STEEL SOUND-CONTROL DOORS

A. Source Limitations:
   1. Ensure work within this Section is designed and furnished by a manufacturer who has been engaged in the manufacture of sound control door assemblies for at least five years prior to start of this work.

2. Obtain sound-control door assemblies, including doors, frames, sound-control seals, hinges (when integral for sound control), thresholds, and other items essential for sound control, from single source from single manufacturer.

B. Manufacturers:

1. Door Components.
2. Krieger Specialty Products.
3. Security Metal Products.

C. Description: Provide flush-design sound-control doors, 1-3/4" thick, of seamless construction; with manufacturer's standard sound-retardant core as required to provide STC and fire rating required. Construct doors with smooth, flush surfaces without visible joints or seams on exposed faces or stile edges. Fabricate according to ANSI/NAAMM-HMMA 865.
1. Exterior Doors: Fabricate from metallic-coated steel sheet 0.052" nominal thickness, or thicker as required to provide STC rating indicated.
2. Interior Doors: Fabricate from cold-rolled steel sheet unless otherwise indicated, 0.048" nominal thickness, or thicker as required to achieve STC rating indicated.
3. Loose Stops for Glazed Lites in Doors: Same material as face sheets.
4. Top and Bottom Channels: Closed with continuous channels of same material as face sheets, spot welded to face sheets not more than 6" o.c.
5. Hardware Reinforcement: Same material as face sheets.

D. Materials:
1. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B, suitable for exposed applications.
2. Hot-Rolled Steel Sheet: ASTM A 1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
3. Metallic-Coated Steel Sheet: ASTM A 653, Commercial Steel (CS), Type B, with G60 zinc (galvanized) or A40 zinc-iron-alloy (galvannealed) coating designation.
4. Glazing: As required by sound-control door assembly manufacturer to comply with sound-control and fire-rated-door labeling requirements.

2.2 SOUND CONTROL PANELS

A. Provide sound-control panels of same materials, construction, sound rating, and finish as specified for adjoining sound-control steel doors.

2.3 SOUND-CONTROL FRAMES

A. Description: Fabricate sound-control door frames with corners mitered, reinforced, and continuously welded full depth and width of frame. Fabricate according to ANSI/NAAMM-HMMA 865.

1. Weld frames according to NAAMM-HMMA 820.

2. Exterior Frames: Fabricate from metallic-coated steel sheet 0.079" nominal thickness, or thicker as required to provide STC rating indicated.
3. Interior Frames: Fabricate from cold-rolled steel sheet unless otherwise indicated, 0.075" nominal thickness, or thicker as required to provide STC rating indicated.
4. Sound-Control Panel Stops: Formed integral with frames, a minimum of 5/8" high, unless otherwise indicated.
5. Hardware Reinforcement: Fabricate according to ANSI/NAAMM-HMMA 865 of same material as face sheets.
6. Head Reinforcement: Reinforce frames with metallic-coated steel channel or angle stiffener, 0.108" nominal thickness, welded to head.
7. Jamb Anchors:
   a. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.064" nominal thickness metallic-coated steel with corrugated or perforated straps not less than 2" wide by 10" long; or wire anchors not less than 0.156" thick.
   b. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.048" nominal thickness uncoated steel unless otherwise indicated.
   c. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8" diameter, metallic-coated steel bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
8. Floor Anchors: Not less than 0.079" nominal thickness metallic-coated steel, and as follows:
   a. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
   b. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2" height adjustment. Terminate bottom of frames at finish floor surface.
9. Ceiling Struts: Minimum 3/8" thick by 2" wide uncoated steel unless otherwise indicated.
10. Plaster Guards: Metallic-coated steel sheet, not less than 0.026" thick.

B. Materials:

1. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B, suitable for exposed applications.
2. Hot-Rolled Steel Sheet: ASTM A 1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
3. Metallic-Coated Steel Sheet: ASTM A 653, Commercial Steel (CS), Type B, with G60 zinc (galvanized) or A40 zinc-iron-alloy (galvannealed) coating designation.
4. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153, Class B.
5. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153 or ASTM F 2329.

6. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching sound-control door frames of type indicated.
7. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers.

2.4 FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

B. Factory-Applied Paint Finish: Manufacturer's standard primer and finish coats, complying with ANSI/SDI A250.3 for performance and acceptance criteria.
1. Color and Gloss: Match Architect’s sample.

C. Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.”

2.5 SOUND-CONTROL HARDWARE

A. Description: Provide manufacturer's standard sound-control system, including head and jamb seals, door bottoms, cam-lift hinges, and thresholds, as required by testing to achieve STC and fire rating indicated.
1. Compression Seals: One-piece units; consisting of closed-cell sponge neoprene seal held in place by metal retainer; with retainer cover of same material as door frame; attached to door frame with concealed screws.
2. Magnetic Seals: One-piece units; consisting of closed-cell sponge neoprene seal and resiliently mounted magnet held in place by metal retainer; with retainer cover of same material as door frame; attached to door frame with concealed screws.
3. Automatic Door Bottoms: Neoprene or silicone gasket, held in place by metal housing, that automatically drops to form seal when door is closed; mounted to bottom edge of door with screws.
a. Mounting: Mortised or semimortised into bottom of door or surface mounted on face of door as required by testing to achieve STC rating indicated.
4. Door Bottoms: Neoprene or silicone gasket held in place by metal housing; mortised into bottom edge of door.
5. Cam-Lift Hinges: Full-mortise template type that raises door 1/2” when door is fully open; with hardened pin; fabricated from stainless steel.
6. Thresholds: Flat, smooth, unfluted type as recommended by manufacturer; fabricated from aluminum.
a. Finish: Clear anodic finish.

B. Other Hardware: Coordinate with Division 08 requirements for door hardware.

2.6 SOUND-CONTROL ACCESSORIES

A. Glazing: Coordinate with requirements of Division 08 Glazing.

B. Grout: Comply with ASTM C 476, with a slump of not more than 4" as measured according to ASTM C 143.

C. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.7 FABRICATION

A. Sound-Control Steel Door Fabrication: Sound-control doors to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal.
   1. Seamless Edge Construction: Fabricate doors with faces joined at vertical edges by welding; welds shall be ground, filled, and dressed to make them invisible and to provide a smooth, flush surface.
   2. Exterior Doors: Close top edges flush and seal joints against water penetration. Provide weep-hole openings in bottom of exterior doors to permit moisture to escape.
   3. Glazed Lites: Factory install glazed lites according to requirements of tested assembly to achieve STC rating indicated. Provide fixed stops and moldings welded on secure side of door.
   4. Hardware Preparation: Factory prepare sound-control doors to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Division 08 Door Hardware.
      a. Reinforce doors to receive nontemplated mortised and surface-mounted door hardware.
      b. Locate door hardware as indicated, or if not indicated, according to NAAMM-HMMA 831 "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."
   5. Tolerances: Fabricate doors to tolerances indicated in ANSI/NAAMM-HMMA 865.

B. Sound-Control Frame Fabrication: Fabricate sound-control frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
   1. Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated from same thickness metal as frames.

2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
4. Jamb Anchors: Provide number and spacing of anchors as follows:
    a. Masonry Type: Locate anchors not more than 18” from top and bottom of frame. Space anchors not more than 32” o.c. and as follows:
        1) Two anchors per jamb up to 60” in height.
        2) Three anchors per jamb from 60” to 90” in height.
        3) Four anchors per jamb from 90” to 96” in height.
        4) Four anchors per jamb plus one additional anchor per jamb for each 24” or fraction thereof more than 96” in height.
    b. Stud Wall Type: Locate anchors not more than 18” from top and bottom of frame. Space anchors not more than 32” o.c. and as follows:
        1) Three anchors per jamb up to 60” in height.
        2) Four anchors per jamb from 60” to 90” in height.
        3) Five anchors per jamb from 90” to 96” in height.
        4) Five anchors per jamb plus one additional anchor per jamb for each 24” or fraction thereof more than 96” in height.
        5) Two anchors per head for frames more than 42” wide and mounted in metal stud partitions.
    c. Postinstalled Expansion Type: Locate anchors not more than 6” from top and bottom of frame. Space anchors not more than 26” o.c.
5. Head Reinforcement: For frames more than 48” wide, provide continuous head reinforcement for full width of opening, welded to back of frame at head.
6. Hardware Preparation: Factory prepare sound-control frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Division 08 Door Hardware.
    a. Reinforce frames to receive nontemplated mortised and surface-mounted door hardware.
    b. Locate hardware as indicated, or if not indicated, according to NAAMM-HMMA 831 "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."
7. Plaster Guards: Weld guards to frame at back of hardware cutouts and glazing-stop screw and sound-control seal preparations to close off interior of openings in frames to be grouted.
8. Tolerances: Fabricate frames to tolerances indicated in ANSI/NAAMM-HMMA 865.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of sound-control door assemblies.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations of sound-control door frame connections before frame installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation and with installation spreaders in place, adjust and securely brace sound-control door frames to the following tolerances:
   1. Squareness: Plus or minus 1/16", measured at door rabbet on a line 90o from jamb perpendicular to frame head.
   2. Alignment: Plus or minus 1/16", measured at jambs on a horizontal line parallel to plane of wall.
   3. Twist: Plus or minus 1/16", measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   4. Plumbness: Plus or minus 1/16", measured at jambs on a perpendicular line from head to floor.

B. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install sound-control door assemblies plumb, rigid, properly aligned, and securely fastened in place; comply with manufacturer's written instructions.

B. Frames: Install sound-control door frames in sizes and profiles indicated.
   1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
      a. At fire-rated openings, install frames according to NFPA 80.
      b. At openings requiring smoke and draft control, install frames according to NFPA 105.
      c. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, and dress; make splice smooth, flush, and invisible on exposed faces.
      d. Install sound-control frames with removable glazing stops located on secure side of opening.

e. Remove temporary braces only after frames or bucks have been properly set and secured.
f. Check squareness, twist, and plumbness of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
g. Apply corrosion-resistant coatings to backs of frames to be filled with mortar, grout, and plaster containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with postinstalled expansion anchors.
   a. Floor anchors may be set with powder-actuated fasteners instead of post-installed expansion anchors, if so indicated and approved on Shop Drawings.
3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
5. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
6. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.
7. Grouted Frames: Solidly fill space between frames and substrate with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
8. Installation Tolerances: Adjust sound-control door frames for squareness, alignment, twist, and plumbness to the following tolerances:
   a. Squareness: Plus or minus 1/16”, measured at door rabbet on a line 90o from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16”, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16”, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16”, measured at jambs on a perpendicular line from head to floor.

C. Doors: Fit sound-control doors accurately in frames, within clearances indicated below. Shim as necessary.
1. Non-Fire-Rated Doors: Fit non-fire-rated doors accurately in frames with the following clearances:
   a. Jambs: 1/8”.
   b. Head with Butt Hinges: 1/8”.
   c. Head with Cam-Lift Hinges: As required by manufacturer, but not more than 3/8”.
   d. Sill: Manufacturer's standard.

e. Between Edges of Pairs of Doors: 1/8”.

2. Fire-Rated Doors: Install fire-rated doors with clearances according to NFPA 80.

D. Sound-Control Seals: Where seals have been prefit and preinstalled in the factory and subsequently removed for shipping, reinstall seals and adjust according to manufacturer's written instructions.

D. Cam-Lift Hinges: Install hinges according to manufacturer's written instructions.

E. Thresholds: Set thresholds in full bed of sealant complying with requirements in Division 07 Joint Sealants.

G. Glazing: Comply with installation requirements in Division 08 Glazing and with sound-control door assembly manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9” o.c., and not more than 2” o.c. from each corner.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Acoustical testing and inspecting agency shall select at random, (10%) ten-percent of sound-control doors from sound-control door assemblies that are completely installed and perform testing for verification that assembly complies with STC rating requirements.

1. Field tests shall be conducted according to ASTM E 336, with results calculated according to ASTM E 413. Acceptable field STC values shall be within 5 dB of laboratory STC values.
2. Inspection Report: Acoustical testing agency shall submit report in writing to Architect and Contractor within 24 hours after testing.
3. If tested door fails, replace or rework all sound-control door assemblies to bring them into compliance at Contractor's expense.
   a. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

C. Prepare test and inspection reports.

C. After sound-control door assemblies are installed, test-demonstrate in the presence of the Owner’s Representative that the doors operate properly under all conditions. Adjust doors and hardware if tests show improper functioning.

3.5 ADJUSTING AND CLEANING

A. Final Adjustments: Check and adjust seals, door bottoms, and other sound-control hardware items right before final inspection. Leave work in complete and proper operating condition.

B. Remove and replace defective work, including defective or damaged sound seals and doors and frames that are warped, bowed, or otherwise unacceptable.
   1. Adjust gaskets, gasket retainers, and retainer covers to provide contact required to achieve STC rating.

C. Clean grout off sound-control door frames immediately after installation.

D. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

E. Metallic-Coated Surfaces: Clean abraded areas of doors and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 08 5113

ALUMINUM WINDOWS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Aluminum windows as indicated.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 07 9200 - Joint Sealants.

3. Section 08 4113 - Aluminum Entrances and Storefront.

4. Section 08 8000 - Glazing.

5. Section 09 2423 - Cement Plaster and Metal Lath.

1.02 DESIGN REQUIREMENTS

A. Drawings indicate sizes, locations, profiles, and general details of aluminum windows construction and installation.

1.03 REFERENCE STANDARDS

A. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors by Uniform or Cyclic Static Air Pressure Difference.

B. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

C. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

D. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage through Installed Windows and Doors.

E. ASTM E1105 Standard test Method for Field Determination of Water Penetration of Installed Exterior Windows, Curtain Walls and Doors by Uniform or Cyclic Static Air Pressure Difference.

1.04 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings for the Work of this section including plans, elevations, opening identification symbols, sizes, and complete details for materials, finishes, sizes, profiles, moldings, dimensioned locations of hardware items with reinforcement, methods of anchoring, assembly, erection, isolation, glazing procedure as well as re-glazing procedures, materials, and caulking.

B. Product Data: Submit manufacturer's Product Data, recommendations and standard details for aluminum windows units, including independent laboratory certified tests as necessary to demonstrate compliance with specified requirements.

C. Material Samples:

1. Finish: Submit Samples of required aluminum finish on 6-inch sections of extruded aluminum.

2. Window Samples: Submit a window Sample fabricated of the materials, fasteners, glazing, panning and caulking system specified.

D. Certificates:

1. Certified Test Reports: Window manufacturer shall affix AAMA Quality Certified label on every unit, or shall submit to Architect a certified test report from an approved testing laboratory, certifying that specified window complies with ANSI/AAMA requirements.

2. Submit a certificate bearing official and legal signature of window supplier stating that the finish complies with AAMA 2605 for Superior Performing Organic Coatings.

3. Provide test data showing compliance with Field Testing requirements.

1.05 QUALITY ASSURANCE

A. Windows shall conform to requirements of ANSI/AAMA 101 Voluntary Specifications for Aluminum Prime Windows and Sliding Glass Doors.

B. Installer must show a minimum experience installing the windows required by this section of five projects within the last five years, and must provide written certification by the manufacturer as an approved installer for each specified window type.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's packaging to protect windows during transportation and storage.

B. Store windows indoors in a clean ventilated area and stack vertically on edge with wood or plastic shims between components to provide water drainage and air circulation.

1.07 WARRANTY

A. Window installation shall be warranted by Contractor against defects in material, fabrication, and installation under normal use and service, for a period of two years.

B. Windows shall be warranted by window manufacturer against defects in material and fabrication under normal use and service, for a period of five years.

C. Pigmented organic finished window and related components shall be warranted for 15 years against blistering, cracking, peeling or chipping or fading beyond AAMA 2605.

PART 2 - PRODUCTS

2.01 FIXED WINDOWS

A. Acceptable Manufacturers:

1. EFCO Series 325X

2. St. Cloud Series 5000 (SCW5000)

3. Traco; NX3800.

4. Graham Architectural Window; Series S6800

5. Peerless; Model G641

B. Fixed aluminum windows shall conform to AAMA/WDMA/CSA 101/I.S.2/A440 AW-PG100-FW.

C. Window frames and sash members, including muntins bars, shall be extruded aluminum sections of 6063-T5 alloy. Metal thickness of sash sections shall be 0.125" inch minimum. Minimum thickness of sill frame section shall be 0.125" inch.

D. Nominal depth of frame members shall be at least 3.25-inch. Corners of frames shall be milled, coped, and mechanically jointed by means of two screws securely fitted into screw grooves or welded. Joint formed by jamb and sill frame shall be watertight.

E. At mullions, frame members of jamb shall be securely interlocked to form continuous watertight mullion.

F. Sash shall allow for insulated glass, and the insulated glass shall be a minimum of 7/8 inch overall. All sash corners shall be coped and butt-type construction, neatly joined and mechanically secured by means of two screws anchored into an integral screw port at all horizontal member locations. Sash joints shall be sealed with narrow joint seam sealer, complying with AAMA 803.3 at all locations. All horizontal sash rails shall be of tubular profile. Horizontal true muntins shall be coped and attached to sash members by means of rivets, screws, or welded. Glazing shall be of wet glazed type with an extruded aluminum snap-on glazing bead at the interior. Sashes shall be factory glazed by the manufacturer to provide proper seal.

2.02 SHOP TESTING

A. Water-resistance test: Conduct according to requirements of ASTM E331. No water leakage is permitted. Windows shall be tested at 12 pounds per square foot test pressure differential.

B. Air-infiltration test: Conduct according to requirements of ASTM E283. Allowable infiltration shall not exceed 1.5 times the amount required. Windows shall be tested at 8 pounds per square foot test pressure differential.

C. Structural performance test: Conduct according to requirements of ASTM E330. Windows shall be tested at pressure differential not lower than 30 pounds per square foot.

2.03 FINISH

A. Windows and accessories shall be furnished with an organic finish applied over a five stage aluminum pre-treatment. Finish shall be a two coat pigmented organic coating system with a minimum of 1.2 mil thickness and conforming to AAMA 2605-02.

B. Finish shall be available in a minimum of five standard colors. Finish color shall be selected by the Architect.

PART 3- EXECUTION

3.01 INSTALLATION

A. Panning System: Panning shall be either a receiver or attached type. The panning extrusions shall be Project site secured at the corners with stainless steel screws in integral screw ports with the joints back sealed to prevent water intrusion. Exposed screws or fasteners on the exterior of the panning are not permitted. Panning and trim shall be furnished in the same color and finish as window system.

B. Receptor System: A two piece snap together receptor shall be furnished to fasten windows in place. The receptor shall aluminum finish to match window. When snapped together, system shall fasten window securely in place with no water penetration.

C. Windows and operators shall be installed by manufacturer or an authorized representative, and shall be set plumb, square, level, and true within their respective openings. Adjoining units of windows or assembly of windows shall be installed in the same plane and with rails, muntins, and like members accurately aligned.

D. Aluminum in contact with plaster, concrete or steel shall be separated from dissimilar material with self-adhering, plastic or synthetic rubber tape, 5-mils minimum thickness. Screws, rivets, bolts and other fastening devices shall be of aluminum, non-magnetic stainless steel or other non-corrosive materials compatible with aluminum. Cadmium- plated fasteners are not permitted.

E. Upon completion of the Work of this section, including glazing, inspect windows and operating devices for proper installation and operation. Operate vents and hardware

and adjust to ensure proper fitting and functioning and leave in smoothly operating condition.

3.02 FIELD QUALITY CONTROL

A. Conduct on-site tests with window manufacturer's representative, Owner and Architect present. The architect will select units to be tested. Testing shall be performed by a qualified independent testing agency acceptable to the OAR.

B. Ten percent of installed windows shall be selected for water testing. If one or more windows fail, additional ten percent of windows (not including the ones previously tested) shall be selected for further testing. Selection of additional ten percent of windows and retesting will be preformed until no leaks occur.

C. Water-resistance test: Conduct according to requirements of ASTM E1105. No water leakage is permitted. Windows shall be field tested at 8 pounds per square foot field test pressure differential.

D. Air-infiltration test: Conduct according to requirements of ASTM E783. Allowable infiltration shall not exceed 1.5 times the amount required. Windows shall be tested at 6.24 PSF (pounds per square foot) field test pressure differential.

E. Field Test report shall be submitted to the Owner, Contractor and Architect. Field Test report must include the following:

1. Name of the testing agency and testing agency’s credentials.

2. Date of test.

3. Standards complied with during testing.

4. Number and locations of specimens tested.

5. Thorough analysis of test result indicating passing or failing of specimens at pressures specified.

6 Photos illustrating conditions of failed compliance at pressures required.

3.03 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.04 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 08 5656

SECURITY WINDOW SCREENS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Security window screens.

2. Security screen for storefronts.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 08 4113 - Aluminum Entrances and Storefronts.

3. Section 08 5123 - Steel windows.

4. Section 08 5113 - Aluminum Windows.

5. Section 09 9000 - Painting and Coating.

6. Section 10 1400 - Signage.

1.02 DESIGN REQUIREMENTS

A. Drawings indicate profile and general details of frame construction and installation. Minor variations from indicated details, to conform to manufacturer's standard shop practice are permitted upon review by the Architect.

1.03 SUBMITTALS

A. Shop Drawings: Indicate sizes, materials, thickness, joining methods, frame reinforcement, anchorage, and clearances for operation and installation details.

1. Submit window and security screen elevations showing main frames, mullions, muntins, and showing location and sizes of openings.

B. Samples: Submit finish samples of frame and screen infill.

C. Product Data: Submit for hardware and any other screen component.

1.04 QUALITY ASSURANCE

A. Coordinate with window frame fabricator.

B. Security window screens shall be products of a manufacturer regularly engaged in the fabrication of such products.

C. Mock-up:

1. Provide mock-up to establish quality and acceptance of security window screens. Mock-up shall consist of one complete security window screen showing the specified profiles, screen, connections, attachments to wall, joint details, hardware and finish.

2. Subject to acceptance by Owner, mock-up may be retained as part of finished work. If mock-up is disapproved, remake or rework mock-up until approval is secured. Rejected mock-ups shall be removed from the jobsite.

1.05 WARRANTY

A. Manufacturer shall provide a five year material and fabrication warranty.

B. Installer shall provide a two year fabrication and installation warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Security Window Screens:

1. Kane Manufacturing, Level 6 Aluminum Security Screen, A-VNG-O-LA.

2. Avant Guards Manufacturing, Level 6 Aluminum Security Screen.

3. Equal.

B. Security Screens for Storefront Doors:

1. Kane Manufacturing, Level 5 Aluminum Security Screen, A-VNG-O-LA.

2. Avant Guards Manufacturing, Level 5 Aluminum Security Screen.

3. Equal.

2.02 MATERIALS

A. Main Frame, Operable Panels, and Emergency Screen Opening:

1. Material: Channel shaped extruded aluminum from 6063-T6 alloy. Minimum nominal wall thickness of 0.125 inch for main frame and 0.090 for sub-frame.

2. Size/Shape: Main frame stiles and rails shall have a minimum dimension of 1 ¼-inch by 3-inch and shall be fabricated with exterior cover channel with interlocking receptor plate. The corners shall be mitered and fitted with 3-inch by 3-inch corner keys. Security window screen panels shall have a sub-frame with a continuous groove retaining a combination cushioning strip/insect shield.

3. Finish:

a. Baked polyester powder coat finish from manufacturer's standard colors.

4. Hardware:

a. Emergency egress screen panels shall be operable and provided with two or more concealed 13-gage, stainless steel hinges with 1/4 inch diameter hardened stainless steel pins and integral compression guards. Piano hinges are not acceptable.

b. Emergency release shall be installed on the interior side at the emergency egress window. Emergency release shall be Kane Down-Quick, or equal.

c. Operable screen panels shall have a concealed, ball-bearing 1/2 inch diameter, case-hardened steel bolts. The bolts shall operate simultaneously from one key station by a bit key activating a Kane 107 bit key lock, or equal. Key holes shall be protected with covers held with vandal-proof fasteners. Bolt locks welded to sub-frame are not acceptable. Piano hinges are not acceptable.

d. Keyhole cover plate shall be installed on the exterior of each screen.

e. Key: Primary bit cut shall be 0.25 inch minimum.

B. Screen Infill and Emergency Egress Screen Infill: Perforated Panel.

1. Material: 14-gage mill-galvannealed steel.

2. Pattern: 3/16 inch diameter holes on a ¼ inch center weave with a 51 percent open area.

3. Finish: Black polyester powder coating and baked to a hard mar-resistant finish.

4. Attachment: The perforated panel shall be attached between the main frame and interlocking cover plate with tamper resistant screws 3 inches on center maximum.

C. Signage: For emergency exit signs at operable screens see Section 10 1400 - Signage.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Security screen frames shall be attached as indicated on plans.

B. Install steel screen frames accurately in location, in perfect alignment, plumb, straight, and true. Brace frames to prevent displacement.

C. Aluminum in contact with plaster, concrete or steel shall be separated from dissimilar material with self-adhering, plastic or synthetic rubber tape, 5 mils minimum thickness. Screws, rivets, bolts and other fastening devices shall be of aluminum, non-magnetic stainless steel or other non-corrosive materials compatible with aluminum. Cadmium- plated fasteners are not permitted.

3.02 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.03 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 08 7100

DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Door hardware.

B. Related Divisions:

1. Division 06 – door hardware installation
2. Division 07 – sealant at exterior thresholds
3. Division 08 – metal doors and frames, interior aluminum frames, wood doors, integrated security systems, specialty doors, storefront and glazed curtainwall systems.
4. Division 10 – operable partitions
5. Division 21 – fire and life safety systems
6. Division 28 – security access systems

C. Specific Omissions: Hardware for the following is specified or indicated elsewhere.

1. Windows.
2. Cabinets, including open wall shelving and locks.
3. Signs, except where scheduled.
4. Toilet accessories, including grab bars.
5. Installation.
6. Rough hardware.
7. Conduit, junction boxes & wiring.
8. Folding partitions, except cylinders where detailed.
9. Sliding aluminum doors, except cylinders where detailed.
10. Access doors and panels, except cylinders where detailed.
11. Corner Guards.
12. Welded steel gates and supports.

1.2 REFERENCES**:**

A. Use date of standard in effect as of Bid date.

1. American National Standards Institute

a) ANSI 156.18 – Materials and Finishes.
b) ICC/ANSI A117.1 - 1998 – Specifications for making buildings and facilities usable by physically handicapped people. [omit for CA work – not applicable]

2. BHMA – Builders Hardware Manufacturers Association
3. 2016 California Building Code

a) Chapter 11B – Accessibility To Public Buildings, Public Accommodations, Commercial Buildings and Public Housing

4. DHI – Door and Hardware Institute
5. NFPA – National Fire Protection Association
    a) NFPA 80 2013 Edition – Standard for Fire Doors and Other Opening Protectives.
    b) NFPA 105 – Smoke and Draft Control Door Assemblies
    c) NFPA 252 – Fire Tests of Door Assemblies
6. UL – Underwriters Laboratories
    a) UL10C – Positive Pressure Fire Tests of Door Assemblies.
    b) UL 305 – Panic Hardware
7. WHI – Warnock Hersey Incorporated State of California Building Code
8. Local applicable codes
9. SDI – Steel Door Institute
10. WI – Woodwork Institute
11. AWI – Architectural Woodwork Institute
12. NAAMM – National Association of Architectural Metal Manufacturers

B. Abbreviations

1. Manufacturers**:** see table at 2.1.A of this section
2. Finishes**:** see 2.7 of this section.

1.3 SUBMITTALS & SUBSTITUTIONS

A. SUBMITTALS**:** Submit six copies of schedule per D. Only submittals printed one sided will be accepted and reviewed. Organize vertically formatted schedule into "Hardware Sets" with index of doors and headings, indicating complete designations of every item required for each door or opening. Minimum 10pt font size. Include following information**:**

1. Type, style, function, size, quantity and finish of hardware items.
2. Use BHMA Finish codes per ANSI A156.18.
3. Name, part number and manufacturer of each item.
4. Fastenings and other pertinent information.
5. Location of hardware set coordinated with floor plans and door schedule.
6. Explanation of abbreviations, symbols, and codes contained in schedule.
7. Mounting locations for hardware.
8. Door and frame sizes, materials and degrees of swing.
9. List of manufacturers used and their nearest representative with address and phone number.
10. Catalog cuts.
11. Point-to-point wiring diagrams.
12. Manufacturer's technical data and installation instructions for electronic hardware.
13. Date of jobsite visit.

B. Bid and submit manufacturer's updated/improved item if scheduled item is discontinued.

C. Deviations**:** Highlight, encircle or otherwise identify deviations from "Schedule of Finish Hardware" on submittal with notations clearly designating those portions as deviating from this section.

D. If discrepancy between drawings and scheduled material in this section, bid the more expensive of the two choices, note the discrepancy in the submittal and request direction from Architect for resolution.

E. Substitutions per Division 1. Include product data and indicate benefit to the Project. Furnish operating samples on request.

F. Furnish as-built/as-installed schedule with closeout documents, including keying schedule, riser and point-to-point wiring diagrams, manufacturers' installation, adjustment and maintenance information, and supplier's final inspection report.

1.4 QUALITY ASSURANCE:

A. Qualifications:

1. Hardware supplier: direct factory contract supplier who employs a certified architectural hardware consultant (AHC), available at reasonable times during course of work for project hardware consultation to Owner, Architect and Contractor.

a) Responsible for detailing, scheduling and ordering of finish hardware. Detailing implies that the submitted schedule of hardware is correct and complete for the intended function and performance of the openings.

B. Hardware: Free of defects, blemishes and excessive play. Obtain each kind of hardware (latch and locksets, exit devices, hinges and closers) from one manufacturer.

C. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

D. Fire-Rated Openings: NFPA 80 compliant. Hardware UL10C (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved-bearing hinges, and resilient seals. Coordinate with wood door section for required intumescent seals. Furnish openings complete.

E. Furnish hardware items required to complete the work in accordance with specified performance level and design intent, complying with manufacturers' instructions and code requirements.

F. Pre-Installation Meetings: Initiate and conduct with supplier, installer and related trades, coordinate materials and techniques, and sequence complex hardware items and systems installation. Include manufacturers' representatives of locks, panic hardware and door closers in the meetings. Convene prior to commencement of related work.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Delivery: coordinate delivery to appropriate locations (shop or field).

1. Permanent keys and cores: secured delivery direct to Owner's representative.

B. Acceptance at Site: Items individually packaged in manufacturers' original containers, complete with proper fasteners and related pieces. Clearly mark packages to indicate contents, locations in hardware schedule and door numbers.

C. Storage: Provide securely locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, dust, excessive heat and cold, etc.

1.6 PROJECT CONDITIONS AND COORDINATION**:**

A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical the same operation and quality as type specified, subject to Architect's approval.

B. Coordination**:** Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents. Furnish related trades with the following information**:**

1. Location of embedded and attached items to concrete.
2. Location of wall-mounted hardware, including wall stops.
3. Location of finish floor materials and floor-mounted hardware.
4. At masonry construction, coordinate with the anchoring and hollow metal supplier prior to frame installation by placing a strip of insulation, wood, or foam, on the back of the hollow metal frame behind the rabbet section for continuous hinges, as well as at rim panic hardware strike locations, silencers, coordinators, and door closer arm locations. When the frame is grouted in place, the backing will allow drilling and tapping without dulling or breaking the installer's bits.
5. Locations for conduit and raceways as needed for electrical, electronic and electro-pneumatic hardware items. Fire/life-safety system interfacing. Point-to-point wiring diagrams plus riser diagrams to related trades.
6. Coordinate: flush top rails of doors at out-swinging exteriors, and throughout where adhesive-mounted seals occur.
7. Manufacturers' templates to door and frame fabricators.

C. Check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation.

D. Environmental considerations**:** segregate unused recyclable paper and paper product packaging, uninstalled metals, and plastics, and have these sent to a recycling center.

E. Prior to submittal, carefully inspect existing conditions to verify finish hardware required to complete Work, including sizes, quantities, existing hardware scheduled for re-use, and sill condition material. If conflict between the specified/scheduled hardware and existing conditions, submit request for direction from Architect. Include date of jobsite visit in the submittal.

1. Submittals prepared without thorough jobsite visit by qualified hardware expert will be rejected as non-compliant.

1.7 WARRANTY**:**

A. Part of respective manufacturers' regular terms of sale. Provide manufacturers' written warranties.

B. Include factory order numbers with close-out documents warranty information:

C. Minimum warranties:

1.	Locksets:	Three Years
2.	Extra Heavy Duty Cylindrical Lock:	Seven Years
3.	Exit Devices:	Three years mechanical One year electrical

4.	Closers:	Thirty years mechanical Two years electrical
5.	Hinges:	One year
6.	Other Hardware	Two years

1.8 COMMISSIONING**:**

A. Conduct these tests prior to request for certificate of substantial completion**:**

1. With installer present, test door hardware operation with climate control system and stairwell pressurization system both at rest and while in full operation.
2. With installer, access control contractor and electrical contractor present, test electrical, electronic and electro-pneumatic hardware systems for satisfactory operation.
3. With installer and electrical contractor present, test hardware interfaced with fire/life-safety system for proper operation and release.

1.9 REGULATORY REQUIREMENTS**:**

A. Locate latching hardware between 34 inches to 44 inches above the finished floor, per 2016 California Building Code, Section 11B-404.2.7.

1. Panic hardware: locate between 36 inches to 44 inches above the finished floor.

B. Handles, pull, latches, locks, other operable parts**:**

1. Readily openable from egress side with one hand and without tight grasping, tight pinching, or twisting of the wrist to operate. 2016 California Building Code Section 11B-309.4.

2. Force required to activate the operable parts: 5.0 pounds maximum, per 2016 California Building Code Section 11B-309.4.

C. Adjust doors to open with not more than 5.0-pounds pressure to open at exterior doors and 5.0-pounds at interior doors. As allowed per 2016 California Building Code Section 11B-404.2, the authority with jurisdiction may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15-pounds.

1. Exception: exterior doors' pressure-to-open may be increased to 8.5-pounds if: at a single location, and one of a bank of eight leafs or fraction of eight, and one leaf of this bank is fitted with a low- or high-energy operator.

D. Low-energy powered doors: comply with ANSI/BHMA A156.19. Reference: 2016 California Building Code Section 11B-404.2.9, Exception 2.

1. Where powered door serves an occupancy of 150 or more, provide back-up battery power or stand-by generator power, capable of supporting a minimum of 150 cycles.

2. Actuators, vertical bar type: minimum 2-inches wide, 30-inches high, bottom located minimum 5-inches above floor or ground, top located minimum 35-inches above floor or ground. Displays International Symbol of Accessibility, per 2016 California Building Code Section 11B-703.7.

3. Actuators, plate type: use two at each side of the opening. Minimum 4-inches diameter or 4-inches square. Displays International Symbol of Accessibility, per 2016 California Building Code Section 11B-703.7. Locate centerline of lower plate between 7- and 8-inches above floor or ground, and upper plate between 30- and 44-inches above floor or ground.

4. Actuator location: conspicuously located, clear and level floor/ground space for forward or parallel approach.

E. Door closing speed shall be as follows: CBC 11B-404.2.8

1. Closer shall be adjusted so that the required time to move a door from an open position of 90 degrees to a position of 12 degrees from the latch is 5 seconds minimum

2. Spring hinges shall be adjusted so that the required time to move a door from an open position of 70 degrees to the closed position is 1.5 seconds minimum

F. Smooth surfaces at bottom 10 inches of push sides of doors, facilitating push-open with wheelchair footrests, per 2016 California Building Code Section 11B-404.2.10.

1. Applied kickplates and armor plates: bevel the left and right edges; free of sharp or abrasive edges.

2. Tempered glass doors without stiles: bottom rail may be less than 10 inches if top leading edge is tapered 60 degrees minimum.

G. Door opening clear width no less than 32 inches, measured from face of frame stop, or edge of inactive leaf of pair of doors, to door face with door opened to 90 degrees. Hardware projection not a factor in clear width if located above 30 inches and below 80 inches, and the hardware projects no more than 4 inches. 2016 California Building Code Section 11B-404.2.3.

1. Exception**:** doors not requiring full passage through the opening, that is, to spaces less than 24 inches in depth, may have the clear opening width reduced to 20 inches. Example**:** shallow closets.

2. Door closers and overhead stops: not less than 78 inches above the finished floor or ground, per 2016 California Building Code 11B-307.4.

H. Thresholds**:** floor or landing no more than 0.50 inches below the top of the threshold of the doorway, per 2016 California Building Code Section 11B-404.2.5. Vertical rise no more than 0.25 inches, change in level between 0.25 inches and 0.50 inches**:** beveled to slope no greater than 1**:**2 (50 percent slope). 2016 California Building Code Section 11B-303.2 & ~.3.

I. Floor stops**:** Do not locate in path of travel. Locate no more than 4 inches from walls, per DSA Policy #99-08 (Access).

J. Pairs of doors with independently-activated hardware both leafs**:** limit swing of right-hand or right-hand-reverse leaf to 90 degrees to protect persons reading wall-mounted tactile signage, per 2016 California Building Code Section 11B-703.4.2.1

K. Door and door hardware encroachment**:** when door is swung fully-open into means-of-egress path, the door may not encroach/project more than 7 inches into the required exit width, with the exception of door release hardware such as lockset levers or panic hardware. These hardware items must be located no less than 34-inches and no more than 48-inches above the floor/ground. 2016 California Building Code, Section 1005.7.1.

1. In I-2 occupancies, latch release hardware is not permitted to project in the required exit width, regardless of its mounting height, per 2016 California Building Code, Section 1005.7.1 at Exception 1.

L. Hardware (including panic hardware) shall not be provided with "night latch" (NL) function for any accessible doors or gates unless the following conditions are met per DSA interpretation 10-08 DSA/AC (external), revised 4/28/09. Such conditions must be clearly demonstrated and indicated in the specifications:

1. Such hardware has dogging feature
2. It is dogged during the time the facility is open
3. Such dogging operation is performed only by employees as their job function (non-public use)

PART 2 PRODUCTS

2.1 MANUFACTURERS**:**

A. Listed acceptable alternate manufacturers**:** these will be considered; submit for review products with equivalent function and features of scheduled products.

ITEM**:**	MANUFACTURER**:**	ACCEPTABLE ALTERNATE**:**
Hinges	(IVE) Ives	Bommer
Key System	(SCH) Schlage	Owner standard
Mechanical Locks	(SCH) Schlage	Owner standard
Exit Devices	(VON) Von Duprin	Owner standard
Closers	(LCN) LCN	Owner standard
Auto Flush Bolts	(IVE) Ives	DCI
Coordinators	(IVE) Ives	DCI
Silencers	(IVE) Ives	Rockwood, Trimco
Push & Pull Plates	(IVE) Ives	Rockwood, Trimco
Kickplates	(IVE) Ives	Rockwood, Trimco
Stops & Holders	(IVE) Ives	Rockwood, Trimco
Overhead Stops	(GLY) Glynn-Johnson	ABH
Thresholds	(ZER)Zero	NGP, Reese
Seals & Bottoms	(ZER)Zero	NGP, Reese

2.2 HINGING METHODS:

A. Drawings typically depict doors at 90 degrees, doors will actually swing to maximum allowable. Use wide-throw conventional or continuous hinges as needed up to 8 inches in width to allow door to stand parallel to wall for true 180-degree opening. Advise architect if 8-inch width is insufficient.

B. Conform to manufacturer's published hinge selection standard for door dimensions, weight and frequency, and to hinge selection as scheduled. Where manufacturer's standard exceeds the scheduled product, furnish the heavier of the two choices, notify Architect of deviation from scheduled hardware.

C. Conventional Hinges: Steel or stainless steel pins and approved bearings. Hinge open widths minimum, but of sufficient throw to permit maximum door swing.

1. Outswinging exterior doors: non-ferrous with non-removable (NRP) pins and security studs.
2. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.

2.3 LOCKSETS, LATCHSETS, DEADBOLTS:

A. Mortise Locksets and Latchsets: as scheduled.

1. Chassis: cold-rolled steel, handing field-changeable without disassembly.
2. Universal lock case – 10 functions in one case.
3. Floating mounting tabs automatically adjusts to fit a beveled door edge.
4. Latchbolts: 0.75 inch throw stainless steel anti-friction type.
5. Lever Trim: through-bolted, accessible design, cast lever or solid extruded bar type levers as scheduled. Filled hollow tube design unacceptable.

a) Spindles: security design independent breakaway. Breakage of outside lever does not allow access to inside lever's hubworks to gain wrongful entry.
b) Inside lever applied by screwless shank mounting – no exposed trim mount screws.
c) Levers rotate up or down for ease of use.
d) Vandalgard locks: locked lever freely rotates down while remaining securely locked. This feature prevents damage to internal lock components when subjected to excessive force.

6. Furnish solid cylinder collars with wave springs. Wall of collar to cover rim of mortise cylinder.
7. Turnpieces: accessible offset turn-lever design not requiring pinching or twisting motions to operate.
8. Deadbolts: stainless steel 1-inch throw.
9. Electric operation: Manufacturer-installed continuous duty solenoid.
10. Strikes: 16 gage curved steel, bronze or brass with 1 inch deep box construction, lips of sufficient length to clear trim and protect clothing.
11. Scheduled Lock Series and Design: Schlage L series,
12. Certifications:

a) ANSI A156.13, 1994, Grade 1 Operational, Grade 1 Security.
b) ANSI/ASTM F476-84 Grade 31 UL Listed.

13. Accessibility: Require not more than 5 lb to retract the latchbolt or deadbolt, or both, per CBC 2016 11B-404.2.7 and 11B-309.4.

2.4 EXIT DEVICES / PANIC HARDWARE

A. General features:

1. Independent lab-tested 1,000,000 cycles.
2. Push-through push-pad design. No exposed push-pad fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.
3. Deadlocking latchbolts, 0.75 inch projection.
4. End caps: impact-resistant, flush-mounted. No raised edges or lips to catch carts or other equipment.
5. No exposed screws to show through glass doors.
6. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.
7. Releasable in normal operation with 15-pound maximum operating force per UBC Standard 10-4, and with 32-pound maximum pressure under 250-pound load to the door.
8. Exterior doors scheduled with XP-series devices: Static load force resistance of at least 2000 pounds.
9. Accessibility: Require not more than 5 lb to retract the latchbolt, per CBC 2016 11B-404.2.7 and 11B-309.4.
    a) Mechanical method: Von Duprin "AX-feature, where touchpad directly retracts the latchbolt with 5 lb or less of force.
    b) Electrical method: Von Duprin's "RX-QEL-", where lightly pressing the touchpad with 5 lb or less of force closes an electric switch, activating quiet electric latch retraction.

B. Specific features:

1. Non-Fire Rated Devices: cylinder dogging.
2. Lever Trim: breakaway type, forged brass or bronze escutcheon min. 0.130 inch thickness, compression spring drive, match lockset lever design.
3. Fire-Labeled Devices: UL label indicating "Fire Exit Hardware". Vertical rod devices less bottom rod (LBR) unless otherwise scheduled.
4. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key. Furnish storage brackets for securely stowing the mullion away from the door when removed.

2.6 CLOSERS

A. Surface Closers: 4040-XP

1. Full rack-and-pinion type cylinder with removable non-ferrous cover and cast iron body. Double heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring.
2. ISO 2000 certified. Units stamped with date-of-manufacture code.
3. Independent lab-tested 10,000,000 cycles.
4. Non-sized, non-handed, and adjustable. Place closer inside building, stairs, and rooms.
5. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
6. Adjust doors to open with not more than 5.0-pounds pressure to open at exterior doors and 5.0-pounds at interior doors. As allowed per 2016 California Building Code Section 11B-404.2.9, the authority with jurisdiction may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15-pounds.

a) Exception: exterior doors' pressure-to-open may be increased to 8.5-pounds if: at a single location, and one of a bank of eight leafs or fraction of eight, and one leaf of this bank is fitted with a low- or high-energy operator.

7. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
8. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units.
9. Exterior door closers**:** tested to 100 hours of ASTM B117 salt spray test, furnish data on request.
10. Exterior doors**:** seasonal adjustments not required for temperatures from 120 degrees F to -30 degrees F, furnish checking fluid data on request.
11. Non-flaming fluid, will not fuel door or floor covering fires.
12. Pressure Relief Valves (PRV) not permitted.

2.7 OTHER HARDWARE

A. Automatic Flush Bolts**:** Low operating force design.

B. Overhead Stops**:** Non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

C. Kick Plates**:** Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.

D. Door Stops**:** Provide stops to protect walls, casework or other hardware.

1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where floor type cannot be used, provide wall type. If neither can be used, provide overhead type.
2. Locate overhead stops for maximum possible opening. Consult with Owner for furniture locations. Minimum**:** 90deg stop / 95deg deadstop. Note degree of opening in submittal.

E. Automatic door bottoms**:** low operating force units. Doors with automatic door bottoms plus head and jamb seals cannot require more than two pounds operating force to open when closer is disconnected.

1. Include automatic type door bottoms, as opposed to fixed sweeps, at stairs and elevator lobbies to allow fine-tuning of pressurization systems.

F. Thresholds**:** As scheduled and per details. Comply with CBC 2016 11B-404.2.5. Substitute products**:** certify that the products equal or exceed specified material's thickness. Proposed substitutions**:** submit for approval.

2. Saddle thresholds**:** 0.125 inches minimum thickness.
3. Exteriors**:** Seal perimeter to exclude water and vermin. Use sealant complying with requirements in Division 7 "Thermal and Moisture Protection". Minimum 0.25 inch diameter fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors. National Guard Products' "COMBO" or Pemko Manufacturing's "FHSL".
4. Fire-rated openings, 90-minutes or less duration**:** use thresholds to interrupt floor covering material under the door where that material has a critical radiant flux value less than 0.22 watts per square centimeter, per NFPA 253. Use threshold unit as scheduled. If none scheduled, include a 0.25in high 5in wide saddle in the bid, and request direction from Architect.

5. Plastic plugs with wood or sheet metal screws are not an acceptable substitute for specified fastening methods.
6. Fasteners**:** Generally, exposed screws to be Phillips or Robertson drive. Pinned TORX drive at high security areas. Flat head sleeve anchors (FHSL) may be slotted drive. Sheet metal and wood screws**:** full-thread. Sleeve nuts**:** full length to prevent door compression.

G. Through-bolts**:** Do not use. Coordinate with wood doors; ensure provision of proper blocking to support wood screws for mounting panic hardware and door closers. Coordinate with metal doors and frames; ensure provision of proper reinforcement to support machine screws for mounting panic hardware and door closers.

1. Exception**:** surface-mounted overhead stops, holders, and friction stays.

H. Silencers**:** Interior hollow metal frames, 3 for single doors, 4 for pairs of doors. Leave no unfilled/uncovered pre-punched silencer holes. Intent**:** door bears against silencers, seals make minimal contact with minimal compression – only enough to effect a seal.

2.7 FINISH**:**

A. Generally**:** BHMA 626 Satin Chromium Areas using BHMA 626: furnish push-plates, pulls and protection plates of BHMA 630, Satin Stainless Steel, unless otherwise scheduled.

B. Door closers**:** factory powder coated to match other hardware, unless otherwise noted.

2.9 KEYING REQUIREMENTS**:**

A. Key System**:** Schlage Everest utility-patented keyway, interchangeable core. Utility patent protection to extend at least until 2029. Key blanks available only from factory-direct sources, not available from after-market key blank manufacturers. For estimate use factory GMK charge. Initiate and conduct meeting(s) with Owner and I-R Security & Safety Consultants representatives to determine system keyway(s), keybow styles, structure and degree of geographic exclusivity. Furnish Owner's written approval of the system; do not order keys or cylinders without written confirmation of actual requirements from the Owner. Contractor will install permanent cylinders/cores.

B. Keys

1. Factory registered master key system.
2. Construction keying**:** furnish temporary keyed-alike cores. Remove at substantial completion and install permanent cylinders/cores in Owner's presence. Demonstrate that construction key no longer operates.
3. Furnish 10 construction keys.
4. Furnish 2 construction control keys.

C. Key Cylinders**:** furnish utility patented, 6-pin solid brass construction.

D. Cylinder cores**:** furnish keyed at factory of lock manufacturer where permanent records are maintained. Locks and cylinders same manufacturer.

E. Permanent keys**:** use secured shipment direct from point of origination to Owner.

1. For estimate**:** 3 keys per change combination, 5 master keys per group, 5 grand-master keys, 3 control keys.
2. For estimate**:** VKC stamping plus "DO NOT DUPLICATE".
3. Bitting List**:** use secured shipment direct from point of origination to Owner upon completion.

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS**:**

A. Can read and understand manufacturers' templates, suppliers' hardware schedule and printed installation instructions. Can readily distinguish drywall screws from manufacturers' furnished fasteners. Available to meet with manufacturers' representatives and related trades to discuss installation of hardware.

3.2 PREPARATION**:**

A. Ensure that walls and frames are square and plumb before hardware installation. Make corrections before commencing hardware installation. Installation denotes acceptance of wall/frame condition.

B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.

1. Notify Architect of code conflicts before ordering material.
1. Locate latching hardware between 34 inches to 44 inches above the finished floor, per California Building Code, Section 1008.1.9.2 and 1133B.2.5.2.
2. Locate panic hardware between 36 inches to 44 inches above the finished floor.
3. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware.

C. Overhead stops**:** before installing, determine proposed locations of furniture items, fixtures, and other items to be protected by the overhead stop's action.

D. Existing frames and doors to be retrofitted with new hardware**:**

1. Field-verify conditions and dimensions prior to ordering hardware. Fill existing hardware cut outs not being reused by the new hardware. Remove existing hardware not being reused, return to Owner unless directed otherwise.
2. Remove existing floor closers not scheduled for reuse, fill cavities with non-shrinking concrete and finish smooth.
3. Cut and weld existing steel frames currently prepared with 2.25 inch height strikes. Cut an approximate 8 inch section from the strike jamb and weld in a reinforced section to accommodate specified hardware's strike.
4. Patch and weld flush filler pieces into existing door hardware preparations in steel doors and frames, leave surfaces smooth.
5. Glue in solid wood block fillers to fill cut outs in existing wood doors, sand surfaces smooth. Alternatively, use an approved epoxy-based wood filler product, submit product data for approval.

3.3 INSTALLATION

A. Install hardware per manufacturer's instructions and recommendations. Do not install surface-mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation. Remove and reinstall or replace work deemed defective by Architect.

1. Gaskets**:** install jamb-applied gaskets before closers, overhead stops, rim strikes, etc; fasten hardware over and through these seals. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.

2. When hardware is to be attached to existing metal surface and insufficient reinforcement exists, use RivNuts, NutSerts or similar anchoring device for screws.
3. Use manufacturers' fasteners furnished with hardware items, or submit Request for Substitution with Architect.
4. Replace fasteners damaged by power-driven tools.

B. Locate floor stops no more than 4 inches from walls and not within paths of travel. See paragraph 2.2 regarding hinge widths, door should be well clear of point of wall reveal. Point of door contact no closer to the hinge edge than half the door width. Where situation is questionable or difficult, contact Architect for direction.

C. Core concrete for exterior door stop anchors. Set anchors in approved non-shrink grout.

D. Locate overhead stops for minimum 90 degrees at rest and for maximum allowable degree of swing.

E. Drill pilot holes for fasteners in wood doors and/or frames.

F. Lubricate and adjust existing hardware scheduled to remain. Carefully remove and give to Owner items not scheduled for reuse.

G. Field-verify existing conditions and measurements prior to ordering hardware. Fill existing hardware cut outs not being used by the new hardware.

H. Remove existing hardware not being reused. Tag and bag removed hardware, turn over to Owner.

I. Where existing wall conditions will not allow door to swing using the scheduled hinges, provide wide-throw hinges and if needed, extended arms on closers.

J. Provide manufacturer’s recommended brackets to accommodate the mounting of closers on doors with flush transoms.

3.4. ADJUSTING

A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.

1. Hardware damaged by improper installation or adjustment methods**:** repair or replace to Owner’s satisfaction.
2. Adjust doors to fully latch with no more than 1 pound of pressure.

a) Door closer valves: turn valves clockwise until at bottom – do not force. Turn valves back out one and one-half turns and begin adjustment process from that point. Do not force valves beyond three full turns counterclockwise.

3. Adjust delayed-action closers on fire-rated doors to fully close from fully-opened position in no more than 10 seconds.
4. Adjust door closers per 1.9 this section.

3.5 DEMONSTRATION**:**

A. Demonstrate mechanical hardware and electrical, electronic and pneumatic hardware systems, including adjustment and maintenance procedures.

3.6 PROTECTION/CLEANING**:**

A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion.

B. Clean adjacent wall, frame and door surfaces soiled from installation / reinstallation process.

3.7 SCHEDULE OF FINISH HARDWARE

A. See door schedule in drawings for hardware set assignments.

B. Do not order material until submittal has been reviewed, stamped, and signed by Architect's door hardware consultant.

C.

SPECWORKS # 1661

HW SET: 113

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE	L9010 06A	626	SCH
1	EA	CLOSER	4040XP S-CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	PERIMETER SEALS	1370A HEAD AND JAMBS	AL	ZER
1	EA	AUTO DOOR BOTTOM	355A	AL	ZER
1	EA	THRESHOLD	AS DETAILED	AL	ZER

HW SET: 142

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	L9070T 06A	626	SCH
1	EA	PERMANENT CORE	23-030	626	SCH
1	EA	CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	626	IVE
1	SET	PERIMETER SEALS	1370A HEAD AND JAMBS	AL	ZER
1	EA	AUTO DOOR BOTTOM	355A	AL	ZER
1	EA	THRESHOLD	AS DETAILED	AL	ZER

HW SET: 142.1

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	L9071T 06A	626	SCH
2	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA	CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	626	IVE
1	SET	PERIMETER SEALS	1370A HEAD AND JAMBS	AL	ZER
1	EA	AUTO DOOR BOTTOM	355A	AL	ZER
1	EA	THRESHOLD	AS DETAILED	AL	ZER

HW SET: 382R.3

6	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	MULLION	KR9954	689	VON
1	EA	MULLION STORAGE KIT	MT54	689	VON
1	SET	MULLION SEAL	8780	CHA	ZER
2	EA	FIRE EXIT HARDWARE	AX-98-L-F-2-996L-PA	626	VON
4	EA	IC RIM CYLINDER	20-057-ICX	626	SCH
1	EA	IC MORT CYL	30-008T FOR MULLION	626	SCH
5	EA	PERMANENT CORE	23-030	626	SCH
1	EA	CLOSER	4040XP	689	LCN
1	EA	CLOSER	4040XP S-CUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	626	IVE
1	SET	PERIMETER SEALS	1370A HEAD AND JAMBS	AL	ZER
1	SET	MEETING ASTRAGAL	328AA	628	ZER
2	EA	AUTO DOOR BOTTOM	355A	AL	ZER
1	EA	THRESHOLD	AS DETAILED	AL	ZER

HW SET: 442.1

3	EA	HINGE	3CB1 4.5 X 4.5 NRP SEC STUD	630	IVE
1	EA	CLASSROOM LOCK	L9071T 06A	626	SCH
2	EA	PERMANENT CORE	23-030	626	SCH
1	EA	CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	FLOOR STOP	FS441/442 AS REQUIRED	626	IVE
1	SET	PERIMETER SEALS	1370A HEAD AND JAMBS	AL	ZER
1	EA	AUTO DOOR BOTTOM	355A	AL	ZER
1	EA	THRESHOLD	AS DETAILED	AL	ZER

HW SET: 445

3	EA	HINGE	3CB1 4.5 X 4.5 NRP SEC STUD	630	IVE
1	EA	HOLDBACK LOCK	L9076T 06A X L/OST	626	SCH
1	EA	PERMANENT CORE	23-030	626	SCH
1	EA	DOOR PULL	VR900	630	IVE
1	EA	CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	FLOOR STOP	FS441/442 AS REQUIRED	626	IVE
1	SET	PERIMETER SEALS	1370A HEAD AND JAMBS	AL	ZER
1	EA	AUTO DOOR BOTTOM	355A	AL	ZER
1	EA	THRESHOLD	AS DETAILED	AL	ZER

HW SET: 446

3	EA	HINGE	3CB1 4.5 X 4.5 NRP SEC STUD	630	IVE
1	EA	HOLDBACK LOCK	L9076T 06A X L/OST	626	SCH
1	EA	PERMANENT CORE	23-030	626	SCH
1	EA	PUSH PLATE	8200 4" X 16" CUT FOR CYL	630	IVE

1	EA	DOOR PULL	VR900	630	IVE
1	EA	CLOSER	4040XP S-CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	PERIMETER SEALS	1370A HEAD AND JAMBS	AL	ZER
1	EA	AUTO DOOR BOTTOM	355A	AL	ZER
1	EA	THRESHOLD	AS DETAILED	AL	ZER

HW SET: 452

3	EA	HINGE	3CB1 4.5 X 4.5 NRP SEC STUD	630	IVE
1	EA	STOREROOM LOCK	L9080T 06A	626	SCH
1	EA	PERMANENT CORE	23-030	626	SCH
1	EA	CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	FLOOR STOP	FS441/442 AS REQUIRED	626	IVE
1	SET	PERIMETER SEALS	1370A HEAD AND JAMBS	AL	ZER
1	EA	AUTO DOOR BOTTOM	355A	AL	ZER
1	EA	THRESHOLD	AS DETAILED	AL	ZER

HW SET: 482.1

3	EA	HINGE	3CB1 4.5 X 4.5	630	IVE
1	EA	EXIT DEVICE	CDSI-AX-98-L-NL-996L-06-PA	626	VON
1	EA	IC RIM CYLINDER	20-057-ICX	626	SCH
1	EA	IC MORT CYL	30-008T FOR DOGGING	626	SCH
2	EA	PERMANENT CORE	23-030	626	SCH
1	EA	CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	FLOOR STOP	FS441/442 AS REQUIRED	626	IVE
1	SET	PERIMETER SEALS	1370A HEAD AND JAMBS	AL	ZER
1	EA	AUTO DOOR BOTTOM	355A	AL	ZER
1	EA	THRESHOLD	AS DETAILED	AL	ZER

HW SET: 543.1

6	EA	HINGE	3CB1 4.5 X 4.5 NRP SEC STUD	630	IVE
1	SET	AUTO FLUSH BOLT	FB31/41 AS REQ'D	626	IVE
1	EA	DUST PROOF STRIKE	DP1/2 AS REQ'D	626	IVE
1	EA	CLASSROOM LOCK	L9071T 06A	626	SCH
2	EA	PERMANENT CORE	23-030	626	SCH
1	EA	COORDINATOR	COR2-COMPLETE	628	IVE
2	EA	CLOSER	4040XP S-CUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW	630	IVE
2	EA	FLOOR STOP	FS441/442 AS REQUIRED	626	IVE
1	SET	PERIMETER SEALS	1370A HEAD AND JAMBS	AL	ZER
2	EA	DOOR SWEEP	339AA	AL	ZER
1	EA	ASTRAGAL	44STST X 188	600	ZER
1	EA	THRESHOLD	AS DETAILED	AL	ZER

HW SET: 582

6	EA	HINGE	3CB1 4.5 X 4.5 NRP SEC STUD	630	IVE
1	EA	MULLION	KR4954	689	VON
1	SET	MULLION SEAL	8780	CHA	ZER
2	EA	EXIT DEVICE	CDSI-AX-98-L-NL-996L-06-PA	626	VON
2	EA	IC RIM CYLINDER	20-057-ICX	626	SCH
2	EA	IC MORT CYL	30-008T FOR DOGGING	626	SCH
1	EA	IC MORT CYL	30-008T FOR MULLION	626	SCH
5	EA	PERMANENT CORE	23-030	626	SCH
2	EA	CLOSER	4040XP EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
2	EA	FLOOR STOP	FS441/442 AS REQUIRED	626	IVE
1	SET	PERIMETER SEALS	1370A HEAD AND JAMBS	AL	ZER
2	EA	AUTO DOOR BOTTOM	355A	AL	ZER
1	EA	THRESHOLD	AS DETAILED	AL	ZER

HW SET: 970

			ALL HARDWARE BY GATE MANUFACTURER		B/O

HW SET: 972

1	EA	CLASSROOM LOCK	L9070T 06A	626	SCH
1	EA	PERMANENT CORE	23-030	626	SCH
			BALANCE OF HARDWARE BY GATE MANUFACTURER		B/O

HW SET: 972.2

1	EA	CLASSROOM LOCK	L9070T 06A	626	SCH
1	EA	PERMANENT CORE	23-030	626	SCH
1	EA	CLOSER	4040XP EDA	689	LCN
1	EA	MOUNTING PLATE	4040XP-18	689	LCN
1	EA	KICK PLATE	BALANCE OF HARDWARE BY GATE MANUFACTURER		B/O

HW SET: 973

			ALL HARDWARE BY GATE MANUFACTURER		B/O

HW SET: 974

2	EA	EXIT DEVICE	CDSI-AX-98-L-NL-996L-06-PA	626	VON
2	EA	IC RIM CYLINDER	20-057-ICX	626	SCH
2	EA	IC MORT CYL	30-008T FOR DOGGING	626	SCH
4	EA	PERMANENT CORE	23-030	626	SCH
1	EA	KICK PLATE			

2	EA	CLOSER	4040XP EDA	689	LCN
2	EA	MOUNTING PLATE	4040XP-18	689	LCN
			BALANCE OF HARDWARE BY GATE MANUFACTURER		B/O

GATE MUST HAVE CENTER POST FOR PANICS TO LATCH TO

HW SET: 975.2

1	EA	CLASSROOM LOCK	L9070T 06A	626	SCH
1	EA	PERMANENT CORE	23-030	626	SCH
2	EA	CLOSER	4040XP EDA	689	LCN
2	EA	MOUNTING PLATE	4040XP-18	689	LCN
			BALANCE OF HARDWARE BY GATE MANUFACTURER		B/O

END OF SECTION

SECTION 08 8000

GLAZING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Glass and glazing as indicated.

B. Related Requirements:

1. Division 01 - General Requirements.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's descriptive literature and installation recommendations for glass, glazing, and accessories.

B. Material Samples: Submit 6-inch square units of each type of glass specified.

1.03 QUALITY ASSURANCE

A. Labeling: Label each piece of glass and glazing and mirrors with manufacturer's name, and the grade or quality of the material. Labels shall be intact before and after installation. Fire-protection-rated glazing shall bear a label or other identification in accordance to CBC 715.5.

B. Comply with the following as a minimum requirement:

1. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.

2. ASTM C1036 - Standard Specification for Flat Glass.

3. ASTM C1048 - Standard Specification For Heat-Treated Flat Glass —Kind HS, Kind FT Coated and Uncoated Glass.

4. CPSC 16 CFR 1201 - Safety Standards for Architectural Glazing Materials issued by the Consumer Products Safety Commission.

5. GANA - Glazing Manual.

C. Qualifications of Installer: Minimum five years experience installing glass in projects of similar scope and complexity.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver glass and glazing materials with manufacturer's labels intact.

B. Do not remove labels until glass has been installed and inspected by the Project Inspector.

C. Protect glass from staining, marking, and damage.

D. Provide Factory glazed units.

1.05 PROJECT CONDITIONS

A. Perform glazing when ambient temperature is above 40 degrees F.

B. Perform glazing on clean, dry surfaces only.

1.06 WARRANTY

A. Manufacturer shall provide a ten year material warranty.

B. Manufacturer shall provide a twenty year material warranty for coatings and thermally or acoustically rated insulation units against deterioration in acoustic or thermal rating.

C. Installer shall provide a three year fabrications and installation warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS AND FABRICATORS

A. To maximum extent possible, provide domestically manufactured and fabricated glass, and provide glass from one manufacturer.

Acoustical Rating Required: STC 40 shall be required as indicated on the window schedule.

Description of Acoustic Window Assembly: Glass type ‘GL-1’ shall be 1-1/8” Insulated Vision Glass Thickness (1/4” Gray or Frosted – 0.50” Air Space [Mill Finish Spacer] – 3/8” Laminated Glass (the Laminated Glass utilizes a .03” interlayer). Frosted Panel locations shall be only as noted on Building Elevation sheets AA301, AA302, AB301 and AC301.

B. Types of glass specified or indicated shall be manufactured or fabricated by one of the following:

1. Pilkington LOF (fire rated glazing).

2. PPG Glass Technology.

3. Visteon Float Glass Operations.

4. Viracon.

5. Southwest Technologies.

2.02 GLASS MATERIALS

A. General: Conform to ASTM C1036, ASTM C1048 and to ANSI Z97.1. Label factory cut panes.

B. Float Glass: Type I, (transparent glass flat), Class 1 (clear), Quality q3, (glazing select), minimum 1/4 inch thickness unless otherwise indicated or required.

C. Tempered Glass: Condition A (uncoated surfaces), Type I or II, Class 1, Quality q3 (glazing select), Kind FT (fully tempered glass), match color of clear or tinted glass as applicable; fully thermal tempered, heat strengthening or chemical tempering is not permitted. Perform tempering by horizontal oscillating roller hearth or high speed roller hearth process. Do not permit fabrication processes leaving gripper or tong marks. Handle and size glass according to manufacturer's written instructions.

D. Clear Laminated Glass: Two layers of 1/8 inch clear float glass with 0.030 inch thick high strength polyvinyl butyral laminating sheet.

E. Low Emissivity Glass (Low E Glass): Provide units with thin metallic high-transmittance coating applied to the number 2 surface of the unit, unless otherwise indicated. The U-value for the IGU shall be no greater than 0.29, unless otherwise indicated.

F. Obscure Glass: Type II (patterned), Class 1 (clear), Form 3 (patterned), Quality q7 (decorative), patterned one side, pattern as indicated or selected.

2.03 GLASS SETTING MATERIALS

A. Setting Blocks: ASTM C864, channel shape; having ¼ inch internal depth, Shore A hardness of 80 to 90 Durometer. Blocks shall be a minimum 2 inch long. Block width shall be approximately 1/16 inch less than the full width of the rabbet. Block thickness shall be at least 3/16 inch, sized for rabbet depth as required.

B. Spacers: ASTM C864, channel shape, with ¼ inch internal depth, 3/32 inch flanges, eb, 1/8 inch thick, one to 3 inches long. Spacers shall provide Shore A hardness of 40 to 50 Durometer.

C. Glazing Tape: Poly-isobutylene based sealant tape, conforming to AAMA 804.1, with adhesive one side protected by temporary paper cover, Extru-Seal manufactured by Pecora Corp., No. 303 by Protective Treatments, Inc., or equal.

D. Glazing Points (Sprigs): Pure zinc stock, thin, flat, triangular or diamond-shaped pieces, 1/4 inch minimum size.

E. Glazing Sealants for Metal Sash: GE Silicones Silglaze II 2800, GE Silicones Silpruf, GE Silicones 1200 Silicone, and Dow Corning 999A. Polybutylene, oleoresinous, asphalt, and oil base sealants are not permitted. Provide sealant of same color as structural silicone sealant unless otherwise required.

F. Glazing Compounds and Sealants for Thermoplastic: Provide silicone, butyl, or polysulfide glazing compound.

PART 3 - EXECUTION

3.01 TOLERANCES

A. Thickness indicated or specified are nominal within standard tolerances. Maximum size of vertical panes shall not exceed the following:

Float Thickness:	1/8 inch	3/16 inch	1/4 inch
Maximum Areas in Square Feet:	12	16	20

When exceeding these square foot measurements glass is to be safety glazed.

3.02 INSTALLATION, GENERAL

A. Glazed cabinet doors, windows, transoms, and fixtures, not otherwise noted or indicated, shall be glazed with clear float glass.

B. Obscure glass in exterior openings shall be installed with smooth side of glass to weather. Patterned glass shall be installed with pattern running vertically, unless otherwise indicated.

C. Glazing tapes or sealants shall be installed wherever glass contacts wood or metal surfaces. Width of strips shall be as required.

D. Glazing compound shall be neatly and cleanly installed in straight lines, even with inside edge of sash members. Thumb puttying is not permitted.

E. Speak holes shall be installed according to glass manufacturer's written recommendations.

3.03 INSTALLATION OF GLASS

A. Conform to requirements of GANA Glazing Manual.

B. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.

C. Provide compressible filler rods or equivalent back-up material to prevent sealant from extruding into glass channel weep systems, from adhering to back surface of joints and to control depth of sealant for optimum performance.

D. Force sealants into glazing channels, in manner to eliminate voids and to ensure complete bond of sealant to glass and channel surfaces.

E. Tool exposed surfaces of sealants to provide for drainage away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel to eliminate dirt and moisture pockets.

F. Where dry glazing of aluminum frame is indicated or permitted, provide vinyl glazing channels installed in accordance with frame manufacturers written recommendations. Do not stretch channels. Miter corners.

G. For tape glazing, furnish tape of thickness to provide approximately 30 percent compression. Cut tape to proper length and install to permanent stops, the entire length of the head and sill first, then to jambs. Butt tape together with no overlap and remove paper backing. Install glass on setting blocks at quarter points and maintain uniform

glass edge clearance around entire perimeter of glass. Maintain manufacturer's recommended edge clearance and bite on glass. Install glass firmly into tape with a slight lateral movement to assure proper adhesion. Install tape to removable stop with evenly distributed firmness, smoothing out wrinkles in tape. Secure removable stop in proper position so tape makes contact with glass as stop is installed, forcing contact with glass and completely sealing joint. Remove excess tape from both sides at slight angle over sight line. Do not undercut.

3.04 PROTECTION AND CLEANING

A. Protect exterior glass from breakage by furnishing crossed streamers attached to framing and away from glass surface. Do not directly install markers to glass surfaces. Remove non-permanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less often than once a month, for build-up of dirt, scum, alkali deposits or staining. When examination reveals presence of these forms of residue, remove by method recommended by glass manufacturer. Glazing, which cannot be cleaned to a required condition, shall be deemed defective Work.

D. Remove and replace glass, which is broken, chipped, cracked, abraded, or damaged during construction.

E. Remove protective covering from thermoplastic not more than 4 days before Substantial Completion, and immediately before cleaning. Methods of final cleaning and finishing shall be as prescribed by thermoplastic glazing publications referenced above.

F. Wash glass on both faces not more than four days before Substantial Completion. Wash glass by method recommended by glass manufacturer. Do not furnish harsh cleaning agents, caustics, abrasives, or acids for cleaning. Polish glass both sides and leave free of soil, streaks, and labels.

3.05 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.06 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 08 8716

ANTI-GRAFFITI CONTROL FILM

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Anti-graffiti control film applied over new restroom tile.

B. Related Requirements:

1. Division 01 – General Requirements.

2. Section 08 8000: Glazing.

1.02 RELATED REQUIREMENTS

A. ASTM D882 – Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

B. ASTM D1044 – Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion.

C. ASTM D4830 -- Standard Test Methods for Characterizing Thermoplastic Fabrics Used in Roofing and Waterproofing.

D. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

E. ASTM E903 - Effect of Coating Variables on Total Solar Reflectance and Emissivity of Polymer Coated Metal Panels.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, catalog cuts, and other data to demonstrate compliance with the specified requirements.

B. Material Samples: Submit Samples of film installed on glass; minimum Sample size 8 by 11.

C. Quality Control Submittals:

1. Certificates: Manufacturer’s certification that the installer has been trained for the installation of the specified films.

2. Installers Qualifications: Submit list of installations completed within the past three years; provide owners contact information.

3. Manufacturer’s installation instructions.

D. Closeout Submittals: Maintenance, cleaning and replacement instructions.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall have been engaged in the fabrication of anti-graffiti control films for a minimum of five years.

B. Installer Qualifications: Installer shall be trained by the film manufacturer and have been regularly engaged in the installation of such film for at least three years.

C. Mockups: Install anti-graffiti film to window glazing as directed by OAR for installation evaluation. Obtain mockup approval prior to continuing with the remainder of the work.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the Project site with manufacturer's labels intact and legible.

B. Protect film from damage.

1.06 SITE CONDITIONS

A. Maintain temperature, humidity and ventilation within limits recommended by film manufacturer.

1.07 WARRANTY

A. Manufacturer shall provide a one year material warranty for products installed outdoors, and a 15 year warranty for products installed indoors.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Provide products manufactured by one of the following:

1. 3M.

2. CPFilms Inc., LLumar Films.

3. Huper Optik USA.

2.02 PHYSICAL AND MECHANICAL PROPERTIES

A. Film Thickness:

1. 4 mils.

2. 6 mils.

B. Scratch Resistance: Film shall have 5 percent maximum haze increase when tested to ASTM D1044.

C. Surface Burning Characteristics: When tested in accordance to ASTM E84 shall not exceed the following values:

1. Flame spread index: 25 maximum.

2. Smoke Development Index: 450 maximum.

D. Puncture Strength when tested per ASTM D4830: .Minimum of 79 pounds for the 4 mil film and 110 for the 6 mils.

E. Physical Properties when film is applied on a 1/8 inch clear glass and tested in accordance to ASTM E903:

1. Shading Coefficient: 0.97 for the 4 mils films and 0.95 for 6 mils.

2. Visible Light Transmission: 86 to 89 percent.

3. Solar Transmission: 81 percent for 4 mils and 79 percent for 6 mils.

4. Solar Absorption: 10 percent for 4 mils and 13 percent for 6 mils.

5. Solar Reflection: 9 percent for 4 mils and 8 percent for 6 mils.

6. UV Transmission: Less than 5 percent.

F. Tensile properties when tested in accordance to ASTM D882:

1. Minimum Tensile Strength of Film: 30,000 pounds per square inch.

2. Minimum Elongation at Break: 100 percent.

3. Minimum Break Strength: 130 pounds per inch.

2.03 ACCESSORIES

A. Provide accessories, such as adhesive, sealants and cleaners, primers and sealers as recommended by film manufacturer and compatible for application indicated and surfaces in contact.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine glass surfaces to receive film and verify that they are free from defects and imperfections, which will affect installation. Correct such deficiencies before starting film installation.

3.02 PREPARATION

A. Window frames shall be checked for dirt, dust, and other debris. Frames shall be cleaned and vacuumed. Window surfaces shall be cleaned with a commercial cleaner recommended by manufacturer.

B. Window surfaces to receive anti-graffiti control film shall be bladed with one sided razor blade with blade holder for the purpose of removing particulate matter on glass surface.

C. Protect window frame from damage generated by film application.

3.03 INSTALLATION

A. Film shall be installed in strict accordance with manufacturer's written instructions.

B. After final squeegee technique, film shall be flat with no visible concentrations of moisture.

C. Film edges shall be cut neatly and square at a uniform distance of 1/8 inch maximum of the window sealing device.

D. Installed film shall be free of any creases or tears once installed to designated interior window surfaces.

E. Treated interior film surface shall be clean and free of soap residue and squeegee marks.

F. If film has a dimpled appearance from residual moisture, moisture shall dry flat with no moisture dimples within a 30 day period after the date of Substantial Completion.

3.04 CLEANING

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.05 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 2423

CEMENT PLASTER AND METAL LATH

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Lath and Portland cement plaster and stucco.

2. Scratch coat plaster as a substrate for ceramic wall tile.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 06 1000 - Rough Carpentry.

3. Section 09 3013 - Ceramic Tiling.

1.02 DESIGN REQUIREMENTS

A. Provide pre-formulated finish coat products that require only addition of clean water for mixing.

1.03 SUBMITTALS

A. Shop Drawings: Submit elevations and details indicating locations and types of components, splices, connections and accessory items. Indicate locations and types of framing substrates.

B. Material Samples: Submit minimum 48-inch by 48-inch samples of each stucco and Portland cement plaster texture for review. Samples shall be representative of texture, color, and proposed fabrication and finish quality. Maintain reviewed Samples on Project site for reference.

C. Product Data: Submit manufacturer's catalog data for each material and component proposed for installation.

D. Certificates: Furnish manufacturer's certification that materials meet or exceed Specification requirements.

E. Mock-ups: Provide a mock-up at least 10-foot by 10-foot by 1 foot. Include at least one control joint and, corner condition and one window opening flashing. Locate where required by the Architect.

1.04 QUALITY ASSURANCE

A. Coordinate with related Work to provide backing support for items mounted on finished surfaces and to provide allowances for pipes and other items in wall cavities.

B. Comply with the following ASTM Standard Specifications as a minimum requirement:

1. ASTM A641 – Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

2. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

3. ASTM C150 – Standard Specification for Portland Cement.

4. ASTM C206 – Standard Specification for Finishing Hydrated Lime.

5. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring.

6. ASTM C842 – Standard Specification for Installation of Interior Gypsum Plaster.

7. ASTM C847 - Standard Specification for Metal Lath.

8. ASTM C897 – Standard Specification for Aggregate for Job Mixed Portland Cement-Based Plasters.

9. ASTM C926 – Standard Specification for Application of Portland Cement-Based Plaster.

10. ASTM C933 – Standard Specification for Welded Wire Lath.

11. ASTM C932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering.

12. ASTM C1032 - Standard Specification for Woven Wire Plaster Base.

13. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.

14. ASTM C1509 - Accessories for Gypsum Wallboard and Gypsum Veneer Base.

C. Exterior and Interior Lath: Where lath is fastened to wood supports, comply with CBC requirements.

D. Plaster: Conforming to requirements of the Portland Cement Plaster (Stucco) Manual published by the Portland Cement Association.

E. Metal Lath: NAAMM Standard ML/SFA 920 Guide Specifications for Metal Lath and Furring.

1.05 DELIVERY, STORAGE AND HANDLING

A. Protect metal lathing and plastering materials before, during and after installation. In event of damage immediately provide required repairs and replacements.

B. Deliver and store Portland cement materials on the Project site in a manner to provide protection from exposure and damage by moisture.

C. Pile materials to permit easy access for proper inspection and identification of each shipment. Stockpile adequate supplies of sand on the Project site to permit sampling and testing before installation. Store to avoid inclusion of foreign material.

D. Deliver plaster materials to the Project site in manufacturer's sealed and labeled packages.

PART 2 - PRODUCTS

2.01 LATH AND ACCESSORY MATERIALS

A. Each bundle of lath shall be sealed with a metal tag bearing the lath designation, weight and manufacturer's name.

B. Water Repellant Backing:

1. Weather-exposed for Horizontal Surfaces: W.R. Grace & Co., "Bituthene 4000" sheet, 0.060 inch thick, consisting of polyethylene sheet and rubberized asphalt, self-adhering, W.R. Meadows, Inc., Protecto Wrap Company, or equal.

2. Flashing and back-up for joints and reveals: W.R. Grace Vycor Ultra, Protecto Wrap Co. Protecto Jiffy Seal Ice & Water Guard HT, Carlisle Construction Materials, WIP 300HT, or equal.

C. Adhesives and sealers for water repellant backing: Types as recommended by manufacturer for installation with specified membrane sheet.

D. Expanded Metal Lath: ASTM C847, small diamond mesh expanded metal lath, 3.4 pounds per square yard, expanded from steel sheets with hot-dip galvanized coating G60 in accordance with ASTM A653. Lath shall be V-grooved self-furring type for installation over sheathing and flat type for installation over spaced framing. Install 3/8 inch ribbed lath when framing is over 24 inches on center.

E. Weather Resistive Backing for Metal Lath: Laminated water resistant Kraft paper backing conforming to Fed Spec UU-B-790A, Type 1, Grade D60, manufactured by Fortifiber, Davis Wire, Leather back, or equal. Furnish for exterior plastering (except on soffits and ceilings), and for mortar-set ceramic wall tile.

F. Polypropylene Fabric Backing for Metal Lath: Tyvek, Typar, or equal.

G. Cornerite and Striplath: Flat or shaped lath reinforcing units, galvanized expanded metal weighing no less than 2.5 pounds per square yard, with 3 inch legs when formed for angle reinforcement and 2 inch minimum legs for galvanized wire type.

H. Plastering Accessories: Minimum 0.0172 inch galvanized steel or 0.0207 zinc alloy with expanded wings. PVC is not permitted. Furnish casing beads, expansion and control joints, weep and vent screeds.

1. Exterior Stress Relief Joints: Sizes and profiles, indicated or required. Control joints shall have expanded wings. Manufactured by Amico, Cemco, Dietrich, Keene or Superior.

a. Expansion Joints: Two piece sections designed to accommodate expansion, contraction and shear forces.

b. Control Joints: One-piece sections, with integral wings, installed as indicated on drawings, where cracks can be expected.

2. Drip Screed: Similar to Superior No. 10.

3. Casing Beads: Expanded flange type with minimum 7/8 inch grounds to establish plaster thickness.

4. Exterior Corner Reinforcement: Welded-wire type as manufactured by Stockton Products, Tree Island Industries Ltd., Jaenson Wire, or equal.

5. Ventilating Screeds: Alabama Metal Industries, or equal, soffit vent screed, perforated web type, with integral plaster grounds.

6. Foundation Weep Screeds: Alabama Metal Industries, or equal, integral plaster ground and weep screed.

I. Fasteners:

1. Screws: USG corrosion resistant.

a. Type S or S-12 for metal studs.

b. Type A for wood and metal studs 0.033 to 0.018 inches thick.

2. Wire for fastening lath to metal framing, fastening lath together and fastening corner beads, metal grounds and base screeds to lath and framing shall be 0.043 inch, galvanized conforming with ASTM A641.

3. Nails: 0.116 inch diameter galvanized roofing nails, 7/16 inch head, barbed shanks, 1 ½-inch long for horizontal application and providing a minimum of ¾ inch penetration for vertical surfaces. Furnish fiber wadded furring nails for attaching lath to wood sheathing unless self-furred type of plaster reinforcement is accepted.

4. Power driven nails shall be used for attaching lath to concrete and concrete masonry. Nails shall be a code recognized fastener such as Pneutek, Inc. fasteners or equal. Each fastener shall provide minimum withdrawal resistance of 50 pounds minimum.

5. Staples: Minimum ¾ inch crown, 0.053 inch galvanized steel. Staples shall have sufficient length to penetrate studs at least ¾ inch.

J. Wire: Galvanized soft-annealed steel wire in conformance to ASTM A641.

1. Hanger wire for suspended ceilings, minimum 0.144 inch diameter.

2. Wire for fastening metal channels together, 0.064 inch diameter.

3. Wire for fastening lath to supports, tying ends and edges of lath sheets, and securing accessories to lath, 0.048 inch diameter.

2.02 PLASTER MATERIALS

A. Portland Cement: ASTM C150, Type II, low alkali.

B. Hydrated Lime: ASTM C206, Type S.

C. Sand: Washed natural sand conforming to ASTM C897, except gradation of sand shall be as follows:

Percentage retained, each sieve, by weight:

Sieve Size	Maximum	Minimum
No. 4	0	0
No. 8	10	0
No. 16	40	10
No. 30	65	30
No. 50	90	70
No. 100	100	95

D. Water: Clean, potable and from domestic source.

E. Exterior Finish Coat Plaster: Shall consist of one of the following systems:

1. Three Coat Systems: Mineral Stucco as fabricated by California Stucco, La Habra, Highland Stucco, Merlex, Omega Stucco, Inc, or equal. Furnish formulations requiring only addition of water for installation. Sand shall pass Number 20 sieve. Mix and sand shall provide light dash finish. Furnish integral colored stucco in color as selected by Architect.

2. Two or Three Coat Systems: Controlled pre-mix with manufacturer's additives, as fabricated by The Quikrete Companies, SPEC MIX, Omega, EXPO Stucco or OEHS approved equal. Furnish formulations requiring only addition of water for installation. Sand shall pass Number 20 sieve. Mix and sand shall provide specified finish. Furnish integral colored stucco finish coat in color selected by the Architect.

F. Interior Gypsum Plaster:

1. Base Coat: Structo-Lite by US Gypsum, Goldbond Gypsolite Plaster by National Gypsum, or equal.

2. Finish Coat: Smooth finish or textured finish as indicated, Red Top Gypsum Plaster by USG, Kal-Kote by National Gypsum, or equal.

3. Apply gypsum plaster in accordance to ASTM C842.

G. Plaster Bonding Agent: "Weld-Crete", manufactured by Larsen Products Co., Upco/Div., Emhart Corp. Bonding Adhesive No. 705, or Merlex Stucco "Acrylex," or equal.

H. Base Coat Reinforcement: Alkali resistant fiberglass shorts, ½ inch chopped strands, Type AR, manufactured by OCF, PPG Industries, or equal.

I. Plaster Patching Materials:

1. Bonding Agent: Acrylic resin type, Acryl 60, LHP Bonder, or equal.

2. Patching Plaster: Manufactured by Merlex Stucco, Inc., or equal. Furnish fast setting, compatible with existing plaster materials, "Exterior Pronto Patch," Portland cement base coat material, requiring only addition of water. Material shall provide initial set within 20 minutes and final set within one hour.

J. Underlayment: Single ply self-adhesive waterproofing membrane as manufactured by W.R. Grace Company, Jiffy-Seal by Protecto Wrap, W.R. Meadows, Inc., or equal. Furnish for installation behind stress relief joints and backing on horizontal and vertical surfaces exposed to weather; under metal copings and flashings; and window jambs and sills.

K. Miscellaneous Material: Provide additional components and materials required for a complete installation.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that overhead or concealed Work is finished, completed, tested and inspected as required before starting Work of this Section.

3.02 INSTALLATION-WEATHER BARRIER MEMBRANE

A. Install one layer of underlayment over areas to receive lath with weather barrier membrane. Install horizontally with each course weather lapped 2 inches over layer below and 6 inches on ends. Install two layers of Kraft paper over wood sheathing; second layer shall lap the first layer.

B. Install lath over underlayment in accordance with manufacturer's instructions. Repair and seal tears and holes in weather barrier prior to applying plaster.

C. Install single ply self-adhesive waterproofing membrane per manufacturer‘s recommendations in areas indicated on the Drawings.

D. Flashing Around Openings: Install self-adhering, self-sealing membrane to make openings weather tight in accordance with details shown on drawings.

3.03 LATH INSTALLATION

A. General: Where exterior and interior lath is fastened to horizontal wood supports, the current edition of the CBC shall be complied with. Refer to Section 01 4523 - Testing and Inspection.

B. Exterior Lathing, General: Comply with requirements of ASTM C1063 and ML/SFA 920, whichever is more restrictive.

1. Application of Metal Lath: Metal lath or wire fabric lath shall be installed in accordance with the provisions of CBC current editions. Lath shall be furred out from vertical supports or backing not less than ¼ inch.

2. Self-furring lath meets furring requirements. Furring of expanded metal lath is not required on supports providing a bearing surface width of 1 5/8-inch or less.

3. Where external corner reinforcement is not installed, lath shall be furred out and carried around corners, extending and fastened to at least one support.

4. A weep screed shall be provided at or below foundation plate line on exterior stud walls. Screed shall be installed a minimum of 4 inches above grade and shall be of a type permitting water to drain to exterior of building. Weather-resistant barrier and exterior lath shall cover and terminate on attachment flange of screed.

5. Ends of lath on open framing (unsheathed) shall occur over supports. Where necessary, install additional studs to provide support for lath ends and support for separate flanges of stress relief joints.

C. Interior Lathing, General:

1. Applications of Metal Lath: Type and weight of metal lath, and gage and spacing of wire in welded or woven lath, spacing of supports, and method of fastening to wood supports shall be as set forth in CBC Section 2507.

2. Metal lath shall be fastened to metal supports with specified tie wire spaced not more than 6 inches apart or with other recognized fasteners.

3. Metal lath or wire fabric lath shall be installed with long dimension of sheets perpendicular to supports.

4. Metal lath shall be lapped not less than ½ inch at sides and 1 inch at ends. Wire fabric lath shall be lapped not less than one mesh at sides and ends, but not less than 1 inch. Rib metal lath with edge ribs greater than 1/8 inch shall be lapped at sides by nesting outside ribs. When edge ribs are 1/8 inch or less, rib metal lath may be lapped ½ inch at sides, or outside ribs may be nested. Where end laps of sheets do not occur over supports, they shall be securely fastened together with specified tie wire.

5. "Cornerite" shall be installed in internal corners to retain position during plastering. "Cornerite" may be omitted when lath is continuous or when plaster is not continuous from one plane to an adjacent plane.

6. Install minimum 5-inch by 16-inch strips of metal lath diagonally at corners of openings in walls.

3.04 PLASTER APPLICATION - GENERAL

A. Proportion, mix, apply, and cure plaster in conformance with ASTM C926.

B. Install each plaster coat to an entire wall or ceiling panel without interruption to avoid cold joints and abrupt changes in uniform appearance of succeeding coats. Wet plaster shall abut existing plaster at naturally occurring interruptions in plane of plaster (such as corner angles, openings and control joints) wherever possible. Cut joining, where necessary, square and straight and at least 6 inches away from a joining in preceding coat.

C. Provide sufficient moisture or curing methods to permit continuous and complete hydration of cementitious materials, considering climatic and Project site conditions. If water cured, each basecoat shall be continuously damp for at least 48 hours, including weekends and holidays. Other curing methods, spray applied curing compounds such as Expo-Cure, or OEHS approved equal are permitted.

D. Provide sufficient time between coats to permit each coat to cure or develop enough rigidity to resist cracking or other damage when next coat is installed.

3.05 EXTERIOR PLASTERING

A. Concrete surfaces, except where noted as "Exposed Concrete" or "Painted Concrete," shall be finished with stucco light dash finish coat, as specified.

B. Preparation of Surfaces:

1. Exterior concrete and masonry surfaces to be plastered shall be free of oily or waxy substances, and loose or foreign material. Uniformly spray with nozzle-type water spray at least 12 hours before installation of plaster.

2. Concrete and masonry surfaces to receive two coat application of 5/8 inch thick Portland cement plaster shall be treated with bonding agent. This surface preparation shall not be installed instead of a brown coat of plaster.

3. Concrete surfaces to receive stucco dash finish shall be lightly sandblasted to provide a roughened surface.

4. Verify that lath has been installed securely and that grounds, screeds, casing beads and other accessories are straight, in correct position, and securely fastened in place.

C. Number of Coats and Thickness: Exterior plaster shall be Portland cement as follows with minimum thickness from face of supports or surfaces to finish face of plaster as follows:

1. Lathed Surfaces:

a. Three coats, scratch, brown and finish, 7/8 inch thick, one inch thick where required by CBC.

b. Two coats, controlled pre-mix single base coat and finish, 7/8 inch thick, one inch thick where required by CBC.

2. Plaster Dash and Finish Coats: two coats, 1/8 inch thick.

3. Concrete and Masonry Base: two coats, brown and finish, 5/8 inch thick.

D. Proportions:

1. Proportion ingredients for Portland cement. Calibrated boxes are required to determine the accuracy of proportioning. Proportions shall adhere to current edition of CBC.

2. Dash Bond Coat: Mixed in the proportion of 1 cubic foot of standard Portland cement to 1 ½ cubic feet of sand. Omit dash coat when bonding agent is used.

3. Stucco Finish: Stucco shall be factory prepared, exterior type, colored stucco containing a Portland cement base, required aggregates and mineral pigments. Colors shall be as selected by the Architect. Selected colors are not limited to standard stock colors and certain Work, such as ceilings, soffits and walls, may be finished in non-standard colors as selected.

4. Acrylic Based Stucco Finish: Shall be factory prepared exterior type, acrylic based colored stucco finish. Colors and textures shall be as selected by the Architect.

E. Mixing: Provide plaster mix: cementitious materials and aggregate in proportions specified, furnishing only sufficient water to obtain proper consistency before installation. Do not mix any more material at any time than can be installed within 1/2 hour after mixing. Do not allow material to remain in mixer or mixing boxes overnight.

F. Application:

1. Dash Bond Coat: on concrete or masonry surfaces, leave undisturbed, and maintain damp for at least 24 hours following installation. Omit Dash bond coat when liquid bonding agent is used.

2. Scratch Coat: Install with sufficient material to completely cover laths and scratch across supports.

3. Brown Coat: Rod to a straight, true, even within 1/8 inch tolerance in 5 feet of surface and float to receive finish coat.

4. Single Base Coat: As an alternative to scratch and brown coats, apply in conformance to ASTM C926.

5. Stucco Finish Coat: Install in two coats to a total thickness of 1/8 inch, each coat covering surface uniformly. First coat shall completely cover basecoat with uniform color. Second color shall provide a uniform texture.

    a. First coat shall be installed by providing several passes with nozzle to completely cover surface.

    b. The second coat shall be installed by doubling back same day, when first coat is sufficiently dry.

    c. Over concrete surfaces, second coat shall be installed 24 hours after installation of first coat. In warm weather, first coat shall be cured by light water spray after material has set.

    d. Protection: Protect those surfaces, which are not to receive dash finish coats. Such surfaces shall be shielded and shall have any sand left from dashing operation removed.

    e. Provide smoothed plaster finish to comply with ADA requirements behind handrails.

G. Curing Exterior Plaster: Adhere to current edition of CBC for curing requirements.

H. Option for Machine Application, Scratch and Brown Coats, or Single Base Coat: Instead of hand installed plaster, the furnishing of plastering machines for interior or exterior scratch and brown coats or single base coat is permitted. Machine installation shall be in accordance with the following:

1. Qualifications: Provide proper equipment and apparatus.

2. Apparatus: Pump shall be equipped with an air pressure gage and required safety devices. Hoses and connections shall be tight and pressure shall be maintained constant.

3. Proportion and Application: Proportioning, mixing, number of coats and thickness shall be same as specified for hand application. Cement aggregate and

water shall be mixed to plaster machine. Plaster mix shall be projected into and conveyed through a hose to the nozzle at end of hose and deposited by pressure in its final position ready for manual straightening and finishing.

4. Follow-Up: Perform scoring operation of plaster, based on settings and drying conditions at time of installation. Curing shall be as previously specified.

5. Protection: Before installing any plaster, thoroughly protect other adjacent Work.

3.06 INTERIOR PLASTERING

A. Portland Cement Plaster, Scratch Coat: Install to vertical lathed surfaces where ceramic tile is indicated, and install Portland cement plaster finishes where indicated.

B. Sequence of Operations: Plastering in rooms and spaces where acoustical units are to be installed shall be completed first.

C. Preparation for Plastering:

1. Verify that lath has been installed securely and that grounds, screeds, casing beads and other accessories are straight, in correct position, and securely fastened in place.

2. Bonding Agent: Install to vertical concrete or masonry surfaces to receive ceramic tile.

3. Concrete and masonry surfaces on which suction must be reduced shall be sufficiently moistened before plastering operations start.

4. Install galvanized expanded metal lath on supports in conformance with requirements of ASTM C1063 and CBC.

D. Number of Coats and Thickness: Interior plastering to receive paint shall consist of the following, with thickness measured from face of supports or surface:

1. On Concrete or Masonry: two coats, brown and finish, 5/8 inch thick.

2. On Metal Lath: three coats, scratch, brown and finish 7/8 inch thick.

E. Proportions for Interior Plaster: Adhere to current edition of CBC for proportions and curing requirements.

1. Admixtures shall be proportioned, mixed and installed in accordance with printed directions of manufacturer.

F. Mix: Provide plaster mix, plaster, and aggregate in proportions specified using only sufficient water to obtain proper consistency and a uniform color before installation. Do not mix any more material at any time than can be installed within ½ hour after mixing. Do not allow material to remain in mixer or mixing boxes overnight.

G. Application:

1. Dash Bond Coat: Dash on surface, leave undisturbed, and maintain damp at least 24 hours following installation. Omit Dash bond coat when liquid bonding agent is used.

2. Scratch Coat: Install with sufficient material to form good keys, thoroughly cover lath, and cross scratch.

3. Brown Coat: Rod to a straight, true and even surface. Brown coat must be 1/16 inch below face of grounds to provide adequate space for finish coat. Float surface to increase density.

4. Smooth Finishes: Install two coats for a thickness between 1/8 inch. Install second coat after finish coat begins to set. Install to a true, even plane and trowel to a smooth finish, free from blemishes.

5. Float Finishes: Install to a thickness between 1/16 inch to 1/8 inch, install and uniformly float to true planes.

6. Plaster Screeds: On metal lath or wire fabric lath, install plaster screeds wherever permanent grounds are too far apart to serve as guides for rodding.

H. Curing Interior Plaster: Adhere to requirements of CBC.

3.07 QUALITY CONTROL

A. Finish interior and exterior plaster to a uniform texture, free of imperfections and flat within 1/8 inch in 5 feet. Form a suitable foundation for paint and other finishing materials. Avoid joining marks in finish coats.

3.08 TESTING

A. Written certification of sand compliance is required. Samples of sand shall be obtained at the Project site. Tests may be performed as deemed necessary by the Project Inspector.

3.09 REPAIR REQUIREMENTS FOR DAMAGED PLASTER

A. Plaster Detached from Framing:

1. Remove loose and broken plaster.

2. Repair or replace damaged water-resistant backing and lath in compliance with specified standards.

3. Remove stucco finish from surrounding area in the same plane by sandblasting.

4. Install a scratch coat and a brown coat mixed with liquid bonding agent instead of water to the areas devoid of plaster.

5. Install a coat of liquid bonding agent to entire wall plane.

6. Install a 1/8 inch thick stucco finish coat to entire wall plane and match existing texture and color.

B. Cracked Plaster 1/8 inch to 1/2 inch:

1. Remove loose material from crack with a wire brush.

2. Fill crack with slurry of stucco and liquid bonding agent.

3. Install a coat of liquid bonding agent to entire wall plane.

4. Install 1/8 inch thick stucco finish to entire wall plane and match existing texture and color.

C. Cracks Larger Than ½ inch - Painted:

1. Remove loose material from crack with a wire brush.

2. Fill crack with slurry of one part Portland cement to three parts masonry or stucco sand and liquid bonding agent to match existing texture of adjacent surface.

3. Paint entire wall plane, color to match existing.

4. Where patching of plaster over existing lath is feasible, fasten loose lath and install new lath with nails at 6 inch centers. Where metal is furnished, lap new lath over existing 6 inches and tie at 6 inch centers. Install paper backings as required, shingled into existing.

5. Patching of Holes, Cracks, and Gouges: Holes, cracks, gouges, missing sections, and other defects in existing improvements shall be patched. For holes over 1 inch in size, cut small sections of lath and place in opening attached to existing material. Install 3 coats of plaster. For holes one inch and smaller, install bonding agent to existing surfaces and neatly fill hole with plaster, installing necessary coats to match adjacent surfaces, eliminate cracks and match existing surface texture. Cracks, gouges, and other defects shall be filled with plaster or spackle as required and neatly finished to match adjacent existing improvements.

3.10 CLEANING

A. Remove rubbish, debris, and waste material and legally dispose of off the Project site.

3.11 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 2900

GYPSUM BOARD

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Gypsum board, sheathing and tile backer systems and accessory.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 06 1000 - Rough Carpentry.

3. Section 07 9200 - Joint Sealants.

1.02 PROJECT REQUIREMENTS

A. Design Requirements: Provide systems capable of resisting deflection as required by CBC and authorities having jurisdiction.

B. Regulatory Requirements: Comply with CBC requirements for design and installation.

1.03 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating complete suspension system including connections, anchorage, and trim features.

B. Material Samples: Submit 18 inch by 18 inch Samples of the texture coat of gypsum board panels with edges taped.

C. Product Data: Submit manufacturer's catalog data for each product proposed for installation.

1.04 QUALITY ASSURANCE

A. Comply with following as a minimum requirement:

1. ASTM C474 - Standard Test Methods for Joint Treatment Materials for Gypsum Board Construction.

2. ASTM C475 – Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

3. ASTM C514 – Standard Specification for Nails for the Application of Gypsum Board.

4. ASTM C840 – Standard Specification for Application and Finishing of Gypsum Board.

5. ASTM C919 – Standard Practice for Use of Sealants in Acoustical Applications.

6. ASTM C954 – Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 inch to 0.112 inch in Thickness.

7. ASTM C1002 – Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

8. ASTM C1047 – Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

9. ASTM C1177 - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

10. ASTM C1178 – Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.

11. ASTM 1325 – Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units.

12. ASTM C1396 – Standard Specification for Gypsum Board.

13. ASTM C1629 - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.

14. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

15. ASTM D3274 - Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Microbial (Fungal or Algal) Growth or Soil and Dirt Accumulation.

16. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

17. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

18. ASTM E695 - Standard Method for Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading.

19. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

20. Underwriters Laboratories (ULI) requirements and listings for fire-rated materials and products classification.

21. GA 214 - Gypsum wallboard finish shall conform to requirements of GA 214, Application and Finishing of Gypsum Panel Products, published by the Gypsum Association, and as specified herein.

22. GA 600 - Gypsum wallboard shall conform to requirements of GA 600 Fire Resistance Design Manual, published by the Gypsum Association.

23. American National Standards for the Installation of Ceramic Tile.

24. ANSI A118.9 - Specification for Cementitious Backer Units.

B. Qualifications: Installer shall have a minimum 5 years experience in installing and finishing gypsum board.

C. CHPS Low-Emitting Materials table: Materials submitted must meet the CHPS Low-Emitting criteria and be listed as Low-Emitting on the following web site: www.CHPS.net.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, factory sealed packages, containers or bundles bearing brand name and name of manufacturer.

B. Materials shall be kept dry. Gypsum wallboard shall be neatly stacked flat; avoid sagging and damage to edges, ends, and surfaces.

C. Fire-rated materials shall have fire classifications numbers attached and legible.

D. Provide all means necessary to protect gypsum board systems before, during, and after installation.

E. Gypsum wallboard showing any evidence of water damage shall not be installed. Gypsum wallboard showing evidence of water damage after installation shall be removed and replaced.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Georgia-Pacific, National Gypsum Co., U.S. Gypsum Co., James Hardie.

2.02 MATERIALS

A. Gypsum Board Type X (fire-resistant): 5/8 inch thick, 4-foot wide and up to 16-foot long conforming to ASTM C1396 with long edges tapered.

GYPSUM BOARD SYSTEM			
Panel	**Fasteners**	**Joint Tape**	**Joint Treatment**
United States Gyp. Co.: 5/8 inch Sheetrock regular, type X, Firecode Core, or Firecode C Core Gypsum panels, as required by UL design.	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S or S-12 drywall screw.	Sheetrock paper tape Heavy Duty to meet ASTM C 475.	Sheetrock Setting Type, Lightweight Setting, Sheetrock Taping, Topping, or All-Purpose, Sheetrock Ready-Mixed Taping, Topping, or All-Purpose, or Sheetrock Lightweight All-Purpose or Ready-Mixed - Plus 3
Georgia-Pacific: 5/8 inch ToughRock regular, Fireguard or Fireguard C gypsum, as required by UL design.	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S or S-12 drywall screw.	Sheetrock paper tape Heavy Duty to meet ASTM C475.	Same as above
National Gypsum Co. 5/8 inch Gold Bond regular, Fire-Shield or Fire-Shield C gypsum wallboard, as required by UL design.	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S or S-12 drywall screw.	ProForm Joint Tape, ProForm Multi-Flex Tape Bead, ProForm Fiberglass Mesh Tape to meet ASTM C 475.	ProForm Multi-Use, ProForm All Purpose, ProForm Lite, ProForm Ultra, ProForm Taping, ProForm Triple-T, ProForm Topping, or ProForm Sta-Smooth, Sta-Smooth Lite, Sta-Smooth HS Joint Compound.

B. Impact Resistant Gypsum Board, Type X (fire-resistant): 5/8 inch thick, 4-foot wide and up to 16-foot long complying with one of the following:

1. Fire resistant rated gypsum core with additives to enhance impact resistance, faced with moisture and mold resistant paper, and complying with ASTM C1396.

2. Fire resistant, high density paperless gypsum with reinforcing fiber mesh.

3. Fire resistant fiberglass-mat faced gypsum board panels

GYPSUM BOARD IMPACT RESISTANT SYSTEMS			
Panel	**Fasteners**	**Joint. Tape**	**Joint Treatment**
United States Gyp. Co.: 5/8 inch Fiberock VHI Gypsum fiber panels.	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S-12 drywall screw.	Sheetrock paper tape Heavy Duty.	Sheetrock Setting compound.
Georgia-Pacific: 5/8 inch DensArmor Plus Impact Resistant Panels	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S-12 drywall screw.	Glass mesh.	Same as above.
National Gypsum Co.: 5/8 inch Hi-Impact XP gypsum wallboard.	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S-12 drywall screw.	ProForm joint tape	Proform XP all-purpose joint compound.

C. Mold and Water Resistant Gypsum Board, Type X (fire-resistant): (Use at elevator shaft interior), 5/8 inch thick 4-foot wide, up to 16-foot long conforming to ASTM C1396 with long edges tapered.

1. Resistance to Mold Growth: Minimum score of "10" when tested in accordance to ASTM D3273 and evaluated in accordance with ASTM D3274.

2. Resistance to Fungi: Maximum score of "0" when tested in accordance to ASTM G21.

GYPSUM BOARD MOLD RESISTANT SYSTEM			
Panel	**Fasteners**	**Joint Tape**	**Joint Treatment**
United States Gyp. Co.: 5/8 inch Sheetrock Mold Tough, Firecode Core, or Firecode C Core Gypsum panels.	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S or S-12 drywall screw.	Glass Mesh.	Setting-type joint compound rated 10 when tested in accordance with ASTM D3273 and evaluated in accordance with ASTM D3274.
Georgia-Pacific: 5/8 inch Dens Armor Plus Fireguard or Fireguard C Interior Panels (Fire-Rated).	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S or S-12 drywall screw.	Same as above.	Same as above.
National Gypsum Co.: 5/8 inch Gold Bond XP regular, Fire-Shield or Fire-Shield C gypsum wallboard.	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S or S-12 drywall screw.	Same as above.	Same as above.

D. Gypsum Liner, Type X (fire-resistant): 1 inch thick 24-inch wide, up to 14-foot long, conforming to ASTM C1396 or C1658.

1. Resistance to Mold Growth: Minimum score of "10" when tested in accordance to ASTM D3273 and evaluated in accordance with ASTM D3274.

2. Resistance to Fungi: Maximum score of “0” when tested in accordance to

ASTM G21.

GYPSUM BOARD SHAFTWALL SYSTEMS			
Panel	**Fasteners**	**Joint. Tape**	**Joint Treatment**
United States Gyp. Co.: 5/8 inch Mold Tough Type X Firecode Core, Gypsum panels, ¾ inch Mold Tough Ultracode Core and 1 inch Mold Tough Liner panels.	1 ¼-inch, 1 5/8-inch, or 2 ¼-inch Type S or S-12 drywall screw.	Glass Mesh.	Setting-type joint compound rated 10 when tested in accordance with ASTM D3273 and evaluated in accordance with ASTM D3274.
Georgia-Pacific: 5/8 inch ToughRock Fireguard, or ToughRock Fireguard, C gypsum board or DensArmor Plus Fireguard or Fireguard C Interior Panels (Fire-Rated) and 1 inch DensGlass Ultra Shaftliners panels.	1 ¼-inch, 1 5/8-inch, or 2 ¼-inch Type S or S-12 drywall screw.	Same as above.	Same as above.
National Gypsum Co.: 5/8 inch Gold Bond regular, Fire-Shield or Fire-Shield C gypsum wallboard and 1 inch Gold Bond Fire-Shield Shaftliner.	1 ¼-inch, 1 5/8-inch, or 2 ¼-inch Type S or S-12 drywall screw.	ProForm XP all-purpose joint compound.	Same as above.

E. Tile Backer Board, Type X (fire-resistant):

1. Water resistant panels, 5/8 inch thick, 4-foot wide and up to 8-foot long conforming to conforming to one of the following requirements:

   a. Aggregated Portland cement board with polymer-coated, woven glass-fiber mesh embedded in front and back surfaces.

   b. Fiberglass-mat faced gypsum backing board complying with ASTM C1178.

   c. Cementitious board surfaced with fiberglass reinforcing mesh on front and back and complying with ANSI A118.9 and ASTM C1325.

2. Tile backer boards shall meet the following requirements:

   a. Resistance to Mold Growth: Minimum score of "10" when tested in accordance to ASTM D3273 and evaluated in accordance with ASTM D3274.

   b. Resistance to Fungi: Maximum score of "0" when tested in accordance to ASTM G21.

TILE BACKER BOARD SYSTEMS			
Panel	**Fasteners**	**Joint. Tape**	**Joint Treatment**
United States Gyp. Co.: 5/8 inch DUROCK Cement Board.	Wood: 1 ½-inch galvanized roofing nails or 1 1/4-inch 1 5/8 inch, or 2 ¼-inch DUROCK No. 8 wood screws. Steel:1 1/4-inch or 1 5/8 inch DUROCK No. 8 screws.	DUROCK glassfiber tape.	ANSI A136.1 Type I: Organic adhesive or ANSI A118.1acrylic latex modified dry-set mortar or ANSI A118.4 Latex Portland cement mortar.
Georgia-Pacific: 5/8 inch DensShield Fireguard Tile Backer.	Wood: 1 ¾-inch galvanized roofing nails or 1 5/8 inch Buglehead corrosion resistant, course thread, drywall screws. Steel: 1 1/4-inch Buglehead, corrosion resistant, fine thread, drywall screws.	2-inch wide fiberglass mesh tape.	ANSI A136.1 Type I: Organic adhesive or ANSI A118.1 acrylic latex modified dry-set mortar or ANSI A118.4 Latex Portland cement mortar.
National Gypsum Co.: 5/8 inch PermaBase Brand Cement Board.	Wood: 1 ½-inch galvanized roofing nails or 1 1/4-inch or 1 5/8 inch, PermaBase corrosion resistant screws. Steel: 1 1/4-inch or 1 5/8 inch Type S-12 screws.	PermaBase mesh tape. 2-inch wide polymer-coated (alkali resistant) mesh tape for interior applications. 4-inch wide polymer coated (alkali resistant) mesh tape for exterior applications.	Treat joints and set facing material with latex-Portland cement mortar or dry-set (thin-set) mortar. Mortars shall comply with ANSI A118.1 or A118.4 standards. Type I organic adhesive meeting ANSI A-136.1 for interior use only.
James Hardie Building Products Inc.: ½ inch or ¼ inch Hardibacker 500 Cement Board (for floor and countertop application at existing schools only).	Wood: 1 ½-inch galvanized roofing nails. Wood and Steel: 1 1/4-inch No. 8 by 0.375 HD self drilling, corrosion resistant ribbed wafer head screws.	2-inch Wide High Strength. Coated, alkali-resistant, glass fiber reinforcing tape.	ANSI A136.1 Type I: Organic adhesive or ANSI A118.1acrylic latex modified dry-set mortar or ANSI A118.4 Latex Portland cement mortar.

F. Sheathing, Type X (fire-resistant): 5/8 inch thick, 4-foot wide and up to 10-foot long fiberglass-mat faced gypsum backing board complying with ASTM C1177 or ASTM C1178.

1. Resistance to Mold Growth: Minimum score of "10" when tested in accordance to ASTM D3273 and evaluated in accordance with ASTM D3274.

2. Resistance to Fungi: Maximum score of "0" when tested in accordance to ASTM G21.

GYPSUM BOARD SHEATHING SYSTEMS			
Panel	**Fasteners**	**Joint. Tape**	**Joint Treatment**
United States Gyp. Co.: 5/8 inch Securock Glass-Mat Sheathing.	Wood: 1 ¼-inch # 6 buglehead corrosion-resistant fasteners. Steel: 1 ¼-inch Type S-12 drywall screw.		
Georgia-Pacific: 5/8 inch Densglass Gold Type "X"	Wood: 1 ¼-inch # 6 buglehead corrosion-resistant fasteners. Steel: 1 ¼-inch Type S-12 drywall screw.		
National Gypsum Co.: Gold Bond Brand e2XP Fire-Shield Extended Exposure Gypsum Sheathing.	Wood: 1 ¼-inch # 6 buglehead corrosion-resistant fasteners. Steel: 1 ¼-inch Type S-12 drywall screw.		

2.03 ACCESSORIES

A. Metal Trim: Paper-faced metal drywall beads and trim meeting ASTM C1047, as manufactured by USG/Beadex, National Gypsum, or equal. Trim units shall be of size and type to fit gypsum board construction and shall include corner beads, casings, edge trim and other shapes indicated and required.

B. Mold Resistant Joint Compound: As recommended by board manufacturer, OnePass by CTS Cement Manufacturing Co., or equal, meeting the following requirements:

1. Minimum score of "10" when tested in accordance with ASTM D3273 and evaluated in accordance with ASTM D3274.

2. Shall conform to ASTM C475.

C. Joint Tapes: Shall conform to ASTM C475.

D. Finishing Materials:

1. High solids primer shall be SHEETROCK Brand First Coat manufactured by USG or High-build primer by Sherwin Williams, or equal.

2. Texture coat finish material shall be manufactured by U.S. Gypsum, Hamilton, or Highland Stucco and Lime Products, Inc., or equal.

E. Acoustical Sealant: Non-hardening, non-shrinking, for use in conjunction with gypsum board, as recommended by Board Manufacturer and conforming to ASTM C919.

F. Fasteners:

1. Self-drilling, self-tapping bugle-head drywall screws; in conformance to ASTM C1002. No. 6 Type S or S12, 1 ¼--inch long for metal framing,

2. Wood framing:

   a. Nails: Hot dip, 0.016 inch diameter galvanized nails with 7/16 inch head and 1 ¼-inch minimum length.

   b. Screws: Type W 1 ¼-inch minimum length for single-layer panels. Screws shall be furnished with a corrosion-resistant treatment.

3. Adhesive: as recommended by board manufacturer and in compliance to ASTM C557.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Metal Trim:

1. Provide corner beads at outside corners and angles, metal casing where gypsum board terminates at uncased openings, metal edge trim where board edges abut horizontal and vertical surfaces of other construction.

2. Install trim in accordance with manufacturer's directions with appropriate joint compound. Install trim in longest practical pieces.

B. Gypsum Board:

1. Install gypsum board in conformance with ASTM C840.

2. Gypsum board shall be cut by scoring and breaking or by sawing, working from face side. Where board meets projecting surfaces it shall be scribed and neatly cut. Unless conditions require otherwise, gypsum board shall be installed first to ceilings, then to walls. End joints shall occur over a support. Install panels of maximum practical length so a minimum number of end joints occur.

3. End joints shall be staggered and joints on opposite sides of a partition shall be arranged to occur on different studs. Joint layout at openings shall be installed so no end joints will align with edges of openings.

4. Except where specified otherwise, fasteners shall be spaced not less than 3/8 inch from edges and ends of gypsum board. Do not stagger fasteners at adjoining edges and ends.

5. Install gypsum board vertically or horizontal as permitted by specific UL Design at walls. Fasten board with drywall screws spaced not to exceed 8 inches on centers around perimeter of boards and 8 inches on centers on intermediate studs. Space screws at 8 inches on centers along top and bottom runners. Screws shall be driven to provide screwhead penetration just below gypsum board surface without breaking surface paper. Where electrical outlet and switch boxes are indicated, provide adjustable attachment brackets between studs.

6. Install gypsum board to ceiling framing with long dimension at right angles to furring channels, or wood framing members, and fasten with specified drywall screws or nails spaced 6 inches to 7 inches on centers across board. Screws or nails shall be not less than 1/2 inch from side joints and 3/8 inch from butt end joints. Abutting end joints shall occur over furring channels and end joints of boards shall be staggered. Support cutouts or openings in ceilings with furring channels.

7. Install access doors, furnished under another section, in correct location, plumb, or level, flush with adjacent construction, and securely fastened to framing.

3.02 TOLERANCES

A. Install gypsum board flat within 1/8 inch in 10 feet.

3.03 JOINT TREATMENT AND FINISHING

Level	Joints	Interior Angles	Accessories	Fasteners	Surface
1	Tape set in compound	Tape set in joint compound			Tool marks and ridges acceptable
2	Tape set in joint compound and one separate coat of joint compound	Tape embedded in joint compound and wiped to leave a thin coat of compound over tape, and one separate coat	Covered by one separate coat of joint compound	Covered by one separate coat of joint compound	Free from excess joint compound. Tool marks and ridges acceptable.
3	After taping, cover with two separate coats of joint compound	After taping, cover with one separate coat of joint compound	Covered by 3 separate coats of joint compound	Covered by 2 separate coats of joint compound	Smooth and free of tool marks and ridges *
4	After taping, cover with 2 separate coats of joint compound	After taping, cover with one separate coat of joint compound	Covered by 3 separate coats of joint compound	Covered by 3 separate coats of joint compound	Smooth and free of tool marks and ridges *
5	After taping, cover with 2 separate coats of joint compound	After taping, cover with one separate coat of joint compound	Covered by 3 separate coats of joint compound	Covered by 3 separate coats of joint compound	Skim coat of joint compound applied to entire surface. Surface free from tool marks and ridges. *

*At completion of specified taping and finishing, install one coat of high solids primer as specified hereafter

B. Levels: Install tape bedding compound, tape, and finishing cement on joints in wallboard as required for specified levels of finish.

C. Levels 2 through 5:

1. Install joint cement and finishing cement over screw heads. Treat all inside corners with joint cement, tape, and finishing cement. Treat outside corners with corner beads and finishing cement.

2. Provide metal casing beads at all edges of gypsum wallboard, which abut ceiling, wall, or column finish, and elsewhere as required, such as openings, offsets, etc. Install all exposed joints, trims, and attachments non-apparent following installation of paint or other finishes. If joints and fasteners are visibly apparent, correct defects as required.

3. Seal raw edges of plumbing openings and boards that have been cut to fit with sealing compound brushed on.

4. When entire installation is completed, correct and repair broken, dented, scratched or damaged wallboard before installation of finish materials by other trades.

D. Levels 3 and 4: Install one coat of high solids primer over entire surface.

E. Level 5: Install one coat of skim coat over entire surface, followed by one coat of high solids primer over entire surface.

3.04 REQUIRED LEVELS OF FINISH

A. Unless otherwise indicated or specified, levels of finish required shall be as follows:

1. Level 1: Plenum areas above ceilings, insides of shafts, and other concealed areas. Taping to be as required for fire rated assemblies.

2. Level 2: Water-resistant wallboard backing for high moisture areas to be covered with a water resistant surface other than tile, vinyl or paint, i.e stainless steel cladding etc.

3. Level 3: Backing for vinyl wall covering and adhered acoustic tile. Also, provide where textured finish is indicated.

4. Level 4: Exposed painted wallboard in classrooms, utility rooms, and similar spaces not requiring Level 5 finish.

5. Level 5: Exposed, painted wallboard in offices and corridors.

3.05 TEXTURE COAT

A. Spray install texture coat to interior gypsum board surfaces where indicated on Drawings.

B. Texture coat shall provide a uniform splatter pattern finish with an 80 percent minimum coverage of surface.

C. Provide protection from spray for interior surfaces of electrical boxes and wiring.

3.06 CLEAN-UP

A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

3.07 PROTECTION

A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 3013

CERAMIC TILING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Ceramic tile.

2. Stone thresholds.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 06 1000 - Rough Carpentry

3. Section 07 9200 - Joint Sealants

4. Section 09 2423 - Cement Plaster and Metal Lath.

1.02 SUBMITTALS

A. Product Data: Manufacturer's data, standard specifications, Material Safety Data Sheets, and other technical information for each product specified.

B. Material Samples: Manufacturer’s standard palette, indicating full range of tile colors, textures, and grout colors.

C. Mock-Ups: For each type, color, and texture, minimum one foot square or three full tile courses, on Plexiglas to demonstrate proper bond mortar and coverage; grout color, hardness and depth.

D. Installation Instructions: Manufacturer's preparation and installation instructions.

E. Product Certificates: Signed by manufacturer certifying that products furnished comply with requirements of this Specification.

1.03 QUALITY ASSURANCE

A. Comply with applicable parts of the following codes or standards as a minimum requirement:

1. ANSI A108, American National Standard Specifications for the Installation of Ceramic Tile.

2. ANSI A118, American National Standard Specifications for Ceramic Tile Installation Materials.

3. ANSI A136.1, Standard Specifications for Ceramic Tile.

4. ASTM A185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

5. ASTM C185 - Standard Test Method for Air Content of Hydraulic Cement Mortar.

6. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.

7. ASTM C150 - Standard Specification for Portland Cement.

8. ASTM C241 - Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic.

9. ASTM C206 - Standard Specification for Finishing Hydrated Lime

10. ASTM C503 - Standard Specification for Marble Dimension Stone.

11. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.

12. ASTM D4551 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Flexible Concealed Water-Containment Membrane.

13. Tile Council of North America (TCNA) – Current edition of "Handbook for Ceramic Tile installation".

14. CHPS Low-Emitting Materials Table: Materials submitted for tile assemblies must bee listed as low emitting on the CHPS website www.CHPS.net.

15. Materials shall be compliant with requirements for slip resistance as per CBC Chapter 11B and ADAAG.

B. Grade Certificate and Labeling: With each delivery of tile, furnish manufacturer's "Master Grade Certificate" to the Project Inspector.

C. Source of Materials: Provide materials obtained from one source for each type and color of tile, grout, and setting materials.

D. Consistent Quality: Products shall be consistent in appearance and physical properties.

E. Comply with requirements of California Building Code and ADAAG.

F. Qualifications of Tile Manufacturer: Company specializing in ceramic tile, mosaics, pavers, trim units, and thresholds with five years minimum experience.

G. Qualification of Installation System Manufacturer: Company specializing in installation systems/ mortars, grouts/ adhesives with ten years minimum experience.

H. Qualifications of Installer: Company specializing in installation of ceramic tile, mosaics, pavers, trim units and thresholds with five years experience with installations of similar scope, materials, and design.

I. Pre-Construction Meetings: Prior to start of Work of this section and after approval of submittals, schedule an on-site meeting between Contractor, OAR, Project Inspector, and representatives of the material manufacturer and tile installer to review construction conditions and Drawings for conformance with the requirements of this Specification for each substrate.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver tile and other materials in sealed containers, with manufacturer's labels intact.

B. Keep all materials clean and dry.

1.05 MAINTENANCE

A. Extra Materials: Provide a minimum of five percent of each type and color as the installed tile, in manufacturers' cartons and labeled.

1.06 WARRANTY

A. Manufacturer shall provide a five year material warranty.

B. Installer shall provide a five year fabrication and installation warranty.

C. For waterproofing, manufacturer shall provide a 10 year material warranty for waterproofing installation, tile setting, and grouting materials.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Tile: To establish quality, Specification is based on ANSI A137.1 Standard Grade. Equivalent tile products from the following manufacturers may be provided:

1. Dal-Tile Corporation.

2. American Olean Company.

3. Florida Tile, Inc.

B. Installation Materials: To establish quality for setting and waterproofing materials, Specification is based on ANSI A137.1. Products and methods of the following manufacturers may be provided:

1. Laticrete International, Inc.

2. Custom Building Products.

3. Mapei.

2.02 MATERIALS

A. Colors, Textures, and Patterns: Tile shall be from manufacturer's standard product line. 90 percent shall be from "price group 2", and "10 percent from price group 3", unless indicated otherwise. Tile trim and accessories shall match adjoining tile. Grout color shall match tile unless otherwise indicated.

B. Tile sizes: Tile sizes specified are modular dimensions unless otherwise indicated.

C. Mortar Sand: ASTM C144.

D. Portland Cement: ASTM C 50, Type I or II.

E. Hydrated Lime: ASTM C207, Type S; or ASTM C206 Type S

F. Portland Cement Mortar: ANSI 118.1

G. Portland Cement Mortar Bed: Sand-cement mortar mix gauged with Laticrete Acrylic Admix or Custom Building Products Thin-Set Mortar Admix.

H. Portland Cement Mortar Bed for Shower Areas: Laticrete 226 Thick Bed Mortar Mix Gauged with Laticrete 3701 Mortar and Grout Admix or on site mix per ANSI A108.1A with Custom Building Products Thin-Set Mortar Admix.

I. Latex Portland Cement Bond Mortar: Laticrete 317 Floor & Wall Thinset gauged with Laticrete 3701 Admix, or Custom Building Products Master Blend mixed with Thin-Set Mortar Admix.

J. Waterproof Membrane: Cold-applied, single component liquid with embedded reinforcing fabric where recommended by manufacturer: Laticrete Hydro Ban Waterproof Membrane or Custom Building Products Red Guard Waterproof Membrane.

K. Reinforcing Wire Fabric: 2-inch by 2-inch, 16 by 16 gage, galvanized electrically welded wire reinforcing, per ASTM A 185.

L. Latex Portland Cement Grout: Laticrete Sanded Grout (1500 Series), Custom Polyblend Sanded Grout or Laticrete Unsanded Grout 1600 Series (for joints smaller than 1/8"), Custom Polyblend Unsanded Grout.

M. Epoxy Grout for Quarry Tile: Laticrete Spectralock Pro Epoxy Grout for Floors and Walls or Custom 100 percent Solids Epoxy Grout.

N. Cleavage Membrane and Wall Backing Paper: Cleavage membrane shall be 15-pound asphalt-saturated felt manufactured according to ASTM D226 Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing

O. Separation Material (for all sealed joints including perimeters and quarry-tile fields of floor mortar beds): Quality Foam, QF 200 white, 3/8 inch wide by 5-inch high.

P. Backer Rod for sealants (for ceramic mosaic fields): Polyethylene foam, closed-cell, flexible and compressible, 3/16 inch diameter.

Q. Cleaner and Sealer:

1. Cleaner and sealer shall be from one manufacturer, acceptable to tile and grout manufacturers. To establish quality, the Specification is based on Aqua Mix Inc. Equivalent products from Miracle Sealants Co., Watco Tile and Brick, or equal may be provided.

2. Cleaner: Aqua Mix Concentrated Tile Cleaner, neutral phosphate-free cleaner, or Custom Building Products Tile Lab Concentrated Tile and Stone Cleaner.

3. Sealer: Aqua Mix Penetrating Sealer, fungus- and bacteria-resistant, stain-resistant, and slip-resistant as specified for tile, Custom Building Products Tile Lab Surface Gard, or equal.

R. Sealants:

1. Sealant and primer shall be from one manufacturer, acceptable to tile and grout manufacturers. See Section 07 9200 - Joint Sealants.

2. Ceramic Mosaic Tile: One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

2.03 TILE

A. Glazed Wall Tile:

1. Size: 4-1/4 inch by 4-1/4 inch face dimensions by 5/16 inch thick (ceramic mosaic tile may also be used on walls).

2. Colors and patterns as selected by Architect from price groups specified.

C. Trim:

1. Integral bullnose at external corners.

2. Provide bullnose where tile projects from jamb.

3. Mosaic tile base with wall tile above: A3401.

4. Mosaic tile base without wall tile above: S3619T (6-inch high sanitary coved base).

5. Bullnose at wainscot: A4200 and A4402.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Examine substrates and conditions for compliance with installation requirements. Verify that all penetrations through substrate have been installed. Proceed with Work only after all conditions are in compliance.

B. Substrates shall be firm; dry; clean and within flatness tolerances required by relevant ANSI A108 tile installation standards. Prepare surfaces as follows:

1. Concrete Floors: Allow concrete floors to cure for 28 days minimum before beginning tile and grout installation. Remove laitance, sand, dust, and loose particles.

2. Plywood Subfloors: Before installing mortar setting bed over plywood sub-floors, install cleavage membrane over sub-floor. Anchor firmly in place and lap joints 6 inches minimum. Turn membrane up 6 inches at walls and beneath building felt on walls.

C. Substrates to receive wall tile and base shall be:

1. Scratch coat of cement plaster, as specified in Section 09 2423 - Cement Plaster and Metal Lath (required in student restrooms, showers and locker rooms, and quarry tile bases).

2. Cementitious backing panels, as specified in Section 09 2900 - Gypsum Board.

D. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical items of Work, and similar items located in or behind tile has been completed before installing tile.

E. Verify that joints and cracks in tile substrates are coordinated with caulked-joint locations; if not coordinated, adjust as required by the Architect.

F. Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are maintained in compliance with referenced standards and manufacturer's written instructions.

G. Protect adjacent surfaces during progress of Work of this section.

3.02 TILE INSTALLATION, GENERAL

A. Install tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Center the tile fields in both directions for each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

B. For tile mounted in sheets: Joints between tile sheets shall be the same width as joints within tile sheets.

C. Extend Work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate Work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without damaging tile. Carefully grind the cut edges of tile abutting trim, finish, or built-in items. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Locate joints, directly above joints in concrete substrates, at horizontal and vertical changes in plane, or where indicated during installation of mortar beds. In quarry tile floors, provide at 12 feet on center maximum. Provide 3/8-inch wide foam at joints. Do not saw-cut joints after installing tiles.

F. Prepare and clean joints to be sealed. Apply sealants to comply with requirements of Section 07 9200 - Joint Sealants.

G. Conform to manufacturers printed instructions, and applicable requirements of ANSI and TCNA Standards.

3.03 TILE INSTALLATION, FLOOR

A. Install reinforcing and latex Portland-cement mortar setting bed over cured concrete slab or cleavage membrane on plywood floor. Lap reinforcing at least one full mesh, and

support or lift so that it is approximately in the middle of mortar bed. Do not abut against vertical surfaces. Install foam separation material at perimeters and expansion joint locations for caulked joints.

B. Mix setting mortar in accordance with ANSI recommendations.

C. Once begun, mortar installation must continue until room is completed. Discard any batch not floated and finished within ½ hour of mixing. Firmly compact before screeding. Screed to true plane and pitch as indicated. Slope mortar bed sufficiently that water flows to drain and no puddling will occur. Slope mortar down to floor drains for proper installation of waterproof membrane. After screeding, firmly rub down with steel or wood float.

D. Cure mortar bed with a light fog spray of water and cover with 6-mil Visqueen for 72 hours.

E. Waterproof Membrane:

1. Install waterproof membrane where indicated and in all kitchen, toilet, shower, and locker areas according to TCNA Standards. Extend membrane up wall mortar or backing board as follows:

   a. 3 inches above top of curb wall.

   b. 6 inches minimum above floor.

   c. In shower rooms, install from floor to ceiling.

2. Insure that layers of membrane are fully inserted into clamping ring of floor drain. After membrane installation and before tile setting, install pea gravel around sub drain to prevent blockage of weep holes and place mortar to proper level for setting tile.

3. For tile installations other than slab on grade, before setting tile and after seven days curing, water test membrane by damming drains and doors, filling floor with water to 4-inch minimum depth, and leaving for 24 hours. Correct any leaks and re-test before proceeding. After testing, protect membrane from traffic until tile Work begins.

F Thin Set Method: Confirm substrate is completely clean and free of dust. Cut foam at floor perimeters flush with top of mortar bed. Insure that bond coats do not intrude into joints to be sealed. Install tile over properly cured setting bed or waterproof membrane utilizing "thin-set" method with latex portland cement bond mortar, in accordance with manufacturer's printed instructions and ANSI A108.5.

G. Minimum coverage of bond mortar shall be 80 percent except 95 percent in shower areas, for quarry tile, and exterior installations. Place tile into fresh mortar press tile to

insure full contact. Before setting proceeds, set and remove three tiles or sheets of tiles to confirm specified coverage of bond mortar. If coverage is insufficient, utilize a larger toothed trowel or back butter tiles until proper coverage is provided.

H. Install tile on floors with the following joint widths:

1. Ceramic Mosaic Tile: 1/16 to 1/8 inch.

2. Quarry Tile: 1/4 to 3/8 inch.

3. Paver Tile: 3/16 to 3/8 inch.

I. Install base tile for quarry tile floors on a mortar bed, with joints matching floor.

3.04 TILE INSTALLATION, WALLS

A. Install wall mortar beds before floor mortar beds.

B. On plaster walls, clean scratch coat surface of loose or foreign materials, fog spray with water, and install brown coat mortar bed over scratch coat to a thickness not less than 3/8 inch and not greater than ¾ inch. Once started, wall mortar installation must continue until wall is completely floated. Discard any batch not floated and finished within ½ hour of mixing. As soon as wall mortar is dried to sufficient hardness, but still plastic, firmly rub with wood float.

C. Cover cure with 40-weight Kraft paper for 72 hours minimum.

D. Install tile over properly cured setting bed, waterproof membrane, or cementitious backing panels utilizing "thin-set" method with latex portland cement bond mortar, in accordance with manufacturer's printed instructions and ANSI A108.5. Confirm substrate is completely clean and free of dust. Insure that bond coats do not intrude into joints to be caulked.

E. Minimum coverage of bond mortar shall be 80 percent except 95 percent in shower areas or exterior installations. Set and test as specified for floors.

F. Lay out Work so tiles will be centered on each wall or section of wall in order to minimize tile cuts. Lay out tile wainscots to next full tile beyond dimensions indicated. Spot setting bed with mortared tile, set plumb and true, accurately indicate plane of finished tile surfaces.

G. Install tile on walls with following joint widths:

1. Glazed Wall Tile: 1/16 inch.

2. Ceramic Mosaic Tile: 1/16 to 1/8 inch.

3. Quarry Tile: 1/4 to 3/8 inch.

4. Special Large Tile: 3/16 to 3/8 inch.

H. Horizontal joints shall be level, vertical joints plumb with surfaces true and plumb, edges of tiles flushed.

I. Rub exposed cuts smooth with a fine stone; no cut edge shall be set against a fixture or adjoining surface without a 1/16 inch joint to be caulked.

J. Install access doors where required, furnished under another section, in correct location, plumb or level, flush with adjacent construction, and securely fastened to framing.

3.05 GROUTING

A. Prior to starting, ensure that all tile surfaces are clean and excessive bond mortar is scraped and vacuumed from joints (approximately 2/3 depth of tile should be open for grouting). Follow manufacturer's instructions for mixing grout. Once grout Work commences, proceed until complete wall or floor area is finished utilizing one batch of grout.

B. Latex portland cement grouting: Dampen tile surface and joints with water using sponge, but leaving no puddles in joints. Force grout into joints using sufficient pressure on rubber float so as to fill joints completely, and scrape excess grout off tile surface with rubber float. Smooth or tool grout to uniform joint finish. Do not over water.

C. Curing latex Portland cement grout: Remove final grout haze with clean soft cloth, and cover with 40-weight Kraft paper to cure. Leave paper in place for protection. Cover wall surfaces with 40-weight Kraft paper for 72 hours.

D. Epoxy grouting: Do not dampen tile. Follow manufacturer's instructions for mixing grout. Force grout into joints with sufficient pressure on rubber float so as to fill joints completely, and scrape excess grout off tile surface with rubber float. Smooth or tool grout to uniform joint finish. Do not allow grout to harden on face of tile.

E. Curing epoxy grout: Do not cover floor, but do not allow foot traffic for 72 hours. Then, if grout is not tacky, cover with 40-weight Kraft paper for protection.

3.06 CLEANING AND SEALING

A. If grout scum is not visible on tile surface after curing, clean tile surface with clear water. Remove and replace cracked, broken or defective Work with proper material.

B. If, when curing membrane is removed, grout scum is visible on tile surface, use the following cleaning method:

1. Immediately recover floor with paper or felt and allow to continue curing for a minimum of 14 days; uncover floor and maintain entire tile surface saturated with clean cool water for not less than two hours.

2. Utilize a neutral cleaner acceptable to manufacturers of tile and grout, and follow manufacturer's instruction. Do not provide generic acid cleaners.

3. Wet tile floors and apply cleaning solution to floor surface, then scrub with a brush. Rinse area several times with clean water to flush solution off floor surface.

C. Apply penetrating sealer in accordance with manufacturer's instructions utilizing a dense sponge applicator, paint pad, sprayer or brush. Avoid overlapping, puddling, and rundown. Completely wipe surface dry within 3 to 5 minutes using cotton or paper towels; do not allow sealer to dry on tile. After two hours, test surface by applying water droplets to surface. If water is absorbed, apply a second coat. Avoid surface traffic for 24 hours.

3.06 SEALANTS

A. Insure joints to be sealed are free of setting and grouting materials and construction debris. Do not permit any foot traffic on installed sealants for a minimum of 48 hours or protect with hardboard strips.

B. Install in accordance with Section 07 9200 - Joint Sealants.

3.07 PROTECTION

A. Admit no traffic where tile is installed until mortar and grout has set for a minimum of 72 hours.

B. Protect Work of this section until Substantial Completion.

3.08 CLEAN UP

A. Remove rubbish, debris, and waste material and legally dispose of off the Project site.

END OF SECTION

SECTION 09 9013

PAINTING OF EXISTING FACILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Interior and exterior painting.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 07 9200 - Joint Sealants.

1.02 REGULATORY REQUIREMENTS

A. Paint materials shall comply with Food and Drug Administration's (FDA) Lead Law and current rules and regulations of local, state and federal agencies governing use of paint materials.

B. Paint color requirements for CALOSHA: CALOSHA requires the following items be painted as prescribed:

1. Gas Mains and Valves shall be painted "gun metal gray" (medium gray)

2. Fire Valves and Raisers shall be painted OSHA's "safety red"

1.03 SUBMITTALS

A. Submit in accordance with Section 01 3300: Submittal Procedures.

1. Submit a complete list of materials to be furnished stating supplier and distributor's names with product recommendations.

2. Submit manufacturer's standard color samples for each type of paint specified. Once colors have been selected, submit six samples of each color selected for each type of paint, on standard 8 ½ by 11 spray-out panel.

3. Before any coating is applied, submit to IOR samples of each color to be used on contract. If more than one batch of material and color is to be used, samples from each batch shall be submitted.

B. Paint and Enamel Spray-Outs

1. Samples of Paint and Enamel shall be submitted on standard 8 ½ by 11 Leneta Opacity-Display Charts. Each display chart shall have color in full coverage. Sample shall be prepared using material from batch to be used on actual job. Identify school on which paint is to be used, batch number, color number, type of material, name of manufacturer and name of Contractor.

2. Furnish samples of colors to Project Inspector. Samples shall be kept on the job until painting is completed.

3. Contractor shall be responsible for finish color on surface to be painted; where different materials of same color are specified to be applied on same, or adjoining surfaces, final color match shall match color sample on those surfaces.

C. Elastomeric coating shall be submitted in duplicate samples of texture coating. Samples shall be not less than 2 ½-inch by 3 ½-inch in size and on adequate backing.

D. Materials and color samples shall be approved before a job start meeting will be scheduled.

1.04 QUALITY ASSURANCE

A. Certification of Materials: With every delivery of paint materials, manufacturer shall certify, on form supplied by Owner that materials comply with requirements of this Section.

B. Paint materials shall comply with applicable requirements of Food and Drug Administration's (FDA) Lead Law and SCAQMD.

C. Painters working on Lead related work shall be (DHS) Lead Certified by the State of California.

1.05 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to project site in original unbroken containers bearing manufacturer's name, brand number, batch number, and MSDS Sheets.

B. Open and mix ingredients on premises in presence of Project Inspector. Immediately remove rejected materials from premises.

1.06 METAL STORAGE CONTAINER

A. Storage and Mixing of Materials: Store materials and mix only in spaces designated for purpose by Project Inspector. Keep such spaces clean and take necessary precautions to prevent fire. Hang out oily rags singly in open air. Stack paint containers so that manufacturer's labels are clearly displayed.

B. Paint, combustible materials, gasoline driven equipment, etcetera shall not be stored or left in any school building overnight.

C. In event that equipment and material storage sheds must be placed on asphalt pavement less than six months old, each wheel, leg or other supporting member shall be centered on a 4-foot by 8-foot by ¾ inch thick sheet of plywood. Shed shall be set down in such a manner as to prevent damage to pavement. Contractor shall be responsible for any damage to pavement caused by improper placement of shed.

1.06 ENVIRONMENTAL CONDITIONS

A. Temperature: Do not apply exterior paint in damp, rainy weather or until surface has dried from effects of such weather. Do not apply paint, interior or exterior, when temperature is below 50 degrees F., or above manufacturer's stated recommended temperature, or when dust conditions are unfavorable to proper workmanship.

1.07 WARRANTY

A. Manufacturer shall provide a three year material warranty from date of Substantial Completion.

B. Contractor warrants work executed and materials furnished under contract shall be free from defects of materials and application for a period of three years from date of Substantial Completion.

C. Elastomeric coating shall be warranted for a period of five years from date of Substantial Completion.

1.08 PROTECTION

A. Fire alarm boxes, fire sprinkler heads, smoke detectors and intrusion alarm systems shall be uncovered and available to perform function that it was designed for each and every night.

B. Pressure relief grilles with barometric damper leading to a corridor or an exterior shall be masked off before spraying and then uncovered immediately after spraying.

C. Conspicuously post sufficient "Wet Paint" signs continuously to alert public and school personnel to existing conditions until paint is completely dried.

D. Provide and maintain barriers, guards, lights, warning signs, etcetera for complete protection and as directed by the Project Inspector.

E. Do not impede emergency egress.

1.11 MISCELLANEOUS

A. Provide and maintain barriers, guards, lights, warning signs, etcetera for complete protection and as directed by the OAR. Provide access to doors and openings. Do not store equipment or material near openings or traffic lanes that could be hazardous during an emergency.

1.12 DEFINITION OF TERMS

A. Work shall include labor, material, equipment and scaffolding required for cleaning and preparation of surfaces to receive painters finish and for painting and varnishing, as herein specified. Perform work unless specifically noted otherwise.

B. Painting shall include complete preparation and finish or refinishing in accordance with requirements specified herein. Drywall shall be treated same as specified for plaster.

C. Wherever woodwork is specified to be refinished, it will include wood finish member (trim), movable cabinets with doors and center cut doors, windows and sash, screen doors, screens, sash poles, movable and fixed bulletin boards and chalkboards, etcetera.

D. Plastic, impregnated plywood, hardwood, metal, asbestos board (if painted), and mastic coated wood surfaces shall be treated in same manner as specified for "woodwork".

H. Whenever "Paint or Enamel" is referred to in these specifications, it shall be taken to mean types of waterborne materials and water reducible materials.

I. Whenever "edges" are referred to in these specifications, it shall be taken to mean every edges, (which include tops and bottoms).

J. Work shall be done by skilled and experienced painters in a professional manner. Painters must wear presentable white uniforms consistent with industry standard and personal ID Badges.

1. Provide ID badges identifying the following:

a. Employee's name

b. Employee's photo

c. Company Position (i.e. apprentice, journeyman, foreman)

d. Company name and logo

e. Company phone number.

1.14 SCHEDULING OF WORK

A. Schedule work through the OAR.

PART 2 - PRODUCTS

2.01 PAINT MATERIALS

A. Factory mix paint materials to correct color, gloss, and consistency for installation to maximum extent feasible.

B. Paint materials shall be by one manufacturer.

C. Paint materials shall be “Premium Architectural Grade”.

D. Acceptable manufacturers, unless otherwise noted:

1. Vista Paints

E. Gloss degree standards shall be as follows:

High Gloss	70 and above	Eggshell	30 to 47
Semi-Gloss	48 to 69	Satin	15 to 29

2.02 PAINT MATERIALS

A. Manufacturer: Behr, Premium Plus Ultra Flat, or equal.

B. Anti-Graffiti Coating: Per Section 09 9623 Graffiti-Resistant Coatings.

PART 3 – EXECUTION

3.01 REMOVE AND REINSTALL

A. Remove coat hooks, name plates, label frames, sash lifts, sash locks, pencil sharpeners, flag brackets, drawer handles and locks, window coverings, switch and receptacle plates, removable bulletin boards, mirrors, maps and thermometer. Reinstall all of the above after painting is completed.

B. Remove exposed nails, hooks, tacks, screws, staples and pins in surface to be painted and patch holes with a matching material. Remove interior and exterior obsolete screens, grille hangers, fasteners and patch holes.

C. Remove and reinstall Venetian blinds and channels, insuring security latches are secure. When removed, blinds and channels shall be marked with its location and reinstalled in the same location.

D. Contractor shall replace map and picture hooks as directed by the Project Inspector.

E. Paper labels shall be soaked off and glue residue from tape removed.

F. Remove metal or plastic room numbers, letters, signs, and, after painting is complete, clean and reinstall them neatly.

G. Sash locks shall be reset in accordance with instructions for locking doors and windows each night.

3.03 REPLACEMENT SCREWS AND HARDWARE

A. Hardware shall be replaced using new screws, of same diameter, but one size longer than those removed. Screws used must be of finish design and material to match hardware.

B. Remove paint from hardware, including paint from previous painting.

3.04 GENERAL PREPARATION OF EXISTING PAINTED SURFACES

A. Previously painted surfaces will be assumed to contain lead.

B. Trenching: Before any cleaning or sandblasting operation is started, soil at base of building shall be trenched to a depth of six inches and eight inches wide. After completing painting application and allowing sufficient drying time, trench shall be refilled.

C. Insure a consistently uniform horizontal, vertical and curved surface, with a maximum deformation of 1/8 inch in a five foot span. Apply a brown scrub coat and a fog coat.

D. Glass, fiberglass and polycarbonate on exterior shall be traced neat and clean with approximately, but no more than 1/16 inch overlay. Paint specks, smears or splatters shall be immediately removed and surface cleaned.

E. Miscellaneous Exterior Surfaces; Freestanding exterior school signs, windbreaks, baffles, benches, scoreboards, fences and gates (excluding chain link), decorative panels, interior and exterior surfaces of display cases, storage and supply cabinets, including both sides and edges shall be prepared and primed as specified under "Doors." They shall receive number of coats of paint as detailed under "Colors and Number of Paint Coats."

F. Examine surfaces to receive paint finish. Surfaces which are not properly prepared, and cleaned or which are not in condition to receive finish specified, shall be corrected before paint is applied. Painting shall not be done on existing painted surfaces until surfaces are approved by the Project Inspector.

G. Remove items fastened to existing painted surfaces and patch holes with a material, and re-fasten in original location upon completion of painting work.

H. Existing painted surfaces indicated to be painted, shall be prepared as follows:

1. Wood, plaster and metal surfaces shall be washed with TSP (tri-sodium phosphate) substitute to remove dirt, grease and other foreign materials and rinsed with clean water and then sand papered and dusted off. Surfaces shall have wax completely removed before washing, which includes base, shoe base, and concrete base.

2. a. Checked, cracked, blistered, scaled, peeling, and alligatored paint on wood and metal surfaces shall have paint removed down to original finished surface, then hand-sanded and dusted clean.

b. Surfaces shall then be considered as new work.

c. Woodwork must be hand sanded smooth after each and every coat, except last coat. Coats shall be free from dust, dirt or other imperfections.

d. Steel sash and aluminum sash to be painted must be steel-wooled and dusted off. Sash putty shall be hand sanded smooth and dusted off.

e. Remove lint and grease from screens, vents, hoods, etcetera that are to be painted.

3.05 OTHER SURFACE PREPARATION REQUIREMENTS

A. Existing painted surfaces shall be prepared and made ready to receive new coat of paint or other finish coating materials by any of following methods:

1. H.E.P.A. machine sanding: Checked, cracked, blistered, scaled loose, and alligator paint on wood and metal surfaces on exterior or interior of facilities shall be machine sanded to a smooth solid surface, dusted clean and then painted as specified. Power sanding shall be done with a H.E.P.A. vacuum sander and shall be used only when school is not in session, and students and staff are not on site.

2. Trenching: Before any cleaning or sandblasting operation is started, soil at base of building shall be trenched to a depth of six inches and eight inches wide. After completing painting application and allowing sufficient drying time, trench shall be refilled.

3. Hydro-washing: Exterior masonry and plaster on buildings, bungalows, pavilions, and appurtenances must be washed with a cleaner using hydro-washing equipment, or as directed by Project Inspector, to remove grease,

dirt and foreign materials and then rinsed with clean water to remove residue. Surfaces must be allowed to dry for at least five days or as determined by Project Inspector. Care shall be taken to prevent water from entering buildings through vents, etcetera Immediately following hydro-washing, areas surrounding buildings must be rinsed down.

a. Exposed mastic, concrete, and/or plaster surfaces shall be cleaned with a cleaner, using hydro-cleaning equipment. This process is to remove dirt, foreign materials, grease, and oil and rinsed with clean water to remove residues.

b. Before hydro-washing efflorescence must be brushed off and surface treated with a 10 percent solution of Muriatic Acid, neutralized with a 10 percent solution of ammonia water and then rinsed with clean water.

c. Painted surfaces that will be directly or indirectly impacted by hydro-washing shall have paint stabilized to remove loose, flaky or peeling paint. Wood, metal, and other exterior non-masonry/stucco surfaces shall be primed where stabilization has occurred prior to application of cleaner and hydro-washing.

d. Hydro-washing is not intended to remove loose, flaky or peeling paint or paint chips. Water generated from cleaning and hydro-washing process that does not contain visible paint chips shall be directed to soil, such as a planted area, or collected and disposed in the sewer system.

e. At no time shall water from hydro-washing process be directed to a storm drain, be allowed to flow off Owner property to adjoining public or private property, or to flow across asphalt or cement concrete and allowed to dry.

f. If, during hydro-washing process, paint chips are generated with waste water work shall stop. Contractor shall install a system under and around area requiring washing sufficient enough to collect waste water generated. Waste water shall be stored in DOT approved barrels and visible paint chips separated from waste water. Paint chips shall be characterized to determine if waste is hazardous or disposed of assuming it is hazardous. Waste water shall be characterized to determine if it is hazardous and disposed of according to code. If water tests non-hazardous, water shall be removed from Owner's property.

g. Hazardous waste generated by this process requires being transported under a Uniform Hazardous Waste Manifest. Contractor shall ensure manifest is completed as required by code.

OAR will sign manifest once it is accurately completed and prior to transport of waste off site.

4. Sandblasting: Shall be performed when school is not in session and when students are not present. Premises shall be left in a clean condition and ready for use by occupants by end of any day prior to beginning of school session. Work shall be coordinated with Project Inspector and the OAR. Only wet blasting shall be allowed. Masonry or stucco surfaces shall be sandblasted to remove mastic, paint and other materials to original plaster brown coat or formed concrete surface. Rinse with clean water to remove residue. Adjacent surface, plants and shrubs shall be protected from damage due to sandblasting operations.

   a. Immediately upon completion of sandblasting operation, roof, gutters and areas around buildings, etcetera shall be cleaned of sand and debris resulting from sandblasting operation. No sand or debris shall be hosed or swept into drains.

   b. Metal surfaces including decorative metal and fencing requiring sandblasting shall be sandblasted to white metal and primed same day with a metal primer per manufacturer's recommendation.

3.06 CRACKS AND VOIDS

A. Voids between wall and ceiling surfaces and wood or metal trim or scribed edges where finish exists or is specified to be applied and including picture molding, must be filled with putty, filler or latex sealing compound.

B. Areas where finish plaster coat is loose must have that portion removed to a solid surface. Surfaces that are broken, cracked, or damaged and areas where finish plaster coat has been removed must be coated with compatible bonding agent. Surface will then be given a cement plaster finish coat consisting of one-part Plastic Portland Cement to three parts sand to match existing finish. Cracks shall be "V-eed" out, filled, finished flush with and textured to match adjoining surfaces, per Owner Representative's approval.

C. Neutralize walls showing effects of alkali.

3.07 SEALING SASH, DOOR FRAMES

A. Sealant that will interfere with proper application of waterproof coating shall be removed. Seal around door and window frames, flashing, vents, separations between masonry or plaster and adjoining surfaces, etcetera, with a sealant compound recommended by manufacturer of coating to be used. Sealing and filling shall be done with sufficient pressure to force material to base of opening.

3.08 REPAIR OF PLASTER

A. Exterior areas, where finish plaster coat is loose, shall have that portion removed to a solid surface. Surfaces that are broken, cracked, or damaged and areas where finish plaster coat has been removed shall be coated with compatible bonding agent. Surface will then be given a cement plaster finish coat consisting of one-part Plastic Portland Cement to three parts plaster sand to match existing finish. Cracks shall be "veed-out", filled, finished flush with and textured to match adjoining surfaces, per Project Inspector's approval.

1. If existing plaster was a machine applied, dash coat, apply final application of finish coat over patched areas by machine to match existing adjacent machine texture. Use a finish plaster material with a bonding admixture mixed according to manufacturer's recommendation.

2. Cracks, holes, and damaged spots larger than ½ inch, see 3.09.

B. Exterior plaster designated to be painted shall receive three coats. First coat shall be sealer. Second and third coats shall 100 percent acrylic gloss enamel unless otherwise indicated.

C. Interior plaster patching shall receive four coats. First coat shall be pigmented sealer. Second coat shall be enamel undercoat. Third and fourth coats shall gloss or semi-gloss enamel as indicated.

3.09 REPAIR OF SPALLING CONCRETE

A. Remove surface contamination, broken and spalled concrete to a sound concrete base. Concrete shall be removed to a depth of one-half inch minimum around rebar. Sides of areas to be repaired shall be straight, not tapered or sloped.

B. Spalled or loose concrete shall be removed using an electric or compressed air chipping hammer.

C. Clean exposed rebar by sandblasting, remove debris and dust and treat steel with a sealant compatible to patching materials same day. Project Inspector shall approve sealant application prior to any patching materials being applied.

D. Repair concrete to match existing concrete surfaces using Sika Top 123 Gel Mortar, DAP Concrete Patch, Quikrete Fast-Setting Concrete, or equal.

E. Sealant and patching materials shall be applied by qualified applicator.

3.10 SPRAYING MASONRY/CEMENT PLASTER

A. Masonry/plaster material must be a 100 percent acrylic flat paint, color as directed. Material must be applied in strict conformity to manufacturer's directions. There must be at least 24 hours drying time between first coat which shall be factory tinted 10 percent to 15 percent lighter (or darker) in color than finish coat. Manufacturer shall be acquainted with conditions of surfaces to be

refinished and provide written specifications for the job including special primers or additives needed for adhesion sealing of first coat of paint and general performance of materials. Finished surface must be uniform and free of imperfections. Each coat applied to surface must be sprayed using "Cross-Off" method of application by spraying horizontally with a 50 percent overlap on returns and doubling back with a vertical stroke with a 50 percent overlap on returns.

B. After painting of masonry/plaster, replace (stencil) security numbers per plot plan. See Owner representative for locations.

3.11 MIXING AND APPLICATION

A. Colors of coatings shall be as directed by Project Inspector.

B. Three coats of paint shall be applied as follows:

1. First coat: primer or undercoat, shall be white.

2. Second coat shall be factory tinted in range of 10 percent to 15 percent lighter or darker than finish coat.

3. Third coat shall be factory tinted to color selected, but allowing for tint variations in more than one color for application to different surfaces. Color combinations in rooms and for surfaces shall be varied in accordance with color letter.

C. Any number of colors may be used on any portion of work. Owner reserves right to change colors before work is started in an area or on a particular surface.

D. Various colors may require additional coats of paint complete coverage. No additional allowances will be made. Contractor is responsible for consulting color letter and knowing color and coverage.

E. Surfaces to be finished and each coating shall be separately inspected by Project Inspector and checked for mill thickness. The requirements are two mils each coat wet and three mils dry after three coats. Notice that such work is ready for inspection shall be given to Project Inspector. Should such notice not be given before succeeding coat is put on, finish applied shall be removed or an additional coat shall be applied, as directed by Project Inspector. Allow at least one day drying time between coats for exterior work or as directed by Project Inspector for proper drying.

F. Roof work to be painted Q8-38T Birch Gray.

3.12 PAINT ROLLERS, BRUSH AND SPRAY

A. Paint rollers may be used on interior plaster, drywall, masonry, stucco and plywood surfaces, nap not to exceed 1/2 inch in length.

B. First coat on wood overhang and ceilings must have material applied by roller and then must be brushed out in a professional manner to leave surface free of imperfections. Finish coat may be sprayed.

C. Other surfaces shall have coatings applied with brushes of proper size.

D. Spray work shall be permitted only on radiators, acoustic plaster, acoustic tile, fiberboard, wood fiber acoustical units, masonry and plaster or as directed by Project Inspector.

3.13 PRIMING

A. Surfaces from which paint finish have been removed down to original wood or metal surfaces shall be primed as follows:

1. Wood shall be sealed or primed with a non-water borne material on both sides and edges. Wood completely sealed with a non-water borne material shall be top coated with a water borne material as specified herein. Finish material (water borne) shall be compatible with non-water borne primer per manufacturer's recommendations. Hardwood shall be filled and stained to an even color.

2. Galvanized Metal: Clean oil and foreign material from surfaces. Apply vinyl wash pretreatment coating. Follow manufacturer's instructions for drying time, and then prime with one coat of metal primer.

3. Ferrous and non-ferrous metal: Use a primer for ferrous and non-ferrous metal.

3.14 FIRE AND LIFE SAFETY EQUIPMENT

A. Cal-OSHA requires the following equipment be painted as follows:

1. Gas Mains and Valves shall be painted "gun metal gray" (medium gray)

2. Fire Valves and Raisers shall be painted OSHA's "safety red"

3.15 DOORS

A. Painted or refinished exterior wood or metal must be finished on both sides and edges with three coats of paint consisting of first coat of primer, second coat and third coat of exterior high gloss enamel.

B. Where doors open into rooms or spaces having different finishes, communicating doors must have edges finished according to industry standard or as directed by Project Inspector.

1. Strike edge of door shall be same color as inside face of door.

2. Hinged edge of door shall be same finish as outside face of door.

C. Exterior hardwood doors and frames where varnish finish has been removed shall be built-up to match adjoining finish with stain, filler and one coat of exterior varnish. Then surfaces, including edges must be given specified number of coats of exterior varnish as detailed under "Stain and Varnish Finish."

3.16 PORCH, STAIRS AND HANDRAILS

A. Unpainted, painted and mastic coated porch floors, treads, risers and thresholds of building shall be prepared as specified herein and painted with two coats of a non-skid porch and deck paint.

B. Handrails must be finished same as specified for exterior wood doors using exterior gloss enamel.

3.17 THRESHOLDS

A. Painted thresholds to be prepared, primed, and receive two coats of a non-skid porch and deck paint.

B. Natural finished wood thresholds to be prepared and receive three coats of a high gloss varnish.

3.18 INTERIOR PLASTER AND DRYWALL WORK - WALLS, CEILINGS, ETCETERA

A. Where ceilings are specified to be painted, beams, cornices, coves, ornamental features, staff work, plaster grilles, etcetera shall be included.

B. Ceilings shall be white, unless otherwise noted. Includes classrooms, storage rooms, offices, arcades, etcetera. Boiler room and fan room ceiling color shall match adjacent walls.

C. Where walls are specified to be painted, columns, staff work, piers, returns, reveals, soffits of stairs, both sides of stair railings, soffits and reveals of windows and other openings shall be included.

D. Grease, ink spots and marks of indelible pencils shall be completely removed by use of water and abrasive soap powder without injury to finished surface.

E. First coat may be thinned per paint manufacturer's recommendation with a thinner prepared specifically for material used. Coats shall be flowed on freely. First coat must be prepared so as to stop suction, and should any dead spots appear, they shall be touched up before next coat is applied. The last coat shall be a uniform surface, free of defects.

3.19 AREAS REQUIRING ENAMEL

A. Interior and Exterior Enamel – Gloss

Woodwork, walls and ceilings (except acoustic tile or acoustic plaster or as otherwise specified herein) in following areas:

1. Physical Education and Gym Buildings.

2. Cafeteria: Except student and teachers' dining rooms.

3. Shops.

4. Miscellaneous Rooms: Toilet rooms, custodian closets, storerooms, boiler and mechanical rooms.

5. Kitchen Complex: Color; Eastwind – Fill and seal cracks and voids.

B. Interior and Exterior Enamel – Semi-Gloss

Woodwork, walls and ceilings (except acoustic tile or acoustic plaster or as otherwise specified herein) in following areas:

1. Administrative offices.

2. Faculty lounges and auditoriums.

3. Walls and surfaces in rooms or areas specified to receive an enamel finish and not herein specified to receive a Gloss Enamel finish, shall have a finish coat of Semi-Gloss Enamel.

C. Interior masonry, brick and concrete surfaces having an existing painter's finish shall be finished same as specified for interior plaster and drywall. Concrete pan ceilings may be sprayed as directed by Project Inspector.

3.20 UNPAINTED METAL

A. Unpainted bronze, brass, copper work, window grilles, stairways, handrails, chain-link fences, stainless steel, open metal shelving, porcelain metal faced cabinets and aluminum will not be painted, unless otherwise specified.

3.21 PAINTED METAL

A. Exposed structural steel, miscellaneous/ornamental iron, sheet metal work, guards, steel sash, gates, painted aluminum, basketball rims, etcetera shall have surfaces cleaned and prepared as specified. The areas from which original painter's finish has been removed shall be spot primed with metal primer to match adjoining surfaces and then surfaces shall be given a prime coat of metal primer, second and third coats as specified. Copper pipe shall be painted with one coat of enamel undercoat per manufacturer's recommendation, a second and third coat of enamel as specified.

B. Painted ornamental iron rails and gates, metal ceilings (metal decking, etcetera) stairs, pipe columns, and pipe rails shall be prepared and finished as specified herein. Metal decking and metal roll-up doors may be sprayed.

C. Exterior surfaces (except bottom) of exterior metal storage container, including both sides of door(s) and edges shall be prepared, primed and painted. Exterior metal storage container(s) must be sprayed.

3.22 METAL COVERED DOORS, RADIATORS

A. Metal Covered Doors: Bare metal must be primed with a metal primer. Doors and edges shall then be painted with one coat of enamel undercoat, a second coat and third coat of exterior gloss enamel as specified.

B. Fly screens and hardware cloth of copper, bronze or galvanized wire must be painted with one coat of exterior enamel.

C. Radiator guards must be removed, painted with three coats of enamel to match adjoining surface and replaced after radiators have been painted

3.23 LIGHT FIXTURES

A. Exterior/interior light fixtures (other than plated or bronzed) and bells to be primed and then painted with two coats of an enamel to match adjoining surface. Bell identification plates must have paint removed and be kept clean.

B. Metal stacks and kilns must, after preparation, receive two coats of aluminum paint or a heat resistant material. Minimum required heat resistant coating shall be rated to not less than 700 degrees F.

C. Cafeteria equipment: Metal work in cafeteria, kitchen and serving counters in student and faculty dining rooms having an existing aluminum paint finish must be cleaned as specified and given two coats of an aluminum paint.

3.24 FLAG AND LIGHT POLES

A. Clean by wire-brushing and sanding to remove foreign debris, loose paint, rust, etcetera from pole, platform, steps, cage area and mechanical fixtures related to

those areas. After removing loose paint, feather-edge sand surrounding areas of existing finish. Remove dust. Exclude electrical fixtures.

B. Spot-prime with a quick-dry metal primer.

C. Apply by brushing first and second coat of aluminum paint per manufacturer's time recommendation for re-coating.

E. Rolling or airless spraying is not permitted on flag and light poles.

3.25 METAL SURFACES

A. Clean by wire-brushing and sanding to remove foreign debris, loose paint, rust, etcetera. After removing loose paint, feather-edge sand surrounding areas of existing finish. Remove dust.

B. Exterior bare metal surfaces shall be primed with a metal primer then painted with a first coat of enamel undercoat, then a second coat and third coat of exterior gloss enamel.

C. Hardware having a painted finish shall have paint removed. Doors closers shall be finished with a leather brown or aluminum paint. Aluminum paint shall be applied in sanitary areas such as cafeterias, dining rooms and toilet rooms. Leather brown (N-2501) paint shall be used in other areas.

3.26 PAINTING OF MECHANICAL WORK

A. Exposed heating, ventilating, air conditioning, plumbing, electrical equipment, apparatus, piping, ducts, coverings, etcetera shall be cleaned, prepared and painted as specified herein for that item.

1. In finished areas, these items must be finished with one coat of primer and two coats of enamel to match adjoining wall or ceiling finish as specified herein.

B. Radiator branches, risers, returns, radiators, supports and other types of heating equipment in finished spaces shall be finished with three coats of paint to match adjoining finish as specified herein. Gas steam radiators shall be disconnected and reconnected by Owner.

C. Register faces and grilles, unless plated, must be given three coats of paint to match adjoining finish as specified.

D. Ventilators and interior sheet metal ducts must be treated and finished as specified for interior metal work.

E. Coverings on pipes in finished rooms must be finished same as adjoining wall or ceiling surfaces. Do not break surface of any wrapped pipes.

F. Labels on fire alarm systems, bells, pulls must be covered and kept intact. Fire alarm bells and pulls to be painted red gloss paint.

G. Covering on boilers, tanks, pipes, etcetera in boiler room and heater room must be primed and then finished with gloss enamel.

H. Valves, pipe hangers, flanges, unions, drain pipes, soil lines, exposed blow-off pipes, boiler fronts, smoke boxes, breeching, iron boiler bases, metal stacks, water column/pipe connections, damper regulators, manholes, safety valve connections, boiler appurtenances, etcetera, located in boiler room must be painted with two coats of a boiler paint as recommended by paint manufacturer.

I. Pumps, fans, fan housing, belt guards, including supports, motors, or other equipment, cover plated to sump pump, tank, manhole covers/rings mounted in floors including conduits and piping in boiler or fan rooms must be primed and then finished with two coats of gloss enamel as specified herein.

J. Mechanical work not specifically mentioned must be painted as specified for other work of same character.

K. Finished bronze, brass fittings, plated work, name plate and fusible links and chains must be cleaned of paint.

L. Pressure relief grilles with barometric dampers leading to a corridor or to exterior must be masked off before spraying any material.

M. Automatic sprinkler valves, gas meters and water meters must be painted as specified herein

3.27 ELECTRICAL CABINETS

A. Front side of doors and exposed lip around doors to electrical cabinets in finished areas must be finished same as walls.

3.28 HARDWARE AND AUTOMATIC DOOR CLOSERS

A. Hardware having a painted finish must have paint removed. Doors closers must be finished with a leather brown or aluminum paint. Aluminum paint shall be applied in sanitary areas such as cafeterias, dining rooms, toilet rooms. Leather brown (N-2501) paint shall be used in other areas. Where both sides of doors are specified to be painted, door closers shall be included.

3.29 CLEANING

A. Glass, polycarbonate and fiberglass on interior and exterior where painting has been done shall be cleaned of paint and varnish,. Glass, fiberglass and polycarbonate that are scratched or damaged by painting work , shall be replaced with material to match original.

B. Finished bronze, copper, brass fittings, plated work, name plate and fusible links and chains shall be cleaned of paint.

C. Before applying finish coat of material to exterior sash with security grilles, Contractor shall clean window panes with a cleaner.

D. Dispose of debris, waste or unused materials, off site. Use of school dumpsters is strictly prohibited.

E. Remove paint from hardware, including paint from previous painting.

F. Contractor shall free sash and leave it in an easy operating condition.

G. Glass, fiberglass and polycarbonate on exterior shall be traced neat and clean with no more than 1/16 inch overlay. Paint specks, smears or splatters shall be immediately removed and surface cleaned.

H. Rooms, Buildings, and Campuses must be cleaned of paint debris, including dust caused by painting project to approval of Project Inspector and OAR.

3.30 POST OCCUPANCY WORK

A. Two months after substantial completion, OAR will arrange a date and time when the Contractor must return to the site to check and free sashes that were painted so they are in proper operating condition.

END OF SECTION

SECTION 09 5113

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Lay-in acoustical ceiling systems and metal suspension system.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 09 2216 - Non-Structural Metal Framing.

3. Section 09 2900 - Gypsum Board.

4. Division 23 - HVAC.

5. Division 26 - Electrical.

1.02 QUALITY ASSURANCE

A. Ceiling systems shall consist of lay-in acoustical ceiling panels by a single manufacturer and suspension systems by a single manufacturer for the entire project.

B. Qualifications of Installer: Minimum five years experience in installing acoustical ceiling systems of the types specified.

C. Design Criteria:

1. Deflection of finished surface to 1/360 of span or less.

2. 1/8 inch maximum permissible variation from true plane measured from 10 foot straightedge placed on surface of finished acoustical fiber units.

D. Requirements of Regulatory Agencies:

1. Conform to CBC requirements and UL - Tunnel Test for Fire Hazard Classification of Building Materials.

2. CISCA: Acoustical Ceilings Use and Practice.

3. Division of the State Architect: Comply with requirements of IR 25-2.10.

E. American Society for Testing and Materials (ASTM):

1. ASTM A641 - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

2. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

3. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

4. ASTM C635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

5. ASTM C636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

7. ASTM E580 – Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.

8. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.

9. ASTM E1414 - Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.

10. ASTM E1477 - Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.

F. American Society of Civil Engineers (ASCE):

1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures, as amended by CBC 1615A.1.16.

G. CHPS Low-Emitting Materials Table: Materials submitted must be lsited as low emitting on the CHPS website, www.CHPS.net,

1.03 SUBMITTALS

A. Samples:

1. Lay-in panels of each specified type, 6-inch by 6-inch minimum size.

2. Suspension System: 12-inch long samples of suspension system members, connections, moldings and wall angles, for each color specified.

B. Shop Drawings:

1. Indicate complete plan layouts and installation details.

2. Indicate related Work of other sections which is installed in, attached to, or penetrates ceiling areas, such as air distribution and electrical devices.

C. Product Data:

1. Suspension System for Lay-in Ceiling: Printed data for suspension system components, including load tests, indicating conformance to specified tests and standards.

2. Acoustical units: Printed data indicating conformance to specified tests and standards.

D. Maintenance Materials: Provide extra panels equal to 1 percent of the area of each typical module size of acoustical panel, but not less than 8 of each specified size, style and color.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the Project site in original sealed packages.

B. Storage: Store materials in building area where they will be installed, in original package. Keep clean and free from damage due to water or deteriorating elements.

C. Handle in a manner to prevent damage during storage and installation.

1.05 PROJECT CONDITIONS

A. Installation of acoustical ceiling system shall not begin until the building is enclosed, permanent heating and cooling is in operation, and residual moisture from plaster and concrete work has dissipated. Building areas to receive ceilings shall be free of construction dust and debris.

B. Environmental Requirements: Maintain temperature in space at 55 degrees F or above for 24 hours before, during, and after installation of materials.

C. Scheduling:

1. Before concealing Work of other sections, verify required tests and inspections have been completed.

2. Coordinate with related Work of other sections. Coordinate location and symmetrical placement of air distribution devices, electrical devices, and penetrations with related Work section.

1.06 WARRANTY

A. Manufacturer shall provide a 10 year material warranty.

B. Installer shall provide a two year fabrication and installation warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Armstrong World Industries.

B. USG Corporation.

C. CertainTeed Ceilings Corp.

D. Equal.

2.02 SUSPENSION SYSTEM

A. Metal suspension system for acoustical lay-in tile shall be hot-dipped galvanized steel conforming to ASTM A653. Main beams and cross tees shall be double-web steel construction with exposed flange design, with factory punched cross tee slots, hanger holes and integral couplings.

B. Metal suspension system for acoustical lay-in tile shall conform with ASTM C635, C636 and E580 and section 13.5.6 of ASCE 7, as amended by CBC Section 1615A.1.16, for installation in high seismic areas.

C. Structural classification of suspension systems shall be heavy-duty in conformance to ASTM C635.

D. Vertical Strut: USG Donn Compression Post, or equal, or as indicated; types and designs complying with requirements of authorities having jurisdiction and seismic Zones D, E and F requirements. Provide base attachment clip for connection of vertical strut to main beams.

E. Wall Molding: Fabricated from galvanized steel with 2-inch horizontal leg and hemmed edges, same finish as main and cross tees.

F. Spacer/Stabilizer Bars: Provide for tying together the ends of main runners and cross tees that are not attached to wall molding.

G. Hanger Wire: 0.106 inch diameter (0.144 inch diameter for pendant fixtures), galvanized soft annealed mild steel wire as defined in ASTM A641, Class 1 coating.

H. Provide attachment devices and any other required accessories for a complete suspended ceiling system installation.

2.03 ACOUSTICAL CEILING PANELS

A. Acoustical ceiling panels shall be class A in accordance to ASTM E1264.

B. Acoustical panels shall meet the following surface-burning characteristics when tested in accordance to ASTM E84 for Class A materials:

1. Maximum Flame Spread: 25.

2. Maximum Smoke Developed: 50.

C. Mold and Mildew Resistance: Panels and faces shall be treated with a biocide paint additive or an antimicrobial solution to inhibit mold and mildew.

2.04 CEILING TYPES

A. ACT 1 - Classrooms:

1. Acoustical Ceiling Panel (Staple Up & Adhesive):

a. Panel Name: Armstrong Fine Fissured Tile 741, or equal.

b. Panel Size: 1-foot by 1-foot.

c. Panel Thickness: 1/2 inch.

d. Edge Detail: Tongue-and-Groove; Glue-on.

e. Light Reflectance: 0.85 minimum, complying with ASTM E1477.

f. CAC: Minimum 35 - 39, UL Classified, complying with ASTM E1414.

g. NRC: Minimum 0.55, UL Classified, complying with ASTM C423.

h. Color: White.

i. Recycled Content: Minimum 37 percent.

B. ACT 2 – Faculty Offices, Faculty Lounge, Workroom, Nurse, Counselor and Main Entry at the Administration Building:

1. Acoustical Ceiling Panels:

a. Panel Name: Armstrong Fine Fissured High NRC 1811, USG Radar Climaplus HiNRC 22311, CertainTeed Fine Fissured HHF 497 HNRC, or equal.

b. Panel Size: 2-foot by 4-foot.

c. Panel Thickness: 3/4 inch.

d. Edge Detail: Lay-in.

e. Light Reflectance: 0.83 minimum, complying with ASTM E1477.

f. CAC: Minimum 35 - 39, UL Classified, complying with ASTM E1414.

g. NRC: Minimum 0.70, UL Classified, complying with ASTM C423.

h. Color: White.

i. Recycled Content: Minimum 37 percent.

2. Suspension System:

a. Suspension System Name: Prelude XL by Armstrong, Donn DX by USG, 1200 Seismic Series by Chicago Metallic Corporation, or equal.

b. Color: White.

PART 3 - EXECUTION

3.01 PREPARATION

A. Furnish layouts for inserts, clips or other supports and struts required to be installed by the Work of other trades that depend on the suspended ceiling system for support.

B. Coordinate related Work to ensure completion prior to installation of clips or fasteners.

C. Compare layouts with construction conditions. Tile shall be spaced symmetrically about the centerlines of the room or space, and shall start with a tile or joint line as required to avoid narrow tiles at the finish edges unless indicated otherwise. Joints shall be tight with joint lines straight and aligned with the walls. Ceiling moldings shall be provided where tile abuts wall with matching caulking to eliminate any space.

3.02 INSTALLATION OF SUSPENSION SYSTEMS

A. General:

1. Install suspension system in accordance with ASTM C636 and ASTM E580.

2. System shall be complete; with joints neatly and tightly joined and securely fastened; suspension members shall be installed in a true, flat, level plane.

3. Hanger Wires: 0.106 inch diameter minimum; larger sizes as indicated or required.

a. Fasten wires to panel points and structure above per most stringent requirements of fabricator and CBC and as indicated on Drawings.

b. Wires exceeding 1:6 out-of-plumb shall be braced with counter-sloping wires.

c. Maintain wires at least 6 inches from non-braced ducts, pipes, conduits, and other items.

d. Install wire along main runners at 4 feet on center. Terminal ends of each main runner and cross tee must be supported within 8 inches of each wall with a perimeter wire or within one-fourth (1/4) of the length of the end tee, whichever is least, for the perimeter of the ceiling area.

e. Where obstructions prevent direct suspension, provide trapezes or equivalent devices; 1 ½-inch minimum cold rolled channels back to back may be installed for spans to 6 feet maximum.

f. Wire shall be straight, without extraneous kinks or bend. Hanger wire connections must be capable of carrying a 200 - pound pull without stretching or shifting the suspension clip.

4. Bracing Wires to Resist Seismic Forces: 0.106 inch diameter minimum, larger sizes as indicated or required.

a. System for Bracing Ceilings: Lay-In Ceiling Systems: Install one four-wire set of sway-bracing wires and a vertical strut for each 144 square feet maximum of ceiling area. Locate wire-sets and struts at 12 feet maximum on center. At ceiling perimeters, wire-sets shall be installed within 6 feet of walls.

b. Install four-wire sets and struts within 2 inches of cross-runner intersection with main runner; space wires 90 degrees from each other.

c. Do not install sway bracing wires at an angle greater than 45 degrees with the ceiling plane.

d. Wires shall be tight, without causing ceiling to lift.

e. Fasten struts in accordance with CBC requirements.

f. Maintain wires at least 6 inches from non-braced ducts, pipes, conduit, and other items.

5. Provide additional wires, 0.106 inch diameter minimum, necessary to properly support suspension at electrical devices, air distribution devices, vertical soffits, and other concentrated loads.

6. Suspension:

a. Suspension members shall be fastened to two adjacent walls per ASTM 580; but shall be at least 3/4 inches minimum clear of other walls.

b. Any suspension members not fastened to walls shall be interconnected to prevent spreading, near their free end, with a horizontal metal strut or stabilizer bar or 0.064 inch diameter taut tie wire.

c. Provide additional tees or sub-tees to frame openings for lights, air distribution devices, electrical devices, and other items penetrating

through ceiling, which do not have an integral flange to support and conceal cut edges of acoustic panels. Provide cross bracing necessary to securely support any surface mounted fixtures or other items.

7. Attachment of Wires:

a. To Metal Deck or Steel Framing Members: Install as required by current code.

b. To Suspension Members: Insert through holes in members or supporting clips.

c. Wires shall be fastened with three tight turns minimum for hanger wires and four tight turns minimum bracing wires. Turns shall be made in a 1 ½-inch maximum distance.

B. Suspension System for 2-foot by 4-foot Lay-in Acoustical Ceilings:

1. Main Runners: Install main runners 48 inches apart; 0.106 inch diameter hanger wires space 48 inches on center maximum along runners, and within 8 inches of ends.

2. Install wall moldings with fasteners to studs. Install corner caps at molding intersections.

3. Cross-Tees: Install between main runners in a repetitive pattern of 2-foot spacings.

4. Sub-Tees: Install at edges of penetrations.

3.03 INSTALLATION OF ACOUSTICAL PANELS

A. Install panels into suspension system. Partial panels shall be neatly cut and fitted to suspension and around penetrations and/or obstructions. Duplicate tegular edges at partial panels; cuts to be straight. Repaint cut tiles to match color or as directed by manufacturer for mylar facing at visually exposed conditions or as required by the Architect.

B. Penetrations through the ceilings for sprinkler heads and other similar devices that are not integgrally tied to the celing system in the laeral direction shall have a 2 inch oversizzed ring, sleeve or adapter through the celing tile to allow freee movement of one inch in horizontal directions. Alternateively per ASTM E580, a flexible sprinkler hose fitting that can accommodate one inch of celing movement shall be permitted to be used in lieu of the oversized ring, sleeve or adapter.

3.04 AIR DISTRIBUTION DEVICES

A. Refer to and coordinate with Division 23 - HVAC.

B. Install air distribution grilles and other devices into suspension system. Install 4 taut wires, each 0.106 inch diameter minimum, to each device within 3 inches of device corners, to support their weight independent of the suspension system.

3.05 LIGHT FIXTURES

A. Refer to and coordinate with Division 26 - Electrical.

B. Fixtures weighing less than 56 pounds: Install fixtures into suspension systems and fasten earthquake clips to suspension members. Install minimum 2 slack safety wires, each 0.106 inch diameter minimum, to each fixture at diagonally opposite corners, to support their weight independent of the system.

C. Fixtures weighing 56 Pounds or more: Install fixtures into suspension system and fasten earthquake clips to suspension system members as required by the Drawings and/or code. Install not less than 4 taut 0.106 inch diameter wires capable of supporting four times the fixture load.

D. Support pendant-mounted light fixtures directly from the structure above with hanger wires or cables passing through each pendant hanger and capable of supporting two times the weight of the fixture. Brace the pendant-mounted light fixtures by either a bracing assembly at the ceiling penetration or below the ceiling to the walls, as indicated in the drawings.

3.06 CLEANING

A. General: After installation of acoustical material has been completed, clean surfaces of the material, removing any dirt or discolorations. Replace panels as required.

B. Acoustical Panels: Minor abraded spots and cut edges shall be touched up with the same paint as was used for factory applied finish of the lay-in panels.

C. Remove and replace work that can not be succesfully cleaned and repaired to eliminate evidence of damage.

3.07 CLEAN UP

A. Remove rubbish, debris, and waste materials and legally dispose off of the Project site.

3.08 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 6513

RUBBER BASE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Topset coved rubber base for installation with surface flooring.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 09 6516 - Resilient Sheet Flooring.

3. Section 09 6518 - Rubber Flooring and Stair Covering.

4. Section 09 6519 - Vinyl Composition Tile.

5. Section 09 6543 - Linoleum Flooring.

6. Section 09 6816 - Carpeting.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's published technical data describing materials, construction and recommended installation instructions. Submit technical data and installation instructions for each adhesive material.

B. Maintenance Instructions: Submit manufacturer's recommendations for maintenance, care and cleaning of base.

C. Samples: Submit Samples of top set base in each available color. Following color selections, submit Samples, not less than 12 inches long of each selected color and type. Submit pint cans of each type adhesive.

D. Maintenance Materials: Before Substantial Completion, deliver at least 50 lineal feet and five outside corner units of each color of rubber base installed. Deliver the materials in unopened factory containers or in sealed cartons with labels identifying the contents, matching installed materials. Include unopened cans of adhesives adequate to install the maintenance materials.

1.03 QUALITY ASSURANCE

A. Qualifications of Installer: Minimum five years experience in successfully installing the same or similar flooring materials.

B. Comply with the following as a minimum requirement:

1. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.

2. ASTM F1861: Standard Specification for Resilient Wall Base.

3. Comply with current CHPS requirements, www.chps.net.

4. Chemically based products such as sealers, primers, fillers, adhesives, etc. must be approved by Owner's Office of Environmental Health and Safety (OEHS).

5. Each selected color and configuration shall be from same dye lot and color.

1.04 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to the Project site in original unopened manufacturer's packaging clearly labeled with manufacturer's name. Store materials at room temperature, but not less than 70 degrees F, for a minimum of 48 hours before installation, unless otherwise indicated in manufacturer's printed instructions.

1.05 PROJECT CONDITIONS

A. Ventilation and Temperature: Verify areas that are to receive rubber base are ventilated to remove fumes from installation materials, and areas are within temperature range recommended by the various material manufactures for site installation conditions.

1.06 WARRANTY

A. Manufacturer shall provide a five year material warranty.

B. Installer shall provide a two year fabrication and installation warranty.

PART 2 – PRODUCTS

Basis-of-Design: Johnsonite Traditional per Finish Schedule.

2.01 ACCEPTABLE MANUFACTURERS

A. Johnsonite

B. Roppe, Pinnacle Rubber Base.

C. Flexco Company, Wallflower Premium Rubber Wall Base.

D. Burke/Mercer Wall Base.

E. Equal.

2.02 MATERIALS

A. Rubber base: Conform to ASTM F 861; Group 2, solid (homogeneous); Type 1, TS, (thermoset) vulcanized rubber, Style A, 4-inch high unless otherwise indicated, integral colors as selected, non-shrinking, 1/8 inch thick, with matching molded outside corners.

B. Base Adhesive: Water based, low odor type, as recommended by manufacturer of rubber base.

PART 3 - EXECUTION

3.01 COORDINATION

A. Coordinate the Work of this section with other sections to provide a level, smooth and clean finish surfaces to receive rubber base.

3.02 EXAMINATION

A. Field verify dimensions and other conditions affecting the Work of this section before commencing the Work of this section.

B. Before Work is started, examine surfaces that are to receive rubber base. Deficiencies shall be corrected before starting the Work of this section.

3.03 PREPARATION

A. Do not start preparation until adjacent concrete floor slabs are at least 90 days old and finish flooring is installed.

B. Install rubber base when ambient temperature is 70 degrees F. or higher.

3.04 INSTALLATION

A. Install top set base at hard floors, including resilient flooring, concrete and wood, carpet and other soft floors.

B. Securely fasten cement base to backing in long lengths in accordance with manufacturer's recommendations. Lay out lengths so that not less than 18 inches long filler pieces are provided. Assure that top and toe continuously contact the wall and floor, and that all joints are tight. Install matching factory formed external corners at all offsets. Inside corners shall be coped; wrapped corners are not acceptable.

C. Use of adhesive gun is prohibited. Apply adhesive directly to substrate using the appropriate notched trowel or spreader according to manufacturer's instructions. Maintain 1/8 inch gap from top of base to prevent adhesive oozing onto adjacent surfaces.

D. Base and outside corners shall be rolled with a seam roller before adhesive sets.

3.05 CLEANING

A. Maintain surfaces of base clean as installation progresses. Clean rubber base when sufficiently seated and remove foreign substances.

B. Clean adjacent surfaces of adhesive or other defacement. Replace damaged and/or defective Work to the specified condition.

3.06 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.07 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 6518

RUBBER FLOORING AND STAIR COVERING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Rubber tile flooring.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 03 3000 - Cast-in-Place Concrete.

3. Section 06 1626 - Engineered Plywood Flooring Underlayment.

4. Section 09 0561 - Moisture Testing for Flooring Installation.

5. Section 09 6513 - Rubber Base.

6. Section 09 6516 - Resilient Sheet Flooring.

7. Section 09 6519 - Vinyl Composition Tile.

1.02 DEFINITIONS

A. Pop-up: A pop-up is defined as any surface deviation or looseness of substrate that is equal to or greater than 1/64 (0.015625) inch above the concrete floor level, regardless of the size.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's published technical data describing materials, construction, and recommended installation procedures Submit technical data and installation instructions for each adhesive material. Submit list and Product Data of recommended finish materials.

B. Maintenance Instructions: Submit manufacturer's recommendations for maintenance, care, cleaning of rubber tile.

C. Samples: Submit Samples of rubber tile in each available color and pattern. Following color selections, submit full size Samples of each selected color and pattern. Submit pint cans of each type adhesive.

D. Maintenance Materials: Before Substantial Completion, deliver one unopened container of each color and pattern of rubber tile in each color and pattern installed. Label each container indicating locations installed. Include unopened cans of adhesives adequate to install the maintenance materials.

E. Installer's Experience Qualifications: Submit list of not less than five projects, extending over period of not less than five years, indicating installer's experience record. Submit letter from manufacturer indicating manufacturer's approval for installer of the products.

1.04 QUALITY ASSURANCE

A. Qualifications of Installer: Minimum five years experience in successfully installing the same or similar flooring materials.

B. Comply with the following as a minimum requirement:

1. ASTM E84: Class A Flame Spread Rating of 25 or less.

2. ASTM F1344, Standard Specification for Rubber Floor Tile.

3. ASTM F1869: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor.

4. ASTM F2169: Standard Specification for Resilient Stair Treads.

C. Comply with current CHPS requirements, www.chps.net.

D. Chemically based products such as sealers, primers, fillers, adhesives, etcetera must be approved by Owner's Office of Environmental Health and Safety (OEHS).

1.05 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to Project site in original unopened manufacturer's packaging clearly labeled with manufacturer's name. Materials shall be stored at not less than 70 degrees F for not less than 48 hours before installation.

1.06 PROJECT CONDITIONS

A. Ventilation and Temperature: Verify areas that are to receive new flooring are ventilated to remove fumes from installation materials, and areas are within temperature range recommended by the various material manufactures for Project site installation conditions.

1.07 WARRANTY

A. Manufacturer shall provide a twenty year material warranty.

B. Installer shall provide a two year fabrication and installation warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Nora Rubber Flooring.

B. Mannington Commercial.

C. Burke Flooring.

2.02 MATERIALS

A. Rubber Tile (RT-1 & RT-2): ASTM F1344, Standard Specification for Rubber Floor Tile, Class I B, homogeneous rubber tile, through mottled pattern, 1/8 inch thick, conforming to CBC Chapter 11B and ADAAG requirements for non-slip materials.

Basis-of-Design: Norament Satura Flooring Tiles as indicated on Finish Schedule.

B. Stair Covering:

1. Treads: ASTM F2169, Standard Specification for Resilient Stair Treads. One piece extruded rubber with 2 inch wide minimum flush integral contrasting color abrasive strips designed for installation on stairs of configuration indicated, colors and patterns as selected.

2. Risers and Skirting: 1/8 inch thick one piece rubber or vinyl in selected colors, with exposed edges factory radius molded.

C. Crack Filler and Leveling Compound: Cementitious type, Durabond's Webcrete # 95, Ardex SD-F, Armstrong S-194 or equal, as recommended by flooring manufacturer.

D. Concrete Primer: Non-staining type recommended by manufacturer of rubber tile.

E. Adhesive: Water based, low odor type formulated specially for use with rubber tile, or double sided mounting tape recommended by manufacturer of rubber tile.

F. Reducer Strips: Tapered rubber not less than one inch wide, and thickness to match tile.

G. Underlayment: Install in accordance with Section 06 1626 – Engineered Plywood Flooring Underlayment.

PART 3 - EXECUTION

3.01 COORDINATION

A. Coordinate with related Work to assure level, smooth, and clean finish surfaces to receive rubber floor tile and stair covering.

3.02 EXAMINATION

A. Field verify dimensions and other conditions affecting the Work of this section.

Before Work is commenced, examine surfaces that are to receive rubber tile and stair covering. Repair and/or replace defective Work before starting Work of this section.

3.03 PREPARATION

A. Concrete Slabs:

1. Do not start preparation until adjacent concrete floor slabs are at least 90 days old.

2. Leveling: Check sub-floors for true to level and plane within a tolerance of 1/8 inch in 10 feet. Test floor areas both ways with a 10-foot straightedge and repair high and low areas exceeding allowable tolerance. Pop ups shall be hammered out and floor filled with a cementitious leveling compound. Remove high areas by power sanding, stone rubbing or grinding, chipping off and filling with leveling compound, or equivalent method. Fill low areas with leveling compound. Repair and level the surfaces having abrupt changes in plane, such as trowel marks or ridges, whether or not within the allowable tolerance. Clean areas where repairs are performed.

3. Cleaning: After leveling, clean substrates of deleterious substances and foreign matter. Fill cracks or depressions with cementitious leveling compound of the type recommended by flooring manufacturer for the specific Work conditions.

4. Moisture Testing: Conform to Section 09 0561 - Moisture Testing for Flooring Installation.

5. Delay application of flooring until sub-floors are sufficiently dry, or perform remedial measures as recommended by flooring materials manufacturer.

a. Priming: Prime concrete floor slabs on grade; prime other slabs if recommended by flooring manufacturer.

B. Wood Sub-floors:

1. Install underlayment according to manufacturer’s instructions.

2. Sweep floors. Vacuum sanding dust.

3.04 INSTALLATION OF TILE

A. Color and pattern: Install tiles in a rectangular pattern, in one color without border in rooms or spaces, unless otherwise indicated.

B. Special designs: Floor with special designs shall be installed as indicated on Drawings or as required by Architect.

C. Install rubber floor tile and stair covering with adhesive or double sided mounting tape when ambient temperature is 70 degrees F. or higher.

D. Install the tile adhesive in a thin film evenly with a notched trowel. Trowel notches shall be as recommended by flooring manufacturer.

1. Mix adhesive in accordance with manufacturer's instructions. Provide safety precautions during mixing.

2. Install adhesive only in the area that can be covered by flooring material within the adhesive manufacture's recommended working time.

3. Remove any adhesive that has dried or filmed over.

4. Adhesive application rate shall be as required to avoid telegraphing trowel lines to the surface after maintenance coatings are applied. Adjust tile runoff during installation if necessary.

E. Provide reducer where floor covering edges are exposed, such as at center of the door or where floor coverings terminate.

F. Install rubber tile in accordance with manufacturer's recommendations. Tiles shall fit snugly at wall. Tightly trim to pipes, jambs, outlets, and similar conditions.

G. Install tiles symmetrically about centerlines of areas while progressing toward walls. Adjust border tiles as required. Tiles shall be straight and joints close. Tile shall be cut to fit tightly at doorframes and walls.

H. Mechanically cut flooring material to provide square true edges.

I. As floor tile is installed, the floor shall be rolled with a clean, 150-pound roller in both directions.

3.05 INSTALLATION OF STAIR TREADS, RISERS AND SKIRTING

A. Stair Treads: Install in one-piece size on each tread and riser, tightly jointed to walls and risers. Install full width landing treads unless otherwise indicated. Stagger seams when stair covering is greater than one piece.

B. Clean or sand back of stair tread skirts for proper adhesion.

C. Prior to installing one-piece tread and risers, a cove stick fillet must be installed at the joint where the back of the step meets the step riser. Install the cove stick fillet using tape or adhesive.

D. Fit the nose of the tread tightly against face of stair nosing. Install with OEHS approved epoxy filler.

E. Secure area to allow stair tread adhesive to dry completely before allowing foot traffic.

F. Fully bed treads in manufacturer's recommended OEHS approved adhesive, or tape.

G. Cement skirting and risers in place with tight lapped and double cut or scribe joints.

H. Cut contrasting strips to fit, and install at top, bottom and intermediate risers as indicated or as required by regulatory authorities.

I. Thoroughly roll tread and riser while adhesive is fresh allowing transfer of adhesive to the material for a firm bond.

3.06 CLEANING, WAXING, AND COMPLETION

A. Maintain flooring and stair tread surfaces clean as installation progresses.

B. Clean flooring and treads when sufficiently seated and remove foreign substances.

C. Before Substantial Completion, buff polymeric floor finish only if specifically recommended by finish manufacturer.

D. Clean adjacent surfaces of adhesive or other deleterious conditions.

E. Do not wax floors.

3.07 CLEAN UP

A. Remove rubbish, debris and waste material and legally dispose of off the Project site.

3.08 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.09 INSTRUCTION

A. After Work of this section is complete, flooring manufacture’s technical representative shall provide a four hour instruction period to Owner staff in maintenance of flooring.

END OF SECTION

SECTION 09 6519

VINYL COMPOSITION TILE

JPART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Vinyl composition tile flooring as indicated.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 06 1626 - Engineered Plywood Flooring Underlayment

3. Section 09 6518 - Rubber Flooring and Stair Covering.

4. Section 09 6516 - Resilient Sheet Flooring.

5. Section 09 6513 - Rubber Base.

1.02 DEFINITIONS

A. Pop-up: A pop-up is defined as any surface deviation or looseness of substrate that is equal to or greater than 1/64 (0.015625) inch above the concrete floor level, regardless of the size.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's published technical data describing materials, construction and recommended installation instructions. Submit technical data and installation instructions for each adhesive material. Submit list and Product Data of recommended finish materials.

B. Maintenance Instructions: Submit manufacturer's recommendations for maintenance, care, and cleaning of vinyl composition tile.

C. Samples: Submit Samples of vinyl composition tile and any reducers or transitions in each available color and pattern. Following color selections, submit full size samples of each selected color and pattern. Submit pint cans of each type of adhesive.

D. Maintenance Materials: Before Substantial Completion, deliver one unopened container of each color and pattern of vinyl composition tile in each color and pattern installed. Label each container indicating locations installed. Include unopened cans of adhesives adequate to install the maintenance materials.

E. Installer's Experience Qualifications: Submit list of not less than five projects, extending over period of not less than five years, indicating installer's experience

record. Submit letter from manufacturer indicating manufacturer's approval for installer of the products.

1.04 QUALITY ASSURANCE

A. Qualifications of Installer: Minimum five years experience in successfully installing the same or similar flooring materials.

B. Qualifications of Supervising Installer: In addition to the qualifications of the installer listed above, the flooring installer's supervisor shall have a minimum of 10 hours Cal-OSHA safety training.

C. Pre-Installation and Progress meetings: Prior to start of work of this section and after approval of submittals, schedule on-site meetings between Contractor, Supervising Installer, OAR and Project Inspector to review installation and procedures required for project.

D. Comply with the following as a minimum requirement:

1. Materials shall be compliant with requirements for slip resistance as per CBC Chapter 11B and ADAAG.

2. ASTM E84: Class A Flame Spread Rating of 25 or less.

3. Comply with current CHPS requirements, www.chps.net.

4. Moisture Testing: ASTM F1869.

1.05 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to the Project site in original unopened manufacturer's packaging clearly labeled with manufacturer's name.

B. Materials shall be stored at room temperature, but not less than 70 degrees F for not less than 48 hours before installation, unless manufacturer's instructions specify otherwise.

1.06 PROJECT CONDITIONS

A. Ventilation and Temperature: Verify areas that are to receive new flooring are ventilated to remove fumes from installation materials. Verify that areas are within temperature range recommended by the various material manufactures for Project site installation conditions.

1.07 WARRANTY

A. Manufacturer shall provide a five year material warranty.

B. Installer shall provide a two year fabrication and installation warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Armstrong Contract Interiors.

B. Nora by Interface.

2.02 MATERIALS

A. Vinyl Composition Tile (VCT): Conform to ASTM F1066, Composition 1, asbestos free, Class 2 (through pattern), 12-inch by 24-inch by minimum 1/8 inch thick, colors and patterns as indicated on Drawings.

Basis-of-Design: Armstrong Premium Excelon Raffia tiles as indicated on Finish Schedule.

1. Tile shall be from same batch and run number for each color.

C. Crack Filler and Leveling Compound: 100 percent cementitious binder type (as defined by ASTM C150), shall be approved by Owner's Office of Environmental Health and Safety (OEHS). The following manufacturers are currently listed approved by OEHS:

1. Webcrete #95 as manufactured by Durabond.

2. Ardex SD-F.

3. Armstrong S183 or S184.

4. Leveling Compound shall meet or exceed 200 pounds when tested in accordance with ASTM C 1583.

D. Concrete Primer: Non-staining type recommended by manufacturer of vinyl composition tile.

E. Adhesive: Water based, low odor type formulated specially for installation with vinyl composition tile, and recommended by manufacturer.

F. Reducer Strips: Tapered rubber not less than one inch wide, and thickness to match tile.

G. Floor Finish: One of the following systems:

1. Neutral cleaner, ACT sealer and Super Polymer 85 finish, manufactured by Maintex.

2. Sundance cleaner and Butcher's Mainstay floor finish, manufactured by Waxie Stationary Supply.

3. S-485 neutral cleaner, S-495 Floor Sealer and S-480 floor finish by Armstrong.

4. Equal.

PART 3 - EXECUTION

3.01 COORDINATION

A. Coordinate with related Work to assure level, dry, smooth, and clean finish surfaces to receive vinyl composition floor tile.

3.02 EXAMINATION

A. A. Field verify and correct deficiencies of conditions affecting Work before commencing Work of this section.

3.04 PREPARATION OF WOOD SUB-FLOORS

A. Install underlayment according to manufacturer's instructions.

B. Sweep floors and vacuum sanding dust.

3.05 INSTALLATION OF TILE

A. Color and pattern: Install tiles in the pattern indicated on Drawings. If no pattern is indicated, tiles shall be installed in a rectangular pattern, in one color.

B. Special designs and school logo:

1. Fabricate of sizes and colors indicated on drawings and from electronic file provided by Architect.

2. Precision cut VCT tiles using either computer aided water-jet or laser technologies to a tolerance of 0.005 inch.

C. Install vinyl composition floor tile when ambient temperature is 70 degrees F or higher or manufacturer's range.

D. Install the tile adhesive in a thin film evenly with a notched trowel. Trowel notches shall be as recommended by adhesive manufacturer.

1. Mix adhesive in accordance with manufacturer's instructions.

2. Install adhesive only in area that can be covered by flooring material within the adhesive manufacture's recommended working time. Do not set tile into wet adhesive.

3. Tile must be set into dry, but still tacky, adhesive film. Remove adhesive that has dried beyond recommended time, or has filmed over and is no longer tacky.

4. Adhesive application rate shall be as required to avoid telegraphing trowel lines to the surface after maintenance coatings are applied. Adjust tile runoff during installation if necessary.

5. Immediately remove any excess adhesive from the tile surface using the adhesive manufacturer's recommended cleaner and a damp, not wet, cloth.

E. Provide reducer where floor covering edges are exposed, such as at center of the door or where floor coverings terminate.

F. Install tiles symmetrically about centerlines of areas progressing toward walls. Adjust border tiles as required. Tiles shall be straight and joints close. Tile shall be cut to fit snugly at doorframes, and walls. No slivers at edges.

G. Mechanically cut flooring material to produce square true edges.

H. As floor tile is installed and within adhesive's recommended working time, roll with a clean, smooth, 100-pound roller in both directions. As the rolling proceeds, replace any loosened, defective, or damaged tile with new and finish to the specified condition.

I. Remove dust, debris, and soil with any combination of sweeping, micro-fiber dust-mopping with a properly treated, non-oily mop and vacuuming.

3.06 CLEANING, WAXING, AND COMPLETION

A. Maintain flooring surfaces clean as installation progresses.

B. Use a sprayer to mist the area to be cleaned with a neutral cleaning solution prepared in accordance with manufacturer's instructions.

C. Gently scrub the floor using red or maroon cleaning, not stripping pads, mounted on a single disc, 175 RPM floor machine; or preferably, with a machine that uses horizontally mounted brushes with a counter-rotating spindle motion. Never allow the machine to remain running stationary.

D. Remove the resulting slurry with a wet vacuum.

E. Rinse the floor at least four times, each time using a clean mop and clean rinse water. On the first rinse, apply just enough water to keep the floor wet until the solution is picked-up with a vacuum. The next two rinses should be with a fairly well wrung-out, damp mop. The final rinse should produce virtually clean rinse water. Ensure the rinse water is clean throughout the rinsing process. Avoid tracking the floor after the final rinse. Check the floor after the final rinse for any missed areas and re-scrub/rinse as needed. Repeat the rinsing process until all signs of the cleaning solution are removed and the floor shows no sign of haziness or dusting when dry. If the Contractor has lightweight "automatic" floor machines capable of achieving the same result as described above, they may be used in-place of this method. Do not flood or excessively dampen floor at any time.

F. Allow the Work to dry thoroughly.

G. Finish vinyl composition tile with two coats of sealer, and four coats of finish (wax) applied in accordance with manufacturer's instruction. Each coat shall dry for a period of time recommended by the manufacturer. The last coat of floor wax shall be burnished in accordance with manufacturer's written instructions. Take care not to allow any foreign material, including dust and mop fibers to become embedded in any coat of wet sealer or finish.

H. After the last coat of floor finish has dried sufficiently according to the manufacturer's instructions, burnish work, using high speed equipment, in accordance with manufacturer's written instructions to bring the entire surface, including the corners and edges, to high level of luster, free of marks and dust embedded in finish

I. Clean adjacent baseboard and other surfaces of adhesive and other materials. Replace damaged or defective Work to the specified condition.

3.07 CLEAN UP

A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

3.08 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 10 1400

SIGNAGE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Interior and exterior accessibility, identification, directional and informational signs.

2. Parking signs.

B. Related Requirements:

1. Division 01: General Requirements.

2. Section 08 3473: Sound Control Door Assemblies.

3. Section 08 7100: Door Hardware.

4. Division 09: Finishes.

1.02 REFERENCES

A. ASTM International:

1. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

3. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

4. ASTM D4802 - Standard Specification for Poly (Methyl Methacrylate) Acrylic Plastic Sheet.

B. This section to comply with 11B-703.

1.03 SUBMITTALS

A. Product Data: Submit material descriptions, finishes and color charts for each type of sign.

B. Shop Drawings: Submit Shop Drawings indicating sign style, lettering, overall dimensions and quantities. Submit floor plans showing locations for each sign.

C. Material Samples: Submit three samples illustrating full size sample sign, of type, style and color specified.

D. Manufacturer's installation instructions.

1.04 QUALITY ASSURANCE

A. Pre-Installation Conference: Notify OAR when signs are ready for installation. Arrange for conference at site. Do not proceed with installation until Architect's approval of specific locations and methods of attachment has been obtained.

B. Provide signs from one manufacturer.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site and protect from damage. Store until immediately prior to installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Products of following manufacturers are acceptable and are the basis for intended design and quality.

1. H. Toji and Company.

2. Karman Ltd., Architectural Signs.

3. Vomar Products Inc.

4. ASI-Modulex, Inc.

5. Mohawk Sign Systems, Inc.

6. Accent Signage Systems.

7. The Gruenke Company.

2.02 MATERIALS AND FABRICATION

A. Interior Sign Materials:

1. Substrate Panel: 1/8 inch minimum thick, integrally colored or clear, back foiled and back painted acrylic plastic, or laminated acrylic. Conforming to ASTM D4802; non-glare (matte), UV stable, suitable for interior and exterior use.

a. Corners shall be radius.

b. Edges shall be square and eased.

c. Colors as selected by Architect from manufacturer's custom color range.

2. Aluminum Extrusions: In conformance to ASTM B221.

3. Fasteners:

a. Stainless steel tamper-proof screws and plastic anchors.

b. Signs mounted on fire-rated doors shall be secured with adhesive. Adhesives and sealants shall comply with the limits for VOC content and shall be approved by LAUSD's Office of Environmental Health Services (OEHS).

B. Exterior Sign Materials:

1. Sign: ASTM B209 aluminum sheet, 0.080 inch thick with rounded corners of at least 1/8 inch radius and eased edges. White figure on a blue background; non-glare, high contrast signs. The blue shall be equal to color number 15090 in Federal Standard 595B.

2. Post: 2 by 2 inch galvanized steel tubing, weighing minimum of 4.31 pounds per foot and conforming to ASTM A500, Grade B, 3/16 inch thick wall thickness.

3. Concrete Post Footings: Refer to Section 32 1313, Site Concrete Work.

4. Fasteners: Stainless steel carriage bolts with tamper resistant nuts.

C. Characters and Symbols: Computer cut raised characters and graphics shall be cut from 1/16 inch integrally colored acrylic. Raised characters and graphics shall be inlaid 1/32 inch minimum into first surface of sign background, secured with adhesive so it cannot be removed without the use of tools. Raised characters and graphics shall have beveled, eased or rounded edges. Non-tactile text and graphics shall be applied to the second surface, and background color shall be applied to the second surface and protected with film or an additional backplate. Pictograms and other symbols including the International Symbol of Accessibility, which are included on signs with raised characters and Braille, are not required to be raised.

2.03 COMMUNICATION ELEMENTS AND FEATURES

A. Raised Characters Raised characters shall comply with CBC 11B-703.2.

1. Character Type: Characters on signs shall be raised 1/32 inch minimum above their background and shall be sans serif uppercase characters duplicated in Braille. Characters and Braille shall be in a horizontal format.

2. Character Height: Character height measured vertically from the baseline of the character shall be 5/8 inch minimum and 2 inch maximum based on the height of the uppercase letter "I".

3. Character Proportions: Characters shall be selected from fonts where the width of the uppercase letter “O” is 60 percent minimum and 110 percent maximum of the height of the letter “I”.

4. Stroke Thickness: Stroke thickness of the uppercase letter “I” shall be 15 percent maximum of the height of the character.

5. Character and Line Spacing shall be in conformance to CBC 11B-703.2.7 and 11B-703.2.8.

6. Character Placement: Braille shall be placed a minimum of 3/8 inch and a maximum of 1/2 inch directly below the tactile characters: flush left or centered, and 3/8 inch minimum from raised borders and decorative elements. If the tactile text is multiline, Braille shall be placed below the entire text.

B. Visual Characters: Visual characters shall comply with CBC Section 11B-703.5. Characters shall be conventional in form, and shall be uppercase or lowercase or a combination of both, as indicated on the drawings. Characters shall not be italic, oblique, highly decorative, or of other unusual forms.

1. Finish and Contract: Characters and their backgrounds shall have a non-glare finish. Characters shall contrast with their background with either light characters on a dark background or a dark characters on a light background.

2. Character Proportions: Characters shall be selected from fonts where the width of the uppercase letter “O” is 60 percent minimum and 110 percent maximum of the height of the uppercase of the letter “I”.

3. Character Height: Minimum character height shall comply with CBC Table 11B-703.5.5.

4. Height from Finish Floor or Ground: Visual characters shall be a 40 inches minimum above the finish floor or ground

5. Stroke Thickness: Uppercase letter “I” shall be 10 percent minimum and 20 percent maximum of the height of the character.

6. Character and Line Spacing: Shall be in accordance to CBC 11B-703.5.8 and 11B-703.5.9.

C. Braille: Contracted Grade 2 Braille, conforming to CBC 11B-703.3. Braille characters shall be inlaid optically correct acrylic Raster beads into computer drilled holes in the panel surface.

1. Dimensions and Capitalization: Braille dots shall have a domed or rounded shape and shall comply with CBC Table 11B-703.3.1.The indication of an uppercase letter or letters shall only be used before the first word of sentences, proper nouns and names, individual letters of the alphabet, initials, and acronyms.

2. Position: Braille shall be positioned below the corresponding text in a horizontal format, flush left or centered. If text is multi-lined, Braille shall be placed below

the entire line of text. Braille shall be separated 3/8 inch minimum and 1/2 maximum from any other tactile characters and 3/8 inch minimum from raised borders and decorative elements.

D. Pictograms: In conformance to CBC 11B-703.6. Pictograms shall have a field height of 6 inches minimum. Characters and Braille shall not be located in the pictogram field.

1. Finish and Contract: Pictograms and their field shall have a non-glare finish. Pictograms shall contrast with their field with either a light pictogram on a dark field or a dark pictogram on a light field.

2. Text Descriptors: Pictograms shall have text descriptors located directly below the pictogram field, and shall comply with CBC 11B-703.2, 11B-703.3 and 11B-703.4.

E. International Symbol of Accessibility (ISA): Shall comply with CBC 11B-703.7 and CBC Figure 11B-703.7.2.1. The ISA shall consist of a white figure on a blue background. The blue shall be equal to Color No. 15090 in Federal Standard 595B.

F. Mounting Locations and Height: Shall be as indicated on the drawings and in conformance to CBC 11B-703.4.

1. Identification signs for rooms and spaces shall be located on the wall adjacent to the latch side of the door, as one enters the room or space. Signs that identify exits shall be located on the approach side of the door as one exits the room or space. Signs containing tactile characters shall be located so that a clear floor space 18 inches minimum by 18 inches minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position.

a. Where a tactile sign is provided at a door, the sign shall be located alongside the door at the latch side.

b. Where a tactile sign is provided at double doors with one active leaf, the sign shall be located at the inactive leaf.

c. Where a tactile sign is provided at double doors with two active leafs, the sign shall be located to the right of the right hand door.

d. Where there is no wall space at the latch side of a single door or at the right side of double doors, signs shall be located on the nearest adjacent wall.

2. Mounting height above finish floor or ground: Tactile characters on signs shall be located 48 inches minimum above finish floor or ground surface, measured from the baseline of the lowest Braille cells and 60 inches maximum above the finish floor or ground surface, measured from the baseline of the highest line of raised characters.

2.04 ROOM IDENTIFICATION SIGNS

A. Room Identification Sign Types:

1. Room Identification Sign: Provide “Room Identification Signs” to all rooms.

2. Room Identification Sign with Changeable Insert: 7 inches high by 9 inches wide, minimum, with 4 inches high by 9 inches wide window for name and title removable insert. Locate room name immediately below window, and centered above room number. R Room name shall be raised characters 3/4 inches high minimum, and room number 1 inch minimum; and shall be accompanied with Braille indicators.

3. Room Identification Sign with Room Name and Room Number: 7 inches high by 9 inches wide, minimum. Room name shall be raised characters 3/4 inches high minimum, and room number 1 inch minimum; and shall be accompanied with Braille indicators.

4. Room Number Sign: 7 inches wide by 4 inches high; room number, 1 inch high minimum, raised character, accompanied by Braille indicator immediately bellow.

B. Room Identification Sign for Restrooms: In addition to the room name and Braille indicator, furnish a male, female or male and female (unisex restrooms) pictogram, as may be the case. Restroom names shall be Women or Girls, Men or Boys, or Restroom (for unisex facilities). The outside dimension of the pictogram field shall be a minimum of 6 inches in height. Pictogram shall be per paragraph 2.03.D.

C. Room Identification Sign Requirements:

1. Finish and Contrast: Refer to paragraph 2.03.B.

2. Raised Characters and Proportions: Refer to paragraph 2.03.A.

3. Braille: Refer to paragraph 2.03.C.

4. Mounting Location and Height: Refer to paragraph 2.03.F.

2.05 GEOMETRIC SYMBOLS FOR TOILETS

A. Doorways leading to toilet rooms shall be identified by a geometric symbol complying with CBC Section 11B-703.7.2.6.

B. Male Restroom Door Symbol: 1/4 inch thick equilateral triangle with edges 12 inches long, with vertex pointing upward, the triangle symbol shall contrast with the door, either light on a dark background or dark on a light background. A sign with International Symbol of Accessibility shall appear within the equilateral triangle in contrasting color to it.

C. Female Restroom Door Sign: 1/4 inch thick circle 12-inch diameter, the circle symbol shall contrast with the door, either light on a dark background or dark on a light

background. A sign with International Symbol of Accessibility shall appear within circle in a contrasting color.

D. Unisex Restroom Door Sign (Single occupancy restrooms): 3/4 inch thick circle, 12-inch diameter with a 1/4 inch thick equilateral triangle with the vertex pointing upward superimposed on the circle and within the 12-inch diameter. Triangle and circle shall be of contrasting colors; the circle symbol shall contrast with the door. A sign with International Symbol of Accessibility shall appear within equilateral triangle in contrasting color to it, followed by a verbal description "STAFF ONLY" directly below ISA.

E. Location and Mounting Height: Symbols shall be mounted at 58 inches minimum and 60 inches maximum above the finish floor or ground surface measured from the centerline of the symbol. Where a door is provided the symbol shall be mounted within one inch of the vertical centerline of the door.

F. At locations with no restroom doors, locate sign adjacent to the opening. Tactile room name accompanied by Braille shall be located on symbol sign.

G. In addition to the toilet geometric symbols, room name and Braille indicator, furnish female and male pictograms, as may be the case. Restroom names shall be "Women" for female staff, "Girls" for female students, "Men" for male staff, "Boys" for male students, or Restroom (for unisex facilities).

2.06 RAISED CHARACTER AND BRAILLE EXIT SIGNS

A. Tactile Exit Sign Types:

1. "EXIT".
2. "EXIT RAMP DOWN".
3. "EXIT RAMP UP".
4. "EXIT ROUTE".
5. "TO EXIT".

B. Sign Requirements:

1. Finish and Contrast: Refer to paragraph 2.03.B.
2. Raised Characters and Proportions: Refer to paragraph 2.03.A.
3. Braille: Refer to paragraph 2.03.C.
4. Mounting Location and Height: Refer to paragraph 2.03.F.

2.07 STAIRWAY IDENTIFICATION SIGNS

A. Provide floor identification signs at the landing of each floor level in interior exit stairway connecting more than three stories, designating the floor level, the terminus of the top and bottom of the interior exit stairway and the identification of the stair.

1. Mount signs 5 feet above each floor landing in a position that is readily visible when doors are in the open and closed positions.

2. Sign size shall be a minimum of 18 by 12-inch.

3. The letters designating the identification of the stair, such as "STAIR No. 1", shall be placed at the top of the sign in 1 ½-inches minimum in height block lettering with 1/4 inch strokes.

4. Upper terminus, such as "ROOF ACCESS" or "NO ROOF ACCESS", shall be placed under the stairway identification in 1 inch high block lettering with 1/4 inch strokes.

5. The number designating the floor level shall be a minimum of 5 inches in height with 3/4 inch strokes and located in the center of the sign.

    a. Mezzanine levels shall be identified by letter "M" preceding the floor number.

    b. Basement levels shall be identified by letter "B" preceding the floor number.

6. All other lettering and numbers shall be a minimum of one inch in height.

7. Lower and upper terminus of the stairway shall be placed at the bottom of the sign in 1 inch high block lettering with 1/4 inch strokes.

8. Characters and their background shall have a non-glare finish. Characters shall contrast with their background, with either light characters on a dark background or dark characters on a light background.

B. Tactile Floor Designation Sign in Stairways: Shall be located at the landing of each floor level, placed adjacent to the door on the latch side, to identify the floor level. At the exit discharge level, the sign shall include a raised five-pointed star located to the left of the identifying floor level. The outside diameter of the star shall be the same as the height of the raised characters.

1. Finish and Contrast: Refer to paragraph 2.03.B.

2. Raised Characters and Proportions: Refer to paragraph 2.03.A.

3. Braille: Refer to paragraph 2.03.C.

2.08 DIRECTIONAL EXIT SIGNAGE

A. At exits and elevators serving a required accessible space but not providing an approved accessible means of egress, provide signage indicating the location of accessible means of egress.

1. Finish and Contrast: Refer to paragraph 2.03.B.

2. Character Height and Proportions: Refer to paragraph 2.03.B.

3. Symbol of Accessibility: Refer to paragraph 2.03.E.

2.09 ASSISTIVE LISTENING DEVICE SIGN

A. Provide signs at prominent locations in main entries to assembly areas and rooms indicating the availability of Assistive Listening Devices per CBC Section 11B-216.10. Locate and identify signs on the drawings, and indicate complete text for the sign at each required location.

B. Include International Symbol of Access for Hearing Loss, CBC Figure 11B-703.7.2.3, with text "Assistive-Listening System Available at Main Office". Use upper and lower case characters. Sign shall comply with the following requirements:

1. Finish and Contrast: Refer to paragraph 2.03.B.

2. Character Height and Proportions: Refer to paragraph 2.03.B.

3. Symbol of Accessibility: Refer to paragraph 2.03.E.

2.10 ACCESSIBILITY ENTRANCE SIGNS AND PATH OF TRAVEL DIRECTIONAL SIGNS

A. Entrance Sign: Provide at each building entrance an International Symbol of Accessibility sign. Signs shall be visible to persons along approaching pedestrian ways.

B. Directional Signs: Provide where indicated on the drawings with arrow indicators and International Symbol of Accessibility.

C. Signs shall be mounted on wall with lower edge between 48 inches and 60 inches above ground surface or finish floor. Pole mounted, overhead and projecting signs shall have the lower edge at least 80 inches from the ground surface or finish floor.

D. Sign shall comply with the following requirements.

1. Directional signs shall comply with paragraph 2.03.B.

2. Symbol of Accessibility: Refer to paragraph 2.03.E.

E. No Smoking Sign: Provide at each building entrance. Reverse cut white vinyl sign with 4 1/2-inch high no smoking symbol, mounted on glass entry doors. Under No Smoking

symbol, place words “No Smoking”, ½ inch high minimum, San Serif upper and lower case characters.

2.11 PARKING SIGNS

A. Tow-Away Sign: 18 inches by 24 inches with rounded corners. Black graphics on white background, with lettering not less than 1 inch high. Sign to read: “UNAUTHORIZED VEHICLES PARKED IN DESIGNATED ACCESSIBLE SPACES NOT DISPLAYING DISTINGUISHING PLACARDS OR SPECIAL LICENSE PLATES ISSUED FOR PERSONS WITH DISABILITIES WILL BE TOWED AWAY AT THE OWNER’S EXPENSE. TOWED VEHICLES MAY BE RECLAIMED BY TELEPHONING (310) 419-2700“.

B. Parking Space Identification Sign: 12-inch by 18-inch with rounded corners. White reflectorized graphic on dark blue background, and shall display an 8-inch high International Symbol of Accessibility per paragraph 2.03.E.

1. Additional language or an additional sign below the International Symbol of Accessibility shall state I “Minimum Fine $250”.

2. Signs identifying van accessible parking spaces shall contain additional language or an additional sign with the designation “Van Accessible”.

C. Signs shall be mounted on posts at head of each accessible parking with lower edge 80 inches minimum above ground surface, or mounted on walls at a minimum height of 60 inches from ground surface.

D. Headroom Signs: On parking structures provide signs indicating headroom clearance height at entries and at any point of a vehicular path where entry clearance height is reduced. Minimum character height shall be 3 inches.

2.12 OCCUPANT LOAD SIGNS

A. Provide maximum occupancy load signs. Post in a conspicuous place near the main exit or exit access doorway from the room or space of rooms and areas indicated in the drawings.

B. Minimum size: 4 inches high by 8 inches wide, 7/8 inch high letters, 1 inch high numerals.

C. Sign to read: “MAXIMUM OCCUPANCY LOAD XXX”. Obtain occupant load information from Architect.

2.13 EMERGENCY GAS SHUT OFF SIGN

A. Exterior Signs: Painted aluminum, suitable for outdoor use, with pre-drilled mounting holes.

1. Sign Size: Minimum 4 inches high by 8 inches wide.

2. Color: Subsurface white text, red background.

3. Character Height: One inch high.

4. Text:

a. Site main gas shut off valve(s): “MAIN SITE EMERGENCY GAS SHUT-OFF VALVE.”

b. Building gas shut-off valve(s): “BUILDING EMERGENCY GAS SHUT-OFF VALVE.”

B. Science Lab Gas-Shut-Off Signs: 1/8 inch thick acrylic.

1. Sign Size: Minimum 4 inches high by 8 inches wide.

2. Color: Subsurface white text, red background.

3. Character Height: One inch high.

4. Text: “EMERGENCY GAS SHUT-OFF VALVE.”

2.14 WHEELCHAIR LIFT SIGNS

A. Provide a sign complying with paragraph 2.03.B, posted in a conspicuous place at each landing and within the platform enclosure stating ‘NO FREIGHT” and include the International Symbol of Accessibility per paragraph 2.03.E.

2.15 EVACUATION PLANS

A. 1/8 inch thick acrylic sign consisting of a floor plan depicting the building layout. The words “EVACUATION PLAN” shall be included at the top of the plan in minimum 3/4 inch high characters. Interior spaces shall be indicated by shading and corridor shall be prominent and displayed in white. Sign shall provide emergency procedures information and instructions to be followed in the event of an emergency, and shall be printed with a minimum of 3/16-inch high non-decorative lettering providing a sharp contrast to the background. Emergency procedures information shall include, but not be limited to the following:

1. Viewer location symbol, “YOU ARE HERE” in the plan. Plan shall be oriented in each sign as required to correspond with the users view.

2. Location of exits with arrows leading to them.

3. Location of fire extinguishers.

4. Fire department emergency telephone number 911.

B. Mount signs so that bottom edge is no more than 48 inches from the finish floor, and within close proximity to the building, stair or elevator entrance. The reader must be able to approach the sign without encountering any obstacle.

C. Evacuation Plans Requirements:

1. Finish and Contrast: Refer to paragraph 2.03.B.

2. Character Height and Proportions: Refer to paragraph 2.03.B.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means installer accepts condition of existing surfaces.

3.02 METHODS OF INSTALLATION

A. Interior Identification Signs and Interior Directional Signs:

1. Fasten to wall with four tamper-proof round-head screws, one at each corner of sign. Furnish plastic anchors.

2. When concealed installation is specified, install backplate to wall as above. Fasten sign to backplate with very high-bond double-faced tape.

3. For installation on glass, fasten sign to glass with very high bond double faced tape. On opposite side of glass, anchor matching backplate to glass with very high-bond double-faced tape.

B. Geometric Signs: Geometric toilet room signs shall be fastened to doors with three tamper-proof oval-head counter-sunk screws.

C. Exterior Post Mounted Directional Signs: Size of required footing shall be as indicated on the drawings. Fasten sign with tamperproof stainless steel bolts.

D. Exterior Wall Mounted Identification Signs and Directional Signs:

1. Aluminum signs: Fasten to wall with 4 tamper-proof round-head screws, one at each corner of sign. Furnish plastic anchors.

a. Cement Plaster, Brick, or Masonry: Provide plastic anchors. For signs greater than 640 square inches use Leadwood Screw Anchors, concrete fasteners 1WSA 10112, or equal.

b. Chain Link Fence: Fasten with 9 gage hog rings, King Hughes Fasteners 5150DG50, or equal, with 11/16 inch opening at each corner of sign.

c. Wrought Iron Fence: Install at each corner with 3/16 inch stainless steel rivets.

2. Acrylic signs: Install backplate to wall as above. Fasten sign to backplate with very high-bond double-faced tape and silicone.

E. Exterior Building Sign:

1. Each letter shall be furnished with a minimum of three cast mounting lugs on backside, drilled and tapped to receive installation bolts.

2. Letters shall be installed according to manufacturer's method PMC-1. Letters shall be installed ¾ inch away from wall surface, by an aluminum sleeve spacer.

3.03 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

3.04 PROTECTION

A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 10 2113

SOLID PHENOLIC TOILET COMPARTMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Solid phenolic toilet compartments, urinal screens, and vision screens.

B. Related Requirements:

1. Division 01 - General Requirements

2. Section 06 1000 - Rough Carpentry

1.02 DESIGN REQUIREMENTS

A. Design and fabrication shall conform to requirements of ADAAG and CBC Chapter 11B.

B. Toilet Compartments: Floor supported overhead braced type units consisting of solid phenolic pilasters, panels and doors; plated steel leveling devices with stainless steel covers; and stainless steel fittings, hardware and fastenings.

C. Urinal Screens: Floor supported and wall hung type consisting of solid phenolic screen panels and plated steel leveling devices with stainless steel covers, stainless steel fittings and fastening.

D. Vision Panels: Floor- and wall-mounted solid phenolic type.

1.03 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating complete layout, elevations of partitions, thickness of solid phenolic panels, fastenings, proposed method of anchoring, size and spacing of anchors, details of construction, hardware, fittings, mountings, method of assembly, other related items, and installation details.

B. Product Data: Submit manufacturer's technical data for materials, fabrication, finishing, fastenings, hardware, and installation details.

C. Material Samples:

1. Submit full range of Samples of phenolic chips for initial color selection. Chips shall be at least 2-inch by 3-inch.

2. Submit Samples of hardware and fasteners.

D. Certificates: Furnish manufacturer's certification that materials meet or exceed Specification requirements.

1.04 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. ASTM A167: Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

2. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.

3. Chemical Resistance: Panels to meet or exceed Scientific Equipment Furniture Association's (S.E.F.A.) list of 49 standard chemicals.

4. Consistency:

a. Panels to have uniform thickness (+0.03 inch).

b. Panels to have uniform flatness (maximum difference of 0.03 inch) for a 10-foot span.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to Project site with manufacturer's labels intact and legible, in sealed containers. Materials shall be kept dry.

B. Protect compartments and screens.

1.06 COORDINATION

A. Field Measurements: Secure field measurements before preparation of Shop Drawings and fabrication where possible, for proper and adequate fabrication and installation of the Work of this section.

B. Furnish inserts and anchorage built into other construction for installation of toilet compartments, urinal screens and vision panels.

1.07 WARRANTY

A. Manufacturer shall provide a 10 year material warranty.

1.08 REGULATORY

A. Toe clearance for at least one side partition of a wheelchair accessible compartment shall comply with CBC Section and Figure 11B-604.8.1.4, it shall be 9" high minimum above the finish floor and 6" deep minimum beyond the compartment side face of the partition, exclusive of partition support members. Partition components at toe clearance shall be smooth without sharp edges or abrasive surfaces. Toe clearance at the side partition is not required in a compartment greater than 66" wide.

B. Door and door hardware for accessible compartments shall be self-closing and shall comply with CBC Sections 11B-404.

C. A door pull complying with CBC Section 11B-404.2.7 shall be placed on both sides of the door near the latch.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Solid Phenolic Panels:

1. Bobrick DuraLine Series Compact Laminate

2. Trespa Athlon DSQ panels, Trespa North America Ltd.

3. Pionite Phenolic Panels.

B. Hardware:

1. Galaxy Hardware, Series 8033.

2. Glen Products.

3. Jacknob Corporation.

2.02 MATERIALS

A. Toilet compartments panels, doors and pilasters; urinal screens and visual screens.

1. Core: Phenolic impregnated Kraft papers. Panel shall be at least 93 pounds per cubic foot to ensure full saturation of Kraft core.

2. Face Sheet: Separate sheet of clear melamine over decorative papers impregnated with melamine resin and integrally compression molded with the core.

3. Fire Resistance: The panels shall have the following surface burning characteristics and smoke generation values in accordance with UL classification and labeling in accordance with ASTM E84 tests and shall be self-extinguishing.

a. Flame spread: Maximum 30 for ¾ inch thick panels; 30 for ½ inch thick panels.

b. Smoke developed: Maximum 70 for ¾ inch thick panels; 85 for ½ inch thick panels.

4. Panels shall be UL registered and labeled.

5. Panel shall be resistant to cleaning solvents and uric acid.

6. Product/Material Specification:

a. Modulus of Elasticity: 1.5 million psi minimum.

b. Shear Strength: 2,000 psi minimum.

c. Compressive strength: 24,000 psi minimum.

d. Water Absorption: 3 percent maximum.

e. Use Temperature: 350 degrees F maximum.

f. Surface and Edges: Non-porous.

g. Material Resistance: Will not support fungus or bacteria.

h. Uniform Load Deflection: ¼ inch maximum per Table A:

Table A: Uniform Load (lbs) which causes ¼ inch deflection at Center (Shelves not fixed at either end, static load on E modulus of 2.0 by 106)*

Uniform Load in pounds

Thickness	12 by 24-inch	12 by 36-inch	12 by 48-inch	24 by 36-inch
½ inch	370	110	45	220
¼ inch	1,400	400	170	800

* Loads can be affected by temperature, humidity, time, and other environmental factors. Users should test shelves in appropriate environment. It is assumed that deflection grater than ¼ inch is undesirable aesthetically, even though rupture has not occurred.

B. Stainless Steel: ASTM A167, Type 304.

C. Concealed Fasteners and Leveling Devices:

1. Concealed Fasteners: Stainless steel.

2. Leveling Devices: Zinc or cadmium coated steel, or stainless steel.

2.03 CHARACTERISTICS

A. Doors shall be minimum ¾ inch thick, panels minimum ½ inch thick, pilasters minimum 3/4 inch thick and screens minimum ½ inch thick. Edges shall be machined to a radius of 0625 inch; exposed surfaces shall be free of fabrication marks.

2.04 FABRICATION

A. Pilasters and Doors: Flush, formed of ¾ inch thick solid phenolic panels.

1. Door Dimensions: Unless otherwise indicated, furnish 24-inch wide in-swinging doors for standard toilet compartments, 36-inch wide clear opening out-swinging doors when located at the end, and 36-inch wide clear opening out-swinging doors when located at the side for stalls equipped for use by the physically disabled

2. Anchorage: Provide stainless steel anchorage, complete and threaded rods, washers, and leveling adjustment nuts at pilasters, to permit connection to floor slab. Furnish devices, which are designed to support pilasters from structure without transmitting load to floor fill.

3. Overhead Bracing: Provide anti-grip, decorative, heavy duty, extruded aluminum head rail with clear anodized finish.

B. Panels and Urinal Screens: Flush, formed of ½ inch thick solid phenolic panels. Height and width as indicated in drawings.

2.05 HARDWARE

A. Door hardware shall be cast Type 304 stainless steel, as follows:

1. Hinges: 11 gage Cast Stainless Steel Hinge. Hinge shall be cast of type 304 stainless steel and shall have a Satin finish. Hinge shall be gravity type for self-closing action and shall be fully adjustable up to 360 degrees. Pivot pin shall be made of type 304 stainless steel. Only stainless steel components shall be used in the construction of the Hinge. Plastic inserts are unacceptable. Hinges shall provide emergency access by lifting the door. Hinges shall be pre-drilled for mounting to door and pilaster with Stainless Steel through-bolts. Stamped stainless steel is not acceptable.

2. Strike and Keeper with Emergency Access: Heavy duty cast stainless steel with a Satin finish. The strike and keeper shall be 2.50 inch high, with the mounting holes at 1.50 inch on center, and the wall thickness shall be a minimum of .125 inch. The strike and keeper shall have an integral rubber bumper door stop. The stock number shall be molded into the back of the strike and keeper for ease in identification. Furnish one per door. Stamped stainless steel is not acceptable.

3. Slide Latch: Heavy Duty Cast Stainless steel with a Satin finish. The slide latch shall be surface mounted. The slide bar shall be .150 inch thick, 1.020 inch wide and 3.720 inch long. Latch shall have an internal stainless steel buffering spring to prevent damage when door is inadvertently slammed against the latch. Mounting holes are to be spaced at 3.50 inch on center. Latch knob is to be riveted to the slide bar and then welded to insure that the knob will not come off. The stock number shall be molded into the back of the slide latch for ease identification. Furnish one per door. Stamped stainless steel is not acceptable.

4. Coat Hook: Heavy Duty Cast Stainless Steel with a Satin finish. Coat Hook and bumper shall be 2.340 inch high, 1.230 inch wide and shall protrude out from the door 3.05 inch. The hook portion shall have a finished diameter of .250 inch thick. The stock number shall be molded into the back of the Coat Hook and Bumper for ease in identification. Furnish one per door. Stamped stainless steel

is not acceptable. Mount at 48 inches maximum above finished floor in accessible toilet compartments.

5. Door Stop: Heavy Duty Cast Stainless Steel with a satin finish. Plated Zarnac Door stops are unacceptable. Door Stop shall have a 2.125 inch base diameter and shall protrude 1.80 inch from the Wall. The bumper at the end of the Door Stop shall be .250 inch thick. The diameter of the shaft shall be .6875 inch. The stock number shall be molded into the back of the Door Stop for ease in identification. Furnish one for each Disabled Accessible door. Stamped stainless steel is not acceptable.

6. Pull Handle: Heavy Duty Cast Stainless Steel with a Satin finish. Plated Zamac Door pulls are unacceptable. Pull Handle shall protrude from the face of the door .940 inch and shall be 4.735 inch long. The Pull Handle shall have mounting holes drilled and tapped for 10/24 threads at 3.50 inch on center. The Pull Handle shall be .655 inch wide and shall be mounted back to back with the Slide Latch. The stock number shall be molded into the back of the Pull Handle for ease in identification. Stamped stainless steel is not acceptable. Provide u-pull shape handle on each side of accessible toilet compartment doors.

B. Pilaster Shoes: ASTM A167, Type 302/304 Stainless Steel, minimum 3-inch high, 18 gauge, finish with #3 Directional polish, attached with Stainless Steel Through Bolts.

C. Brackets: One piece double ear bracket or single ear bracket (at end partition) extending within 3 inches of top and bottom panel edges. Extruded 6063-T5 Aluminum with a satin anodized finish. The minimum weight shall be 1.685 pounds per lineal foot. Inside opening of Bracket shall be .50 inch for panels, .75 inch for pilasters. Holes for mounting to wall and panel/pilaster shall be pre-drilled. Holes are to be spaced at 9 inches on center along the full length of the bracket for a total of twelve holes (double ear) for mounting to the wall and six holes (single ear) for mounting to the panel/pilaster. Each bracket is to have a minimum wall thickness of .125 inch.

D. Overhead Bracing (Headrail): Continuous heavy duty extruded 6063-T5 Aluminum Headrail with anti-grip profile. Head rail shall have integral reinforcing channel and curtain track. Head rail shall have Satin Anodized finish. Provide headrail corner brackets, wall brackets, and headrail end caps as required. The headrail and headrail brackets shall have a minimum wall height of 2 inch. The minimum wall thickness of the headrail and head ail brackets shall be .125 inch.

E. Chrome-plated, non-ferrous cast alloy material shall not be furnished for hinges, brackets, locks, latches and other fittings and accessories.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Before covering wall framing with finish materials, examine framing to ensure that backing plates and structural framing have been installed in such position as to receive all attachment screws.

B. Verify spacing of plumbing fixtures to ensure compatibility with installation of compartments.

C. Do not start the Work of this section until all deficiencies have been corrected.

3.02 INSTALLATION

A. Install partitions and screens as shown in the Shop Drawings and in accordance with manufacturer's instructions and as specified. Install straight, level and plumb.

B. No evidence of drilling, cutting or patching shall be visible in finished Work.

C. Fasten panel brackets securely to walls and ceilings with recommended anchoring devices.

D. Fasten panels and pilasters to brackets with through bolts and nuts.

E. Fasten urinal screen panels to walls with two panel brackets, minimum.

F. Provide ½ inch spaces between wall surface and panels or pilasters.

G. Provide for adjustment of floor variations with non-breakable plastic shoes on pilasters. Conceal floor fastenings in pilaster shoes.

H. Furnish each toilet compartment door with top and bottom hinges, and door latch.

I. Install door strike keeper on each pilaster in alignment with door latch.

J. Furnish each toilet compartment door with one coat hook and bumper.

3.03 TOLERANCES OF INSTALLED WORK

A. Maximum Variation from Plumb or Level: 1/8 inch.

B. Maximum Misplacement from Intended Position: 1/8 inch.

3.04 ADJUSTING AND CLEANING

A. Hardware Adjustment: After installation, adjust hardware for proper operation. Install hinges on in-swinging doors to hold open approximately 30 degrees from the closed position when unlatched. Install hinges on out-swinging doors to return to the fully closed position. Adjust doors so that bottoms of doors are level with the bottoms of the pilasters when the doors are in the closed position.

B. Adjust and align door hardware to uniform clearance at vertical edges of doors. Clearance space shall not exceed ¼ inch.

C. Cleaning: Clean compartments, hardware, and doors before Substantial Completion and leave free from imperfections. Remove protective coverings.

3.04 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.05 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 10 2813

TOILET ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of Division 01 apply to this section.

B. Section Includes:

1. Toilet accessories as indicated.

C. Related Sections:

1. Section 06 1000: Rough Carpentry.

2. Section 10 2113: Solid Phenolic Toilet Compartments.

1.02 SYSTEM DESCRIPTION

A. Regulatory Requirements: Comply with CBC requirements and ADA recommendations for accessibility.

1.03 SUBMITTALS

A. Shop Drawings: Submit a schedule of accessories and Shop Drawings indicating installation methods and fasteners.

1.04 QUALITY ASSURANCE

A. Coordinate related Work as required to ensure proper and adequate provision in framing of backing and wall finish for installation of accessories.

B. Coordinate requirements of Section 10170: Solid Phenolic Toilet Compartments to ensure that correct openings are provided in partitions for toilet accessories where required.

1.05 DELIVERY, STORAGE AND HANDLING

A. Protect accessories from damage.

PART 2 - PRODUCTS

2.01 GENERAL

A. Accessories shall be provided with necessary anchoring devices and fasteners appropriate for surfaces on which items are to be fastened.

2.02 MATERIALS

A. Liquid Soap Dispenser: 20 gage stainless steel, 40 oz. capacity, tamper-proof cap and concealed vandal-proof mounting. Continental V 444SS, ASI 0343, Bobrick B-2111, or equal.

B. Toilet Paper Boxes:

1. For Student and Public Restrooms:

a. Non-accessible toilet compartments: Surface mounted, Bobrick B-4288 or equal.

b. Accessible student toilet rooms or compartments: Continuous flow type; semi-recessed Bobrick B-3888, ASI-0031, Bradley 5412 (double roll tissue holder without paper roll spindle stops), or equal.

c. Accessible student toilet rooms or compartments mounted on partition: Continuous flow type; semi-recessed Bobrick B-3571, or equal.

C. Paper Towel Boxes: Surface mounted, Type 304 stainless steel, satin finish. Door with tumbler lock and piano hinge Bobrick B-2620, Crown Zellerbach,, or equal.

D. Grab Bars: 1-1/4 inches diameter by 18 gage stainless steel tubing, of size and configuration indicated. Ends shall be screwed to 11 gage stainless steel wall plate, with snaplock cover flanges. Grab bars over 36 inches in length shall be furnished with stainless steel support at mid point. Exposed stainless steel to be 180 grit satin finish. ASI 3700 series, Tubular Specialties Manufacturing, Inc. series Q-CS-1, Bobrick B-6806 or equal.

E. Mirrors: Framed mirror, with one piece roll-formed 3/4 inch x 3/4 inch Type 304 stainless steel angle frame, with satin finish. Corners shall be heliarc welded, ground and polished smooth. Glass shall be No. 1 quality 1/4 inch float/plate glass, electrolytically copper-plated. Frame shall be furnished with a continuous integral stiffener on sides. Back of mirror shall be protected by 1/8 inch thick, waterproof, shock-absorbing polyethylene padding and 20 gage galvanized steel back attached to frame with concealed screws. Mirror shall be provided with a 20 gage wall hanger. ASI 0600, Bobrick B-290 series, or equal.

F. Toilet Seat Cover Dispensers: Surface-mounted, Type 304 stainless steel, satin finish. ASI 0477SM, Bobrick B-221, or equal.

G. Sanitary Napkin Vendors and Disposals

1. Disposals in non-accessible toilet compartments Surface-mounted, Type 304 stainless steel, satin finish, ASI 0473-A, Bobrick B-270, or equal.
2. Disposals in accessible toilet rooms or compartments mounted on partitions: Bobrick B 354 (semi-recessed) or equal.
3. Disposals in accessible toilet rooms or compartments: recessed, semi-recessed or 3-inch maximum projection from wall surface; Bobrick B 353 (recessed) or equal.

H. Electric Hand Dryer: Excel ThinAir

1. Voltage: 110-120V
2. Cover: ABS White Polymer with antimicrobial additive.
3. Antimicrobial Wall Guard: 89S (Stainless).

PART 3 - EXECUTION

3.01 EXAMINATION

A. Check openings in substrates to receive accessories. Verify openings are correctly located and sized to receive accessories, and that locations will comply with disability access requirements. Confirm that blocking, backing or support is properly located and adequate for the accessory installation.

B. Verify spacing of plumbing fixtures and toilet partitions. Confirm spacing and locations are compatible with proposed accessory locations and will allow compliance with disability access requirements.

3.02 INSTALLATION

A. Install toilet accessories in accordance with manufacturer's written recommendations and accessibility requirements. Fasten components firmly in place.

B. Drill holes to correct size and application that is concealed by item with ¼ inch tolerance.

C. Install recessed accessories into wall openings with sheet metal screws into metal frames.

D. Install surface-mounted accessories to backing plates with machine screws, plumb, and aligned.

E. Grab Bars:

1. Fasten to toilet partition with 3-inch diameter stainless steel back plates with studs, couplings, and stainless steel machine screws.

2. At wood stud walls, fasten wood blocking with threaded stainless steel wood screws of sufficient length to penetrate blocking 1-1/4 inches minimum.

3. At metal stud walls, provide 1/8 inch cold-rolled steel plate, drilled and tapped for machine screws, or 16 gage cold-rolled steel plate complete with threaded sleeves for stainless steel machine screws. Weld plates to studs.

4. At concrete or masonry walls, install bars with sheet metal screws and expansion anchors.

5. At plaster or gypsum board walls, provide spacers of same thickness as wall material to prevent crushing of wall material.

F. Mirrors: Install mirror on manufacturer supplied concealed wall hanger and fasten with 2 theft-resistant locking screws.

G. Stainless Steel Medicine Cabinet: Fasten cabinet to wall.

H. Before Substantial Completion, deliver keys and maintenance instructions and product data to OAR.

3.03 ADJUSTING AND CLEANUP

A. Adjust accessories for proper operation.

B. Remove rubbish, debris, and waste material and legally dispose of off the Project site.

3.04 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 10 4413

FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Fire Extinguishers and Cabinets.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 06 1000 - Rough Carpentry.

3. Section 09 2900 - Gypsum Board.

1.02 SUBMITTALS

A. Shop Drawings: Indicate materials, sizes, anchorage, and installation details.

B. Product Data: Submit manufacturer's product literature, indicating product characteristics.

C. Material Samples: Submit manufacturer's standard cabinet color Samples for selection by Architect.

1.03 QUALITY ASSURANCE

A. Installer shall be manufacturer trained and certified to install the Work of this section.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's wrapping to protect items.

B. Store items in a dry, enclosed area.

PART 2 - PRODUCTS

2.01 FIRE EXTINGUISHERS AND CABINETS

A. Location: Fire extinguisher cabinets and fire extinguishers shall be installed where indicated on Drawings or as required by authorities having jurisdiction.

B. Manufacturer: Fire extinguishers and cabinets shall be manufactured by one of the following:

1. Potter-Roemer.

2. J. L. Industries.

3. Larsen's Manufacturing.

4. Modern Metal Products.

5. Waltrous.

6. Amerex (fire extinguishers).

C. Fire Extinguisher Type: Provide a legally appropriate rechargeable fire extinguisher for every fire extinguisher cabinet and as otherwise indicated.

1. Classrooms, Corridors, Administration and Special Use Rooms, Cabinet mounted:

a. Type ABC multi-purpose dry chemical with UL rating 2A:10B:C, 5 pound size, also with red glossy polyester coated steel cylinder, pressure gage, hose and horn. Maximum Height: 15 ¼-inch. Maximum Cylinder Diameter: 4 ½-inch.

2. Kitchens, Cabinet mounted:

a. Type BC multi-purpose dry chemical with UL rating 40B:C, 5 pound size, with red glossy polyester coated steel cylinder, pressure gage, hose and horn, Maximum Height: 15 ¼-inch, Maximum Cylinder Diameter: 4 ½-inch . K type (wet chemical) for suppression system back-up. UL Rating 2A:K, 6 liters, 2 ½ gallons, with heavy duty stainless steel cylinder, internal diameter not to exceed 7 inches.

3. Electrical, Boiler, Fan, Heating Rooms, bracket mount:

a. Type CO_2, carbon dioxide gas, with UL rating 5B:C. 10B:C, (5 pounds with red glossy polyester coated aluminum cylinder, hose and horn. Maximum Height, (not exceed): 17 ¾-inch. Maximum Cylinder Diameter, (not to exceed): 5 ¼-inch.

D. Fire Extinguisher Requirements:

1. Design Specification:

a. Finish: Corrosion and impact resistant red epoxy.

b. Valve Stem Assembly: Metal, reusable, connects to cylinder by threaded pipefitting, aluminum or steel siphon tube, and shatter resistant plastic face gage.

c. Gage (if applicable) to Indicate: "Recharge," "fully charged (195 PSI)," and "over charge."

d. Pull Pin: Metal, reusable and securely fastened to unit with metal, aluminum chain or very heavy plastic line approximately 4 ½-inch long.

e. Mechanical Operation: Pistol grip, heavy duty metal handle (plastic not permitted), and shall be operated by a grip and squeeze lever.

2. Manufacturer Identification/Information: Manufacturer's name, date manufactured, model number, U.L. approval seal and number, contents operating instructions, Fire Marshall approval, etcetera shall be identified on the Fire Extinguisher.

3. Warning and First Aid Label: Fire extinguisher must indicate all standard warnings concerning breathing, eyes, skin and ingestion. Provide emergency and first aid procedures.

4. Property Identification: Label affixed at front of unit, size 2-inch by 4-inch, shall read "PROPERTY OF INGLEWOOD UNIFIED SCHOOL DISTRICT".

5. Repair Parts: The manufacturer and/or their representative shall maintain within the Los Angeles Metropolitan Area an adequate stock of replacement parts, available for immediate delivery.

6. Warranty:

a. Manufacturer shall provide a five year material warranty.

b. Installer shall provide a five year installation warranty.

7. Material Safety Data Sheet: Provide an MSDS sheet with every shipment.

E. Fire Extinguisher Cabinet: Potter-Roemer cabinets are listed as the standard of quality, products by other listed manufacturers are acceptable.

1. Fully recessed cabinet: Provide fully recessed, square trim edge cabinet with ½ inch projection:

a. Potter-Roemer Fire Extinguisher Cabinet 7020:

1) Door Style: either DVL (Duo Vertical Panel with lock) or E (Center Break Glass with lock), glass to be clear tempered safety glass.

2) Cabinet Door and Frame: Cold rolled steel electrostatically applied, thermally fused polyester coating with recoatable white finish.

3) Identification Lettering: Cabinet door to be furnished with die cut lettering indicating "FIRE EXTINGUISHERS" in contrasting color to cabinet finish, and either vertical or horizontal lettering depending upon door style.

2. Semi-recessed cabinet: Provide semi-recessed, square trim edge cabinet with 1 1/4 inch to 2-inch projection:

a. Potter-Roemer Fire Extinguisher Cabinet 7022:

1) Door Style: either DVL (Duo Vertical Panel with lock) or E (Center Break Glass with lock), glass to be clear tempered safety glass.

2) Cabinet Door and Frame: Cold rolled steel with electrostatically applied, thermally fused polyester coating with recoatable white finish.

3) Identification Lettering: Cabinet door to be furnished with die cut lettering indicating "FIRE EXTINGUISHERS" in contrasting color to cabinet finish, and either vertical or horizontal lettering depending upon door style.

3. Surface mounted cabinet: Provide surface mounted, square trim edge cabinet:

a. Potter-Roemer Fire Extinguisher Cabinet 7024:

1) Door Style: either DVL (Duo Vertical Panel with lock) or E (Center Break Glass with lock), glass to be clear tempered safety glass.

2) Cabinet Door and Frame: Cold rolled steel with electrostatically applied, thermally fused polyester coating with re-coatable white finish.

3) Identification Lettering: Cabinet door to be furnished with die cut lettering indicating "FIRE EXTINGUISHERS" in contrasting color to cabinet finish, and either vertical or horizontal lettering depending upon door style.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall be in accordance with manufacturer's recommendations.

B. Cabinets shall be installed plumb and level, where indicated on Drawings, at heights required by authorities having jurisdiction.

3.02 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.03 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

END OF SECTION

SECTION 10 7516

FLAGPOLES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Ground set aluminum flagpoles.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 03 3000 - Cast-In-Place Concrete.

1.02 STRUCTURAL PERFORMANCE

A. Provide flagpole assemblies, including anchorages and supports, capable of withstanding the effects of wind loads, determined according to NAAMM FP 1001, "Guide Specifications for Design of Metal Flagpoles" or to CBC wind loads, whichever is more stringent.

1. Base flagpole design on polyester flags of maximum standard size suitable for use with flagpole or size indicated, whichever is more stringent.

1.03 SUBMITTALS

A. Shop Drawings: Include elevations and details showing general arrangement, jointing, fittings and accessories, grounding, anchoring and supporting systems, and manufacturer's specifications.

B. Product Data: Submit manufacturer's product literature.

C. Installation Instructions: Submit manufacturer's installation instructions.

1.04 QUALITY ASSURANCE

A. Qualifications of Manufacturer: Flagpole shall be the product of a manufacturer who has been regularly engaged in manufacture of flagpoles for at least five years.

B. Source Limitations: Furnish flagpole as a complete unit, including fittings, accessories, bases, and anchorage devices, from a single manufacturer.

1.05 DELIVERY, STORAGE AND HANDLING

A. Spiral wrap with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following manufacturers:

1. Southern California Flagpole.

2. American Flagpole, Division of Kearney-National Inc. Co.

3. Concord Industries, Inc

4. Equal.

2.02 FLAGPOLES

A. Flagpoles shall be cone-tapered fabricated from seamless extruded aluminum tubing complying with ASTM B241, Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube, alloy 6063 T6, with a minimum wall thickness of 3/16 inch.

B. Exposed Flagpole Height: 35-foot.

C. Construct flagpoles in one piece unless more than one piece is necessary due to structural performance. When more than one piece is required, provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.

2.03 FITTINGS

A. External Halyard with Locking Cleat and Halyard Cover: Manually operated external cleat with key.

B. Finial Ball: Manufacturer's standard flush seam ball, 0.063 inch thick. Diameter of ball shall be approximately same as pole butt diameter, or as indicated in the drawings.

1. Gold anodized finish.

C. Flag Snap Hooks and Halyard: Provide four chromium plated bronze or stainless steel snap hooks per halyard, including neoprene or vinyl covers. Provide a 5/16 inch diameter nylon rope.

D. Flash Collar: Manufacturer's standard collar to seal flagpole base and anchorage system from weather.

E. Furnish foundation, foundation sleeves and required attachments and accessories for a complete flagpole installation.

2.04 METAL FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Aluminum: Fine, directional, medium satin polish, in accordance with AA-M32 and clear anodized in accordance with AA-M32-C22-A41.

2.05 CONCRETE

A. Twenty eight day compressive strength of 3,000 psi minimum. Refer to Section 32 1313 - Site Concrete Work.

PART 3 - EXECUTION

3.01 ERECTION

A. Install in accordance with Shop Drawings and manufacturer's written recommendations.

3.02 TOLERANCES

A. Flagpole shall be true and plumb after installation with cleat located in prevailing wind direction. Maximum variation from true vertical shall be within one inch of true vertical, measured at top of pole, in three directions.

3.03 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.04 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 12 2413

ROLLER WINDOW SHADES

PART 1 – GENERAL

1.1 SECTION REUIREMENTS

A. Comply with applicable provisions of AD Accessibility Guidelines and California Building Code.

B. Maintenance Materials: Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Roller Shades: Full size units equal to 5% of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

C. Field Measurements: where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings provided by contractor. Allow clearances for operating hardware of operable glazed units though entire operating range. Notify Architect of installation conditions that vary from drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 – PRODUCTS

2.1 MANUFACTURERS
As basis of design, performance and warranty: MechoShade Systems, Inc.

A. Acceptable Manufacturers:
   1. MechoShade Systems, Inc.

B. Source Limitations: Obtain roller shades from single source from single manufacturer.

C. Roller Shade Schedule: PROVIDE ROLLER SHADES FOR EACH NEW WINDOW.
   1. System: Manual operating, Mecho5x
   2. Shade pockets
   3. Fascia's

2.2 MANUALLY OPERATED SHADES WITH DOUBLE ROLLERS

A. Chain and Clutch Operating Mechanisms: With continuous loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
   1. Bead Chains: Stainless Steel
      a. Loop Length: Full length of roller shade.
      b. Limit Stops: Provide upper and lower ball stops.
      c. Chain Retainer Type: Clip, jamb mount.
   2. Spring Lift Assist Mechanisms: Manufacturer's standard for balancing roller shade weight and lifting heavy roller shades.

a. Provide for shadebands that weight more than 10 lbs or for shades as recommended by manufacturer, whichever criteria are more stringent.

B. Crank and Gear Operating Mechanisms: Sealed gearbox drive system controlled by crank handle.
   1. Crank Handle Type: Detachable.
   2. Crank Handle Length: Manufacturer's standard.

C. Spring Operating Mechanisms: roller contains spring sized to accommodate shade size indicated. Provide with positive locking mechanism that can stop shade movement at each half turn of roller and with manufacturer's standard pull.
   1. Pole: Manufacturer's standard type in length required to make operation convenient from floor level and with hook for engaging pull.

D. Rollers: Corrosion-resistant steel or extruded aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
   1. Double-Roller Mounting Configuration; Manufacturer's standard.
   2. Inside Roller:
      a. Drive-End Location: Right side of inside face of shade.
      b. Direction of Shadeband Roll: Regular, from back of roller.
   3. Outside Roller:
      a. Drive-End Location: Right side of inside face of shade.
      b. Direction of Shadeband Roll: Regular, from back of roller.
   4. Shadeband-to-Roller Attachment: Manufacturer's standard method.

E. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation locations and conditions indicated.

F. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

G. Inside Shadebands:
   1. Shadeband Material: Light-filtering fabric.
   2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
      a. Type: Enclosed in sealed pocket of shadeband material.
      b. Color and Finish: As selected from manufacturer's full range.

H. Outside Shadebands:
   1. Shadeband Material: Light-blocking fabric.
   2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
      a. Type: Enclosed in sealed pocket of shadeband material.
      b. Color and Finish: As selected from manufacturer's full range.

I. Installation Accessories:
   1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

a. Shape: L-shaped
b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open.

2. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
   a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open.
3. Endcap Covers: to cover exposed endcaps.
4. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
   a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open.
   b. Provide pocket with lip at lower edge to support acoustical ceiling panel.
5. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
   a. Closure-Panel Width: 2 inches.
6. Side Channels: Wight light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
7. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
8. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.4 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
   1. Basis of Design: MechoShade ThermoVeil 1500 Series.
   2. Type: PVC coated polyester
   3. Weave: Basketweave
   4. Roll Width: Stocked in 63, 96 and 126 inches.
   5. Orientation on Shadeband: Up the bolt
   6. Openness Factor: 3%
   7. Color: As selected from manufacturer's full range.

C. Light-Blocking Fabric: Opaque fabric, stain and fade resistant.
   1. Basis-of-Design: MechoShade Classic Blackout 0700 Series.
   2. Type: vinyl-coated fiberglass
   3. Roll Width: Stocked in 72 inches with exceptions
   4. Orientation on Shadeband: Up the bolt
   5. Color: As selected from manufacturer's full range.

2.5 ROLLER-SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
   1. Between Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less ¼ inch per side or ½ inch total, plus or minus 1/8 inch. Length equal to head-to-sill or floor dimension of opening in which shade is installed less ¼ inch, plus or minus 1/8 inch.
   2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:
   1. Vertical Shades: Where width-to-length ration of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacing's along shadeband length to ensure shadeband tracking and alignment through tis full range of movement without distortion of the material.
   2. Skylight Shades: Provide battens and seams at uniform spacing's along shadeband as required to ensure shadeband tracking and alignment through its full range of movement without distortion or sag of material.
   3. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
   1. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

B. Electrical Connections: Connection motor-operated roller shades to building electrical system.

3.2 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION

SECTION 22 0500

COMMON WORK RESULTS FOR PLUMBING

PART 1 – GENERAL

1.01 SUMMARY

A. SECTION INCLUDES

1. This Section provides the basic plumbing requirements that apply to the Work of Division 22.

B. RELATED REQUIREMENTS

1. Division 01: General Requirements.
2. Division 22: Plumbing
3. Division 23: HVAC
4. Division 26: Electrical.

1.02 REGULATORY REQUIREMENTS

A. Current federal Safe Drinking Water Act (SDWA) regulations require the furnishing of lead-free pipe, solder, and flux in the installation or repair of plumbing in non-residential facilities connected to public drinking water systems. Under this regulation, solders and flux are considered lead-free when they contain 0.2 percent lead or less. Under California regulations pipes and pipe fittings are considered lead-free when they contain 0.25 percent lead or less as defined in California Assembly Bill 1953 (AB 1953). No pipe, pipe fittings, or any other fitting or fixture intended to convey or dispense water for human consumption by drinking or cooking is allowed in the domestic plumbing system, if they do not meet the low lead definition of AB 1953. Weighted average lead content of the wetted surface area of pipes, fittings and fixtures may not exceed 0.25 percent.

1. Provide lead-free water pipe, solder, and flux materials that meet the standards as outlined by the federal SDWA regulations and California AB 1953 if installed in drinking water system.
2. Collect pipe, solder, and flux material samples as required by the Project Inspector. Test samples shall be delivered to an Owner designated testing laboratory for testing of lead content.
    a. Test samples for lead content by the atomic absorption spectrophotometry method.
3. Materials found not conforming to SDWA and California AB 1953 regulations shall be deemed defective Work and shall be replaced with lead-free materials.
4. Comprehensive testing of the remaining materials for their lead content shall be performed as required by the Project INSPECTOR.

A. Materials, fabrication, equipment, and installation shall comply with industry standards and code requirements. Where manufacturer's recommendations exceed industry standards, the manufacturer's recommendation shall establish the minimum standard. As a minimum, standards from the following organizations shall apply:

1. ANSI - American National Standards Institute.
2. ASME - American Society of Mechanical Engineers.

a. ASME Boiler and Pressure Vessel Code.

b. ASME B31 - Standards for Pressure Piping.

3. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers.

4. ASTM - American Society for Testing and Materials.

a. ASTM A53 Specification for Welded and Seamless Pipe.

5. AWWA - American Water Works Association.

6. CSA - Canadian Standards Association.

7. FM Global - Factory Mutual Global

8. IAPMO - International Association of Plumbing and Mechanical Officials.

9. NFPA - National Fire Protection Association.

10. OSHA - Occupational Safety and Health Administration.

11. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association.

12. UL - Underwriters Laboratories Inc.

13. Intertek (ETL Certification).

B. Materials, fabrication, equipment, and installation shall comply with federal, state, and local codes including, but not limited to, the following:

1. CBC, California Building Code, and CMC, California Plumbing Code.

a. Latest edition as adopted by the City of Los Angeles, the County of Los Angeles, and the State of California including amendments effective on the Effective Date of the Contract.

2. California Code of Regulations, Title 8, Industrial Relations, Division 1, Chapter 4, Division of Industrial Safety.

3OSHA - Occupational Safety and Health Administration.

4. CDPH - California Department of Public Health.

5. SCAQMD - South Coast Air Quality Management District.

C. Specifications or Drawings shall not be construed to permit deviation from the requirements of governing codes unless approval has been obtained from legally constituted authorities having jurisdiction, and the Architect. The Contract Documents may contain more stringent requirements than those legally required.

D. Permits and Fees: Refer to the General and Supplementary Conditions.

1.03 SUBMITTALS

A. Provide submittals in accordance with Section 01 3000: Submittal Procedures and with specific requirements of Division 22 sections, as applicable.

B. The above information shall become the basis for inspecting and testing materials and actual installation procedures performed in the Work.

C. Shop Drawings: Submit one additional copy when control diagrams having line voltage connections are indicated. Shop Drawings shall be specifically prepared for the Work of this Project. Drawings prepared in accordance with requirements of Section 01 3113:

Project Coordination and Section 01 3000 may be provided by the Architect to serve as a background for the Shop Drawings. Shop Drawings shall comply with the requirements of Section 01 3113 and Section 01 3000 and shall indicate at a minimum:

1. Complete system layout of equipment, components, plumbing fixtures, piping, indicating service clearances, and pipe sizes, fitting types and sizes and pipe elevations, distances of pipes and equipment from building reference points and hanger support locations. The above items shall be coordinated on the shop drawings according to the requirements of Section 01 3113.

2. Schedule and description of equipment, piping and fittings.

1.04 PROJECT RECORD DOCUMENTS

A. Comply with provisions of Section 01 7000: Contract Closeout.

B. Project Record Drawings:

1. Provide a complete set of plumbing and fire protection drawings in AutoCAD and, if available, BIM, complete with external reference drawings, fonts, blocks and plotter pen color/line thickness settings on CD-ROM. Also submit one set of full size reproducible plots on vellum and 3 sets of prints.

2. Before Contract Completion, deliver corrected and completed prints to the OAR. Delivery of project record documents to the OAR does not relinquish responsibility of furnishing required information omitted from project record documents.

C. Operation and Maintenance Manuals:

1. Submit two copies of operation and maintenance manuals in required form and content. If no revisions are required, furnish one additional copy. If revisions are required, one copy shall be returned with instructions for changes; perform such changes and return three copies of manuals. Manuals shall be bound in accordance to Section 01 7000. Deliver manuals to the OAR. Submit an electronic copy of the entire manual in PDF file format.

2. Contents of Manual:

a. Title sheet with Project name, including names, addresses and telephone number of Contractor, installer, and related equipment suppliers.

b. Manufacturer's operating instructions including, but not limited to, the following:

1) Identification of components and controls.

2) Trouble shooting checklist and guidelines.

3) Recommendations for optimum performance.

4) Warnings and safety precautions on improper or hazardous operational procedures or conditions

c. Manufacturer's product data and parts and maintenance booklet for each item of equipment furnished under Division 22 that includes the following as a minimum:

1) Manufacturer’s model, identification and serial numbers.

2) Exploded view of assembly drawings identifying each component or part with the relevant part number.

3) Directory of manufacturer's representatives, service contractors and part distributors.

4) Maintenance and trouble-shooting instructions, including schedule for preventive maintenance, periodic inspection and cleaning criteria.

d. Project Record Drawings: Complete set of plumbing, fire protection and control system drawings in 50 percent reduced print format shall be furnished with the manual. Submit the above record drawings on CD-ROM in AutoCAD and, if available, BIM, complete with external reference drawings, fonts, blocks, and plotter pen color/line thickness settings.

e. Testing, Adjusting, and Balancing reports: Submit as specified in Section 23 0593.

f. South Coast Air Quality Management District (SCAQMD) permits to install and operate boilers, water heaters and other fuel burning equipment and third-party source test reports as required by SCAQMD to allow start-up and operation of equipment.

g. San Bernardino County industrial waste permits.

h. Valve directory complete with location, function, size, and model of each valve with reference to the project record drawings.

i. Equipment and component identification chart complete with location, function, size, and model of each equipment or component with reference to the project record drawings.

1.05 COORDINATION

A. Contract Documents indicate extent and general arrangement of Work under Division 22. Contractor shall coordinate work in accordance with Section 01 3113 requirements and make adjustments as required to provide maximum headroom, a neat arrangement to keep passageways and openings clear to provide accessibility and provisions for maintenance, and to meet code requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Deliver materials to Project site in their original unopened containers with labels intact and legible at time of delivery. Store in strict accordance with manufacturer's recommendations.

B. Do not store plastic pipe or materials in direct sunlight.

1.07 PRELIMINARY OPERATION

A. OAR may require any portion of plumbing Work to be operated before Substantial Completion. Such operation shall be in addition to regular tests, demonstrations and instructions required under the Contract Documents, and shall be performed as required.

B. Notify the INSPECTOR at least 24 hours in advance of lighting or re-lighting pilots.

1.08 TRAINING OF OWNER PERSONNEL

A. Training of Owner's personnel shall include:

1. A minimum of 4 hours of on-site overview of the overall Plumbing System.

2. Refer to Division 22 sections for specific training on each of the components of the Plumbing System.

B. Contract shall include the cost of training Owner operation and maintenance personnel in operating, adjusting, maintenance, trouble-shooting, and Project site repair of each component, equipment, or system provided under this Contract.

C. Operational and maintenance training shall be conducted on the Project site, unless indicated otherwise.

D. Upon completion of Owner training, a completion certificate indicating the nature of the training and a description of the systems, complete with equipment and component lists shall be issued to each trainee. The certificate should be issued in duplicate with one copy retained by OAR.

E. An attendance sheet with the names and signatures of all participants attending the training shall be submitted to the OAR and kept as part of the project documents.

1.09 GUARANTEES AND DAMAGE RESPONSIBILITY

A. Sound of water flowing in piping shall not be transmitted to building structure. Operation of mechanical system shall not produce operational sounds that can be heard outside of rooms enclosing apparatus or equipment.

PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Unless otherwise specified, materials and equipment shall be new, in good and clean condition. Equipment, materials, and components shall be of the make; type and model number noted on Drawings or specified. Pieces of equipment of the same type shall be by the same manufacturer.

B. Whenever an item is listed by a single proprietary name, with or without model number and type, it shall be for purpose of design only, to indicate characteristics and quality desired. Proprietary designation listed on Drawings, or listed first in Specifications, is used as a basis for design to establish a standard for quality and performance and space requirements.

C. Equipment and materials indicated or required to be installed outdoors shall be of the type that is designed, manufactured, listed or approved by authorities having jurisdiction for outdoor installation by being resistant to the adverse effects of weather. The additional protective measures against outdoor weather required by the manufacturers' installation instructions and prevalent practice shall be provided.

D. For substitution of materials or products, refer to the General Conditions.

Substitutions after bid may only be granted if the approved product has become unavailable and approval of any such substitution shall be at the responsibility of this Contractor.

PART 3 – EXECUTION

3.01 SERVICE INTERRUPTIONS, OFF-SITE, GAS AND WATER

A. Schedule Work so there shall be no service interruptions of existing systems or systems during normal hours of operation of affected systems and facilities.

B. When service interruptions are mandatory, arrange in advance with the OAR as to time and date of such interruptions.

C. Systems, which are interrupted, shall be returned back into operation in such manner that they will function as originally intended.

3.02 CUTTING, NOTCHING, AND BACKING

A. Conform to California Building Code, Title 24, Part 2, for notches and bored holes in wood and for pipes and sleeves embedded in concrete and for cuts in steel, as detailed on structural Drawings.

B. Where pipes pass through, or are located within one inch of any construction element, install a resilient pad, ½ inch thick minimum, to prevent contact.

C. Furnish provisions for recesses, chases, and accesses and provide blocking and backing for proper reception and installation of plumbing Work.

3.03 LOCATION OF PIPING AND EQUIPMENT

A. Location of piping, apparatus and equipment indicated on the Drawings is approximate and shall be altered to avoid obstructions, preserve headroom, and provide free and clear openings and passageways.

B. Trenches parallel to footings shall not be closer than 18 inches to the face of footings and shall not be below a plane having a downward slope of 2 horizontal to one vertical, from a line 9 inches above bottom of footing.

C. Pipe in tunnels shall be installed close to one side of tunnel to provide maximum space for passage. Pipe shall not be installed through crawl hole unless otherwise specified or detailed on Drawings.

D. Place equipment in locations and spaces indicated, disassemble and/or reassemble equipment as required by Project conditions.

3.04 TESTS AND TESTING

A. Tests shall be as required under the applicable sections of Division 22, including this Section.

B. Additional tests may be required in the case of products, materials, and equipment if:

1. Submitted items are altered, changed, or cannot be determined as exactly conforming to the Contract Documents.

2. Performance testing and results may also be required on certain items which are as specified, including fan, and pump performance.

C. Piping Tests:

1. Perform tests required to demonstrate that operation of plumbing systems and their parts are in accordance with Specifications covering each item or system, and furnish materials, instruments and equipment necessary to conduct such tests. Tests shall be performed in presence of the Inspector, and representatives of any governmental agency having jurisdiction. Work shall not be concealed or covered until required results are provided.

2. If required tests are not performed, Owner may provide in accordance with the Contract Documents.

3. Pressure gauges furnished in testing shall comply with CPC. Air shall be bled from lines requiring hydrostatic or water tests.

4. Systems shall be pressure-tested in accordance with pipe testing schedule below. Pipe test shall indicate no loss in pressure after a minimum duration of 4 hours at

test pressures indicated. Where local codes require higher test pressures than specified herein for fire sprinkler systems, local codes shall govern.

5. Fuel gas lines shall be first tested with piping exposed, before backfilling trenches or lathing; second with piping in finished arrangement, backfilled and paved where required, and walls finished.

6. Piping systems may be tested as a unit or in sections, but entire system shall successfully meet requirements specified herein, before final testing by the Inspector.

7. Repair of damage to pipes and their appurtenances or to any other structures resulting from or caused by these tests, shall be provided.

D. Pipe Testing Schedule:

System Tested	Test Pressure (psig)	Test With:
Durham system, glass or plastic acid waste, vent and roof drain (except pipes running under a slab or underground)	Fill with water to top of highest vent; allow to stand two hours, or longer, as required by Inspector. Minimum head required for any joint shall be 10 feet in building.	Water
Cast-iron soil, waste and interior downspout, condensate drain from air conditioning equipment	10 feet of water, vertically	
Storm water disposal lines	Running water test	Water
Vacuum pump or condensate pump discharge and condensate return piping	150	Water
Domestic water piping	200	Water
Standpipes, wet or dry	300	Water
Fire sprinkler piping	200	Water
Gas piping(steel threaded or plastic)	60 (both tests)	Air
Gas piping (steel welded)	100 (both tests)	Air
Gas welding station	1-1/2 Working pressure 100 min.	Dry nitrogen
Compressed air piping	175	Air

E. Equipment Performance Assurance Tests:

1. Before operating any equipment or systems, a thorough check shall be performed to determine that systems have been flushed and cleaned as required and that equipment has been properly installed, aligned, lubricated, and serviced. Factory instructions shall be checked to verify installations have been completed and recommended lubricants have been installed in bearings, gearboxes, crankcases, and similar equipment. Particular care shall be furnished in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Equipment shall also be checked for damage that may have occurred during shipment, after delivery, or during installation. Damaged equipment, products, and materials shall be replaced or repaired as required.

2. Upon completion of the above, adjust the system settings to within normal operating conditions to prevent the system from being damaged upon start-up.

3. Run-test the equipment after start-up for five consecutive days. Tests shall include operation of all equipment and systems for a period of not less than two 8 hour periods at 90 percent of the full specified capacities.

4. Equipment Start-up Reports: For each equipment or system on which start-up is performed, submit 8 copies of start-up report for review by the Architect.

   a. The start-up report shall include the manufacturer's standard start-up form completed and signed by the start-up technician.

5. Provide, maintain, and pay costs for equipment, instruments, and operating personnel as required for specified tests.

6. Provide electric energy and fuel required for tests.

7. Final adjustment to equipment or systems shall meet specified performance requirements.

8. Equipment, systems, or Work deemed defective during testing shall be replaced or corrected as required. Test until satisfactory results are provided.

F. Specific Coordinated Plan for Test and Balance:

1. Provide a narrative of the operational intent that clearly describes the function and sequence of operation of each component, equipment, or system installed. Instruct designated Owner personnel in the operation of the installed systems.

2. Prior to final test and balance, plumbing equipment and systems shall be operated and tested as indicated in Article 3.04.F above to demonstrate satisfactory overall operation of the installed systems.

3. Welding performed as part of this Division may be subject to radiographic inspections at random in accordance with requirements specified in Section 22 0513: Basic Plumbing Materials and Methods.

3.05 NOISE AND VIBRATION REDUCTION

A. Correct noise or vibration caused by plumbing systems. Provide all necessary adjustments to specified and installed equipment and accessories to reduce noise to the lowest possible level

B. Correct noise or vibration problems caused by failure to install work in accordance with Contract Documents. Include all labor and materials required as a result of such failure. Pay for re-testing of corrected noise or vibration problems by the project acoustical consultant including travel, lodging, test equipment expenses, etc.

3.06 PROTECTION, CARE AND CLEANING

A. In addition to storage criteria of the General Conditions, and provisions under Section 01 5000: Construction Facilities and Temporary Controls, the following shall be provided:

1. Provide for the safety and good condition of materials and equipment until Substantial Completion. Protect materials and equipment from damage.

2. Protect installed Work.

3. Replacements: In case of damage, immediately provide repairs and/or replacements as required.

4. Protect covering for bearings, open connections to tanks, pumps, compressors and similar equipment.

5. Interior of piping shall be maintained free of dirt, grit, dust, and other foreign materials.

6. Fixtures, piping, finished brass or bronze, and equipment shall have grease, adhesive, labels, and foreign materials removed. Chromium, nickel plate, polished bronze or brass Work shall be polished. Glass shall be cleaned inside and out.

7. Before initial start-up and again before Substantial Completion, piping shall be drained and flushed to completely remove grease and foreign matter. Pressure regulating assemblies, traps, strainers, boilers, flush valves, and similar items shall be thoroughly cleaned. Tag system with an information tag listing responsible party and date of element, before initial start-up and again before Substantial Completion. Compressed air, oil, and gas piping shall be blown out with oil-free compressed air or inert gas.

END OF SECTION

SECTION 22 0513

BASIC PLUMBING MATERIALS AND METHODS

PART 1 – GENERAL

1.01 SUMMARY

A. SECTION INCLUDES

1. This Section prescribes basic materials and methods generally common to the Work of Division 22.

B. RELATED REQUIREMENTS

1. Division 01: General Requirements.

2. Division 22: Plumbing.

3. Division 26: Electrical.

4. Section 33 1100: Site Water Distribution Utilities.

1.02 SUBMITTALS

A. Provide in accordance with Division 01, Section 22 0500 and specific requirements of each section of Division 22.

B. Types of welding rods to be used.

1.03 QUALITY ASSURANCE

A. Standards: Comply with applicable national, state, and local codes and standards: ASTM, ASME, and ANSI. Federal Specifications, AWWA, SISPI, NFPA, FM, UL, CPC (California Plumbing Code), CMC (California Plumbing Code), CSA.

B. Qualifications of Manufacturer: Products used in the Work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production as reviewed by the Architect.

1.04 COORDINATION

A. Coordinate related Work in accordance with provisions of Section 01 3113: Project Coordination.

PART 2 – PRODUCTS

2.01 GENERAL

A. Provide the following products if they are indicated in the Contract Documents or if they are required for the proper installation, function or operation of equipment, systems or components indicated in the Contract Document.

B. Provide the following products as a complete assembly with required accessories for a complete and functioning entity in compliance with governing codes and applicable standards as specified in Section 22 0500, manufacturer's instructions or as required.

1. Omission of minor details in the Contract Documents does not waive and/or otherwise relinquish compliance with the above requirements.

2.02 MANUFACTURERS AND MATERIALS

A. Ball Valves: Bronze, 2-inch and smaller:

BV-1: Class 150, 600 psi, CWP, 2 piece construction reinforced Teflon seats, full port, adjustable packing gland, stainless ball and stem, threaded ends.

Hammond UP-8303A/UP-8305/UP-8513, NIBCO T-685-80-LF/TS-685-66-LF, Milwaukee UPBA400S/450S, or equal.

Provide valve Handle shall be stainless steel when valve is installed below grade or in the ground valve box.

BV-2: Class 150, 600 psi, CWP two piece construction with reinforced TFE seats, full port, adjustable packing gland, (no threaded stem designs allowed), threaded ends.

NIBCO T-685-80-LF, Hammond UP-8303A, Milwaukee UPBA-400 or equal.

NIBCO T585 S6R66 (Stainless Steel), Milwaukee BA-260 (Stainless Steel).

Provide BV-1A shall be used on hot domestic and cold water systems.

BV-3 Class 150, 600 psi CWP, 2-piece construction, bronze body, reinforced Teflon seats, adjustable packing gland, (no threaded stem designs allowed), threaded ends.

Hammond UP8301A, NIBCO T-585-70, Milwaukee BA-400, or equal.

Provide BV-2 to be used only where water is NOT used for water consumption.

Ball Valves in Insulated Piping: Use extended operating handle of non-thermal conducive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation and memory stops that are fully adjustable after insulation is applied. NIBCO Nib-Seal Handle.

B. Butterfly Valves:

Provide Butterfly Valves in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance, article 1.03 of this Section.

BFV-1 Centerline Series A, 200 psi CWP tight shut-off.

1. Body: Lug type ductile iron. Suitable for bi-directional dead-end service at rated pressure without use of downstream flange.

2. Disc: Bronze, or aluminum bronze.

3. Stem: One or two-piece, 400 series stainless steel.

4. Seat and O-Rings: EPDM.

5. Upper and Lower Stem Bearings: Copper alloy or non-metallic material.

6. Operators: Valves 6 inches and smaller, with lever handle. Valves 8 inches and larger, with manual gear operator and disc position indicator.

7. Manufacturers:

a) Valves 2.5 to 6-inch: NIBCO, Milwaukee ML-233E, Hammond 6411-03, or equal.

b) Valves 8-inch and larger: Milwaukee ML 333E, Hammond 6411-03, NIBCO LD 2000, or equal.

C. Check Valves:

Provide check valves in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance, article 1.03 of this Section.

1. Bronze, 2-inch and smaller:

CHV-1: 200 psi, CWP horizontal swing, Y pattern, renewable seat and disc, threaded ends.

NIBCO T-413-Y-LF, Milwaukee UP-509, Hammond UP-904 or equal.

Provide on domestic hot and cold water systems.

CHV-2: Class 125 200 psi, swing check, bronze body, Teflon disc, soldered ends.

Stockham B-310TY, Crane 1340, NIBCO S-413-Y, Milwaukee 1509-T, Hammond IB-912 or equal.

Provide on junior fire sprinkler systems less than 3 fire sprinkler heads.

CHV-3: 200 psi, CWP, bronze body, horizontal swing, Y pattern, renewable seat and disc, solder ends.

Nibco S-413-Y-LF, Milwaukee UP 1509-T, Hammond Up-946 or equal.

Provide on domestic hot and cold water systems.

2. Cast Iron 2 1/2-inch and larger:

CHV-4: Class 125, 200 psi, CWP, IBBM, renewable seat and disc, bolted cap, threaded ends:

Crane 372, Stockham G-927, NIBCO T-918-B, or equal.

Provide on multiple domestic hot and chilled water pump systems, multiple steam boiler return lines from steam trap.

CHV-5: Special low-pressure check valve for installation in gas lines.

Circle Seal Products Co.
119B-PP-0-15 psi; #1:1/8 inch IPS; #2:1/4 inch IPS #3:3/8 inch IPS.

Provide on low pressure gas in chemistry laboratory systems.

D. Flow Control Valve – Manual:

FC-1 Flow control valves: Bell and Gossett Series CB circuit setter balancing valve, line size, with integral pointer (to register degree of valve opening), differential pressure meter connections with built-in check valves and lockable memory stops. Armstrong Series CBV circuit-balancing valves, Victaulic/TA Hydronics, or equal.

Provide balancing and controlling of domestic hot water system flow for different branch circuits.

E. Gate Valves:

Provide gate valves in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance, article 1.03.

1. Bronze, 2-inch and smaller:

GV-1 Class 125, 200 psi CWP, bronze body and bonnet non-rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

Hammond IB645, Crane 1701, Milwaukee 105, American 3F, NIBCO T-113, or equal.

Provide shut-off and isolation of equipment and device for gas system.

GV-2 Class 125, 200 psi, CWP, bronze body and bonnet, non-rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

NIBCO T-113-LF, Milwaukee UP 105, Hammond UP 645 or equal.

Provide on domestic hot and cold water systems.

GV-3 Same as GV-1, except solder ends:

NIBCO S 113, Milwaukee 115, Hammond IB 647, or equal.

Provide in yard box, to each group of fixtures behind access panels, where valves are located near ceiling and beams.

GV-4 Class 125, 200 psi, CWP, bronze body and bonnet, non-rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

NIBCO T-113-LF, Milwaukee UP 105, Hammond UP 645 or equal.

Provide on domestic hot and cold water systems.

GV-5 Class 125, 200 psi WOG, rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

Stockham B-100, Crane 428, NIBCO T-111, Milwaukee 148, Hammond IB-640, or equal.

Same as GV-3 except where clearance is not an issue. Adequate clearance for operation must be provided because hand wheel and stem rise. Provide inlet and outlet connections to water heaters and pumps, make up water lines to HVAC equipment and expansion tanks.

GV-8A Class 250, 250 psi, CWP, O S and Y, IBBM, resilient seat gate valve, flanged ends.

Watts 408-OSY-RW, Kennedy 7168 or equal.

The epoxy coated valves are recommended in the domestic cold water system where corrosives in the water line might cause damage to the inside of valve and where pressure rating in excess of 200 psi is required.

GV-9 Class 125 250 psi CWP iron body, flanged ends, bolted bonnet with wheel handle, resilient wedge, non-rising stem.

Provide in walls for cold water system pipe sizes 2 ½-inch and larger.

NIBCO F-619-RW or equal.

GV-10 Class 125, 250 psi CWP iron body, flanged ends, bolted bonnet with 2-inch operating nut, resilient wedge, non-rising stem, fusion bonded epoxy coated.

Provide for using below grade for cold water system pipe sizes 2 ½-inch and larger.

NIBCO F-619-RW-SON or equal.

F. Globe Valves:

1. Bronze, 2-inch and smaller:

Provide in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance of Article 1.03.

GLV-1A Class 125, 200 psi, CWP, screw-in bonnet, Teflon disc, threaded ends:

Milwaukee UP 502, Hammond UP 440 or equal.

GGLV-2 Class 125, 200 psi, CWP, screw in bonnet, Teflon disc, solder ends.

Hammond IB-418, Milwaukee 1502, NIBCO S-211-Y, or equal.

GLV-2A: Class 125, 200 psi, CWP, screw in bonnet, Teflon disc, soldered ends.

Milwaukee UP 1502, Hammond UP 418 or equal.

Provide on domestic hot and cold water systems.

G. Heater Vent Pipe:

1.Schedule Number:

HVP-1 Shall be UL approved for service specified. Concealed heater vent pipe, including pipe in or through attic spaces, shall be Los Angeles City approved double wall metal vent pipe. For recessed wall heaters, furnish B.W. type. All others may be Type B, or B.W. Clearances must comply with Los Angeles City code and conditions of UL listing.

American Metal Products Co., Inc., Simpson Dura-Vent, AmeriVent, Hart & Cooley Mfg. Co., Metalbestos, or equal.

Provide component parts of a vent assembly, including vent cap, shall be companion items of same manufacturer. Each item shall be UL-approved and listed.

H. Liquid Level Gage:

LLG-1 Refrigerant type, carbon steel with stainless steel trim or all forged steel construction, back-seating standard design. Upper and lower valve furnished with ball check valves; 1/2 inch diameter glass on center. Four 3/16 inch diameter gage glass guard rods or slotted steel guard.

Peneberthy, Henry, Conbraco, or equal.

Magnetic Lever Valves:

MLV-1 Bronze, stainless steel and bronze trim, 2-way, packless normally closed, metal seat.

General Controls, K-10AA2030 or equal.

Provide for Can washing system. Provide for can washing installation.

I. Piping:

PROVIDE FOR PIPES IN A DOMESTIC PLUMBING SYSTEM INTENDED TO CONVEY WATER FOR HUMAN CONSUMPTION SHALL COMPY WITH QUALITY ASSURANCE ARTICLE 1.03.

1. Piping shall be continuously and permanently marked with manufacturer's name, type of material, size, pressure rating, and the applicable ASTM, ANSI, UL, or NSF listing. On plastic pipe, date of extrusion must also be marked.

2. Underground non-ferrous pressure pipes shall be installed with proper color tracer wires. Refer to color code provisions in Section 22 0553: Plumbing Identification.

P-1 Cast iron: Hubless, service weight, ASTM A888, CISPI 301, conforming to CISPI 310 and installed in accordance to IAPMO 1S 06. American Foundry, Tyler, or AB & I or equal.

P-2 Galvanized steel, Schedule 40, ASTM A53., US Steel or equal.

P-3 Copper drainage tube, underground, type L hard, ASTM B 88, Mueller, Cerro Brass or equal.

P-4 Copper drainage tube, inside structure and above grade. Type DWV hard temper, ASTM B 306, Mueller, Anaconda, Cerro Brass, Cambridge-Lee, Halstead or equal.

P-5 Purple pipe, PVC, schedule 40 for reclaimed or recycled water (below ground only for non-potable irrigation systems), type 1, grade 1, PVC-1120, Cell Class 12454 B.

P-6 Copper water tube, Type L hard, ASTM B88. Mueller, Cambridge-Lee, Halstead or equal. (when used above ground only)

P-7 Copper water tube, Type K hard, ASTM B88, by Mueller, Cerro Brass, Cambridge-Lee, Halstead or equal.

P-8 Polyethylene plastic pipe, ASTM D 2513, standard dimension ratio. 11, rated at 80 psi working pressure at 73 degrees Fahrenheit (F). for 3-inch and smaller, SDR 11.5 rated at 76 psi at 73 degrees F. for 4-inch and above, butt or socket type fittings, joined by heat fusion, orange or yellow color.

CPCHEM (Chevron Phillips Chemical Company LP) PE 2406, or equal.

Provide for natural gas below grade only. Transition to anodeless steel riser at meter, regulator, or building wall.

P-9 Red seamless brass 85-5-5-5, iron pipe size (IPS), threaded pipe, ASTM B43. Mueller, Cerro Brass, Cambridge-Lee, Halstead or equal.

P-10 Black steel pipe, Schedule 40, ASTM A53, Type E, ERW by US Steel, or equal.

P-11 Seamless copper tubing, tempered drawn, Type M, ASTM B88 by Mueller, Cerro Brass or equal.

P-12 High Silicon Iron Casting, 1 ½-inch and 2-inch, threaded for science room vents when ferrous waste piping is provided, ANSI-A21.10, WWP-356-36, ASTM D1784-699, by Duriron or equal.

P-13 PVDF (Polyvinylidene Fluoride) schedule 40 pipes, conforming to ASTM F1673, ASTM D3222 and complying with UL723 (ASTM E84). The joints may be no-hub or electro-fusion type. Installer shall be certified by manufacturer for joint installation. Orion, Fuseal or equal.

Provide for installations where the corrosive waste piping passes through air plenums as defined by California Mechanical Code (CMC) and underground.

P-14 Polypropylene chemical waste, flame retardant pipe, conforming to ASTM F1412 and ASTM D4101. The joints may be no-hub or electro-fusion type. Installer shall be certified by the manufacturer for joint installation. Orion, Fuseal or equal.

Provide fireproof wrapping where the corrosive waste piping passes through air plenums as defined by CMC. This type may be used for underground.

P-15 PVC, thick wall, cast-iron OD sized, UL listed, AWWA listed, NSF listed, Class 200 with tracer wire, Blue Brute, or equal.

Provide Domestic water, irrigation and main fire line below ground only (4-inch and over).

P-16 Type 316L Stainless steel chemical waste pipe, marked with manufacturer's identification and fittings. Mechanical press fit joints with EPDM seals Manufacturer's representative shall instruct installers and certify them for joint installation. Piping system shall be provided with a five-year manufacturer’s material warranty.

Blucher-Josam or equal.

THIS TYPE SHALL NOT BE USED FOR UNDERGROUND INSTALLATIONS. ONLY WHERE THE CORROSIVE WASTE PIPING PASSES THROUGH AIR PLENUMS AS DEFINED BY CMC.

P-17 304 / 304L Stainless Steel, .049 wall, ASTM A312. Pipe must be certified for use with the Vic-Press 304TM piping system, by Trent Tube, Victaulic or equal.

THIS TYPE SHALL NOT BE USED FOR UNDERGROUND INSTALLATIONS. ONLY WHERE THE CORROSIVE WASTE PIPING PASSES THROUGH AIR PLENUMS AS DEFINED BY CMC.

P-18 CPVC (Chlorinated polyvinyl Chloride) schedule 40 pipe, conforming to ASTM D1784 and complying with UL723 (ASTM E84). The joints shall be of solvent cement type conforming to ASTM F493. Installer shall be certified by the manufacturer for this type of joint installation. Spears, Corzan, Charlotte or equal.

P-19 PVC, schedule 40, extruded from 100 percent virgin Polyvinyl Chloride (PVC) compound, meeting requirements of class 1254-13 of ASTM D1784.

J. Pipe Fittings:

Pipe fittings in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance, article 1.03.C.

PF-1 Cast iron, soil or waste no-hub coupling with neoprene gaskets, stainless steel corrugated shields and stainless steel clamps. 2 bands for size 1 ½-inch thru 4-inch, IAPMO, ASTM C 564 and CISPI 310.

American Foundry, Mission, Tyler, or equal.

PF-2 Cast iron, soil or waste, Heavy-duty no-hub coupling with neoprene gaskets, stainless steel corrugated shields and stainless steel clamps. 4 bands for size 5-inch thru 10-inch. IAPMO, ASTM C564 and CISPI 310.

American Foundry, Mission, Tyler, or equal.

PROVIDE WITH P-1.

PF-3 Malleable iron, Class 150, threaded, galvanized, beaded, ANSI B 16.3. P-2

Stockham, Stanley Flagg, Grinnell Oreual.

PROVIDE WITH P-2.

PF-4 Cast brass drainage fittings ASA B 16.23, ASTM B 42. Provide with copper drainage tube.

Mueller Brass, Nibco, Stanley Flagg, Lee Brass Or equal.

PROVIDE WITH P-3 AND P-4.

PF-5 Wrought copper - solder type ANSI B 16.22

Mueller Brass, Nibco, Lee Brass or equal.

PROVIDE WITH P-6 PIPE, SOLDER, AND FLUX SHALL BE LEAD-FREE FOR DRINKING WATER. FLUX SHALL BE AN APPROVED WATER-SOLUBLE MATERIAL.

PF-6 Polyethylene plastic fittings, ASTM D 3261 and D 2683, standard dimension ratio 11, rated at 80 psi working pressure at 73 degrees F. for 3 inches and smaller, SDR 11.5 rated at 76 psi at 73 degrees F. for 4 inches and above, butt or socket type fittings, joined by heat fusion, color orange or yellow.

CPCHEM, (Chevron Phillips Chemical Company LP) or equal.

Provide with P-8.

PF-7 Polyethylene transition risers, for Pff-6 above, Transition fitting must have a minimum vertical height of 36 inches from the horizontal connection which will allow for a 6-inch steel riser above ground. Polyethylene transition risers shall be anodeless.

Central Plastics Company or equal.

Installed in a gas piping system for the purpose of providing a transition from horizontal below ground (polyethylene) to a vertical above ground (steel). Transition must be made on the horizontal side of the gas piping system and meet ASTM standards for Polyethylene plastic pipe and fittings.

PF-8 Bronze and brass, 250 psi, threaded, ASA B16.17 and F S WW-P-460.

PROVIDE WITH P-9.

Mueller Brass, Lee Brass Or equal.

PF-9 Malleable iron, Class 125, ANSI B 16.3, threaded or welded Schedule 40 black steel for 2-inches and below and welded for 2 ½-inch and above, by Stockham or equal.

PROVIDE WITH P-10.

PF-10 Cast iron, threaded, Class 125, ANSI B 16.1.

PROVIDE WITH P-12.

Stockham or equal.

PF-11 Cast-iron OD sized,, bell and spigot gasket joints.

PF-12 Steel butt weld type, ASTM A 234WPB.

PROVIDE WITH P-12.

PF-13a No-hub couplings for factory grooved PVDF or polypropylene, schedule 40 piping. The coupling shall be of the same material and gauge as the pipe. Each coupling shall have 300 series stainless steel outer band and 5/16 inch bolts, nuts and washers plated to meet a 100-hour salt spray test per ASTM B117. Installer shall be certified by the manufacturer for this type of joint installation. Orion, Fuseal or equal.

PROVIDE WITH P-13.

PF-13b The pipe and fitting shall be joined using the socket fusion system conforming to ASTM 2657. Installer shall be certified by the manufacturer for this kind of joint installation. Orion, Fuseal or equal.

PROVIDE WITH P-14.

PF-13c CPVC (Chlorinated Polyvinyl Chloride) schedule 40 pipe and fittings, conforming to ASTM D1784 and complying with UL723 (ASTM E84), shall be joined using solvent cement conforming to ASTM F493. Installer shall be certified by the manufacturer for this kind of joint installation. Spears, Corzan or equal.

PROVIDE WITH P-18.

PF-14a Drains, bottle traps and similar devices for CPVC, PVDF or polypropylene, schedule 40 piping, shall be of same material and gauge as the pipe with mechanical joints. Installer shall be certified by the manufacturer for this kind of joint installation. Orion, Fuseal or equal.

FURNISH WITH MATCHING PIPE ONLY. PROVIDE FIREPROOF WRAPPING WHERE THE POLYPROPYLENE PIPING PASSES THROUGH AIR PLENUMS AS DEFINED BY CMC.

PF-14b Type 316L Stainless steel joint for chemical waste piping systems including drain or bottle traps. Blucher-Josam or equal.

FURNISH WHEN USED WITH MATCHING PIPE ONLY. THIS TYPE SHALL NOT BE USED FOR UNDERGROUND INSTALLATIONS AND ONLY WHERE THE CORROSIVE WASTE PIPING PASSES THROUGH AIR PLENUMS AND THE AVAILABLE SPACE IS NOT SUFFICIENT FOR FIRE PROOF WRAPPING OF POLYETHYLENE PIPING. GRADE TO SUIT INTENDED SERVICE. PROVIDE WITH PIPING SCHEDULE P-16.

Victaulic Vic Press 304TM or equal.

PF-15 Precision cold drawn austenitic 304/304L stainless steel, with elastomer O-rings

PF-16 Grooved end type– ASTM A395 and A536 ductile iron; ASTM A234 WPB forged steel; fabricated from ASTM A53 carbon steel. Couplings shall be supplied with angle-pattern bolt pads for rigidity, except in locations where flexibility is desired. Gaskets shall be pre- lubricated. Galvanized or painted, by Victaulic or equal.

GRADE TO SUIT THE INTENDED SERVICE. PROVIDE WITH PIPING SCHEDULE NUMBER P-2 OR P-10.

PF-17 Grooved end type– ASTM B75 or B152 and ANSI B16.22 wrought copper, bronze sand casting per ASTM B584-87 copper alloy CDA 836 per ANSIbB16.18. Couplings shall be CTS style 606 supplied with angle pattern bolt pads for rigidity, coated with copper coated alkyd enamel. Gaskets shall be pre-lubricated Flush seal type by Victaulic or equal.

FOR DOMESTIC HOT AND COLD WATER 2 ½-INCH AND LARGER COPPER APPLICATIONS. PROVIDE WITH PIPING SCHEDULE NUMBER P-6.

PF-18 CPVC fittings must conform to ASTM D2846 specification for chlorinated polyvinylchloride (CPVC) plastic for hot and cold water distribution system.

PF-19 Plastic fittings, schedule 40 molded from PVC type I compound, conforming to the requirements of specification ASTM D2466.

K. Pipe Isolators:

PLA-1 Absorption pad shall be not less than ½ inch thick, unloaded. Pad shall completely encompass pipe.

Provide for copper piping.

Holdrite, LSP, Stoneman, Potter-Roemer, Trisolator, PR-Isolator, or equal.

PLA-2 PLASTIC CUSHION TO FORM AN INSULATING LINER AND ELIMINATE METAL TO METAL CONTACT WHEN SECURING COPPER TUBES AND PIPES IN AIR CONDITIONING AND REFRIGERATION INSULATION PREVENTING GALVANIC EROSION. (ACOUSTICAL TYPE FOR SOUND ABSORPTION).

Hydra-Zorb Cushion Clamps, Acousto-Clamp, or equal.

L. Pressure Gage: Aluminum or steel case, minimum 4 ¼-inch dial; pressure type or combination vacuum-pressure type, with provisions for field calibration. Dial indicator to indicate pressure in psi with accuracy to within plus or minus 0.5 percent of maximum dial reading. Furnish gages with restriction screw, size 60, to eliminate vibration impulses. Black case and ring, bourdon tube of seamless copper alloy with brass tip and socket. Three way gage cock, constructed of brass with stuffing box, 1/2 inch couplings, with fixed or movable cap nut to shut off pressure gage.

PG-1 Pressure type, black drawn steel case, 4-1/2-inch glass dial, range approximately twice line pressure.

Marsh Keckley, Trerice, Weksler, Weiss, or equal.

M. Plug Valves:

PV-1 2 inches and smaller: Rockwell No.114, lubricated plug type, 200-pound., water operating gauge pressure iron body and plug, regular pattern, threaded, with indicating arc; by Walworth, Homestead, WKM, or equal.

Provide Isolation and on-off application for gas system.

PV-2. 2 ½-inch and larger: Rockwell No.115 and No.165 lubricated plug type, 200 pound water operating gauge. Iron body and plug, regular pattern, flanged, with indicating arc. Walworth, Homestead, WKM, or equal.

N. Safety Relief Valves:

SRV-1 Combination temperature and pressure relief type. CSA approved. Set to open at 125 psi pressure.

Watts 40L Cash-Acme NCLX-1

Provide for Steam system, hot water system.

SRV-2 Same as SRV-1, except provide on storage type water heater with anode in dip tube.

Watts 10 x L, Cash-Acme NCLX-1

SRV-3 Spring type, ASME and NB stamped and certified with manual lifting device for air or gas.

Bailey, Cash-Acme, Watts, Keckley or equal.

Provide for Gas system and compressed air system.

O. Strainers:

STR-1 Description: Wye type with monel or stainless steel strainer cylinder (manufacturer's standard mesh), and gasketed machine strainer cap. Where indicated on Drawings, provide with valved (globe valve) blowout piping, same size as blowout plug.

1. 2-inch and smaller:
   C.M. Bailey No.100-A, 250 lb., cast iron body, threaded, Keckley 'B', Spirax Sarco Y-type, or equal.
2. 2 ½-inch and larger:
   C.M. Bailey No.100-A, 125 lb., cast iron body, flanged, or Victaulic style 732, 300 psi, ductile iron body, grooved, fusion bonded epoxy coated.

   C.M.Bailey, Armstrong, Muessco, Keckley 'A', or equal.

   Provide for Oil and gas systems.

STR-2 Y pattern cast iron bodies, 125 psi, monel screen. Open area at least twice the cross-sectional area of IPS pipe in which strainer is installed and may be woven wire or perforated type. Screwed ends for sizes up to 2 inches, flanged ends fusion bonded epoxy coated for 2 ½-inch and larger perforations, in accordance with the following:

1. Steam service - 40 square mesh.
2. Other services - 16 square mesh.

Bailey No.100, Armstrong, RP&C, Keckley or equal.

Provide as same as STR-1.

STR-3 Flanged, bucket type, semi-steel body, 125 psi, stainless steel screen with 1/8 inch diameter perforations, all sizes.

Bailey No.1, Zurn 150 Series, RP&C, Keckley GFV or equal.

Provide for Domestic cold and hot water system. Mount above grade for water service.

STR-4 Grooved, T-pattern, ductile iron body, 300 psi, stainless steel frame and mesh basket, grooved ends.

Provide for Domestic hot and cold water system except for high pressure system.

P. Vent Caps:

VC-1 Vandal-proof hood type, for plumbing vent lines.

Stoneman Engineering and Mfg., Semco 1550

Provide for Sanitary drainage system.

Q. Vacuum Valves:

VV-1 Vacuum valves; for vacuum serve, 125 psig working pressure, cast iron body, spring loaded lubricated plug type.

General Controls, Honeywell, Valmatic, or equal.

Provide for Domestic hot and cold water system.

R. Protective Coating for Underground Steel Piping

Provide for WORKING HOIST PIPING ONLY.

1. Black steel or galvanized steel piping indicated for below grade installation, shall be protected as specified prior to delivery to the Project site:

   a. Sandblast black steel pipe to a gray finish. Sandblast galvanized steel pipe lightly only.

   b. Install one coat of cut back asphalt to galvanized pipe immediately after sandblasting. Pre-heat black pipe to 180 degrees F. immediately before coating.

   c. Install one coat of high-temperature (melting point of 240 degrees F. minimum) Grade B asphalt enamel.

   d. Install one wrapping of 20 mils thick glass, fiber mat, Owens-Corning Coromat or L.O.F. Blueflag with 1/4 inch overwrap. Glass fiber shall be dry at time of installation.

   e. Install a second coat of asphalt enamel as specified above. Glass fiber mat shall be centered in the asphalt enamel.

   f. Install an overwrap of Kraft ripple paper.

2. Total thickness of pipe wrapping shall be not less than 1/8 inch. Entire coating operation shall be accomplished by mechanical means in a continuous operation. Hand installation of protective coating is not permitted.

3. Each piece of wrapped pipe shall be legibly identified at no greater than 5 feet intervals by fabrication company. Each material submittal shall include the name of the fabrication company. Maintain one reviewed Sample on the Project Site.

4. Acceptable manufacturers of wrapping are: Hunt, Mobile, Conway or equal.

5. Fittings (including couplings), unprotected pipe adjacent to fittings, and damaged pipe protection shall be wrapped at Project site as follows:

   a. Fittings and pipe to be wrapped shall be thoroughly cleaned of material foreign to pipe manufacturer.

   b. Install one coat of Plicoflex No. 105 or Protecto Wrap No. 1170 adhesive primer to metal.

   c. Wrap pipe and fittings with a minimum thickness of 3/32 inch of Plicoflex No. 310 pipe line butyl molding tape, or Protecto Wrap No. 200 molding tape. Install 3 layers, each layer overlapping next approximately 2/3 width of tape, without stretching. Tape and primer shall be of the same manufacturer.

   d. Wrap vinyl tape, 10 mil thickness, over molding tape with 1 inch minimum overlap.

      J.M. Trantex, 3M Scotchwrap or equal.

5. Pipe and fittings specified to be wrapped shall be tested with a holiday detector, after pipe has been installed in trench and before backfilling, in presence of the Project Inspector. Furnish a Tinkler and Raser model E-P holiday detector, or similar equipment for this test. Work, which is deemed defective, shall be repaired or replaced. The Project Inspector may test for damaged pipe wrapping after backfilling.

6. Instead of wrapping underground steel pipe as specified above, pipe may be machine-wrapped before delivery to the Project site as follows:

   a. Pipe shall be cleaned of moisture, oil, grease, scale, and other foreign material by cleaning with non-oily solvent and wire brushing. Remove metal burrs and projections.

   b. Install one coat of Plicoflex No.105 adhesive primer to cleaned pipe. If thinning is required, furnish only non-oily thinners as recommended by tape manufacturer.

   c. Wrap coated pipe with Plicoflex No.340-25 tape (15 mil butyl and 10 mil vinyl laminate) Tape shall be installed by machine wrapping at approved plant only. Maintain tension (minimum of 5 pounds per inch of width)

on tape over entire diameter of pipe. Tape shall be permanently identified and visible on vinyl side.

d. Fittings, unprotected pipe, and damaged pipe protection shall be wrapped as indicated above.

U. Pipe and Fitting Requirements Schedule: Unless otherwise specified or indicated on Drawings, pipe and fittings shall be installed in accordance with the following table:

TABLE I
PIPE AND FITTING SCHEDULE

Use	Limits	Pipe	Fittings
Domestic hot and Cold water, underground	Up To8 inches	P-7	PF-5
Copper, underground only	All	P-7	PF-5
Cold water, underground (Site piping)	4-inch and over	P-15	PF-11
Domestic hot and cold water, in building and above ground	All	P-6	PF-5
In building above ground	2 to 8-inch	P-6	PF-5
Compressed air	Underground or in concrete	P-9	PF-8
	Above ground	P-10	PF-3
Condensate drains and drains From HVAC Equip.	All	P-6	PF-5
Downspouts, interior above and below grade, up to 5 feet from building.		P-1	PF-1 Or PF-2
Acid Vent	All	P-12	PF-10
Fire Mains (Fire Hydrant)	Underground	P-15	PF-11
Gas Natural	Underground	P-8	PF-6
Gas Natural	Above ground	P-10	PF-9
Copper Drainage Tube (Underground)	Waste and Vent	P-3	PF-4
Copper Drainage Tube (Above Ground)	Waste and Vent	P-4	PF-4
Vents	New Building	P-1	PF-1 or PF-2 (IRE) if required by engineer
Vents	Existing Buildings and Exposed Downspouts	P-2	PF-3
Vents	For acid waste lines underground	P-13, 14, 16, 17, 18	PF- 13a, 13b, 13c, 14a, 14b or 15
Waste lines, Sanitary		P-1	PF-1 or PF-2 (IRE) if required by engineer
Waste lines, Acid	To nearest water dilution jet	P-13, 14, 16, 17, 18	PF- 13a, 13b, 13c,14a, 14b or 15

S. Flanges: Flanges shall be furnished and installed at each flanged connection of each type of equipment, tanks, and valves. Faces of flanges being connected shall be furnished alike. Connection of a raised face flange to a flat-faced flange is not permitted. Flanges shall conform to following schedules:

TYPE OF PIPE	FLANGE
Screwed black or galvanized grooved steel pipelines.	125 pound black cast iron screwed flange, flat faced or grooved flange adapters, Victaulic Style 741, Tyco-Grinnell Fig. 71, Gruvlok Fig. 7401, or equal.
Welded or grooved steel pipe, except high pressure steam lines.	150 pound black forged steel welding flanges, 1/16 inch raised face ASTM A 105, Grade II or grooved flange adapters, Victaulic Style 741, Tyco-Grinnell Fig. 71, Gruvlok Fig. 7401, or equal.
Copper and brass pipe or tubing.	150 pound cast bronze, flat-faced flange with solder end or grooved flange adapters, Victaulic Style 641, Tyco-Grinnell Fig. 61, Gruvlok Fig. 6084, or equal.

1. Gasket material for flanged connections shall be full faced or ring type to suit facing on flanges and shall be furnished in accordance with following schedule

SERVICE	TYPE
Cold water	1/16 inch thick neoprene

Grooved end flange adapters supplied with pressure responsive elastomeric Gaskets supplied with grooved flange adapters shall be pre-lubricated by the manufacturer. Grade of gasket to suit intended service.

T. Unions:

1. Unions shall be furnished and installed in accordance with the following requirements (unless flanges are furnished):
   a. At each threaded or soldered connection to equipment and tanks, except in Freon or fuel gas, piping systems, whether indicated or not.
   b. Immediately downstream of any threaded connection to each manually operated threaded valve or cock, and each threaded check valve, yard box or access box except those in Freon piping systems, whether indicated or not.
   c. At each threaded connection to threaded automatic valves (except those in Freon piping systems) such as reducing valves and temperature control valves, whether indicated or not.
   d. If grooved piping is used, couplings shall serve as unions. Additional unions are not required
2. Unions shall be located so that piping can be easily disconnected for removal of equipment, tank, or valve.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions under which Work of this Section shall be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Provide all materials and equipment for the Work. Furnish and install necessary apparatus, parts, materials, and accessories.

B. Pipe Installation:

1. Install piping parallel to wall and provide an orderly grouping of proper materials and execution.

2. Piping shall clear obstructions, preserve headroom, provide openings and passageways clear, whether indicated or not. Verify the Work of other Divisions to avoid interference.

3. If obstructions or the Work of other Divisions prevent installation of piping or equipment as indicated by the Drawings, perform minor deviations as required by the Architect.

4. Install piping after excavation or cutting has been performed. Piping shall not be permanently enclosed, furred in, or covered before required inspection and testing is performed.

5. Exposed polished or enameled connections from fixtures or equipment shall be installed with no resulting tool marks or threads at fittings. Residue or exposed pipe compound shall be removed from exterior of pipe.

6. Piping shall be concealed in chases, partitions, walls, and between floors, unless otherwise directed or specifically noted on Drawings. When penetrating wood studs, joists, and other wood members, provide such members with reinforcement steel straps of Continental Steel & Tube Co., ULINE, Independent Metal Strap, or equal.

7. Reduce fitting where any change in pipe size occurs. Bushings shall not be furnished unless specifically reviewed by the Architect, or indicated on Drawings.

8. Piping subject to expansion or contraction shall be anchored in a manner, which permits strains to be evenly distributed. Swing joints or expansion loops shall be installed. Seismic restraints shall be installed so as not to interfere with expansion and contraction of piping. Seismic loops required at all building separations.

9. Immediately after lines have been installed, openings shall be capped or plugged to prevent entrance of foreign materials. Caps shall be left in place until removal is necessary for completion of installation.

10. Couplings shall not be installed except where required pipe runs between other fittings are longer than standard length of type of pipe being installed and except where their installation is specifically reviewed by the Architect.

11. Water piping shall be installed generally level, free of traps, unnecessary offset, arranged to conform to building requirements, clear of ducts, flues, conduits, and other Work. Piping shall be arranged with valves installed to provide for complete drainage and control of system. Piping shall not be installed which causes an objectionable noise from flow of water therein under normal conditions. Refer to Section 23 0500: Common Work Results for Plumbing.

12. Water lines may be installed in same trench with sewer lines, provided bottom of water line is 12 inches minimum above top and to the side of sewer line.

13. Changes in pipe sizes shall be furnished with eccentric reducers, flat on top. Offsets to clear obstruction shall not be installed so as to produce air pockets.

C. Pipe Sleeves and Plates:

1. Provide pipe sleeves of Schedule 40 black steel pipe or Schedule 40 PVC plastic pipe in concrete or masonry walls, footings, and concrete floors below grade. Provide adjustable submerged deck type sleeves at locations where pipes pass through concrete floors, except concrete slab floors on grade, and at locations where soil pipe for floor type water closets passes through concrete floors.

   FOR FIRE RATED WALL PENETRATIONS FOLLOW THE UNIFORM BUILDING CODE.

2. Sleeves shall provide ½ inch clearance around pipes, except plastic pipe shall have 1 inch clearance. Caps of deck type sleeves shall be removed just prior to installation of pipe. Area around sleeves shall be smooth and without high or low spots. Sleeves in walls shall not extend beyond exposed surface of wall. Sleeves in concrete floors and walls shall be securely fastened to forms to prevent movement while concrete is being placed.

3. Piping installed on a roof shall clear the roof surface by 10 inches minimum, with or without insulation. Bottom of individual fittings may infringe on 10 inches clear space but not groups of fittings or fittings located within 27 inches of each other.

4. Stiles shall be provided to facilitate crossing of piping when parallel piping runs are laterally greater than 12 inches out-to-out, or any pipe is higher than 18 inches, and more than 40 feet long or runs between two or more major pieces of equipment or housings greater than 20 feet apart. Stiles shall be not less than 20 inches wide with a minimum tread depth of 10 inches. Where stiles are required, they shall be located so greatest obstructed distance is 30 feet.

5. Where pipes pass through waterproofed walls, floors, or floors on grade, sealant with Link-Seal Modular Seals, or equal, between pipe and sleeve to provide a waterproof joint. Where earth is in contact with pipe on both sides of a wall or foundation, the waterproof joint is not required. Commercial rubber compression units may be furnished instead of sealed sleeves if reviewed by the Architect.

6. A swing joint, or other required device, shall be furnished and installed in hot water lines with 10 feet of sealant or compression joint to allow for expansion.

7. Provide polished, chrome-plated flanges when plumbing pipes pass through walls at plumbing fixtures, etcetera as specified in Section 22 4000 Plumbing. Provide polished steel, chromium-plated split floor and ceiling plates at locations where pipes pass through walls, floors, ceilings, and partitions in finished portion that neatly conceals pipe insert.

8. Pipe sleeves shall be provided where pipes intersect footings or foundation walls and sleeve clearances shall provide for footing settlement, but not less than one inch all around pipe.

D. Welding of Pipe and Qualifications of Welder:

1. Joints above grade or accessible conduit or tunnels in steel piping may be either welded or screwed unless specifically indicated otherwise on Drawings or specified. Joints in below grade steel piping, whether in insulation or not, shall not be welded, unless otherwise indicated.

2. Welded joints in pipe shall be continuous around pipe and shall comply with ASME B31: Code for Pressure Piping, unless otherwise specified.

3. Each pipe weld shall be stamped with welder's identification mark. Welding shall be performed by welders possessing a valid certificate of qualification for welding carbon steel welding pipe in horizontal position (2G) and horizontal fixed position (5G) in accordance with the requirements of Section IX of the ASME Boiler and Pressure Vessel Code, by an Owner-recognized, DSA approved testing laboratory.

4. Before any welder performs welding on the Work, furnish the INSPECTOR with a copy of welder's valid qualification papers and obtain verification. Welder qualification is not valid unless it has been issued while welder was performing work for current employer, and has performed type of work described by qualification in the preceding 3 months.

   REFERENCE: ASME BOILER AND PRESSURE VESSEL CODE, SECTION VIII, UW-29 TESTS OF WELDERS AND WELDING OPERATORS.

5. Welding performed under these Specifications is subject to special tests and inspections including rigid Ultra Sonic Testing (UT) and radiographic inspection at random, in accordance with Technique for Radiographic Examination of Welded Joints by an Owner recognized, DSA approved testing laboratory.

   ASME BOILER AND PRESSURE VESSEL CODE, SECTION VIII, UW-51 RADIOGRAPHIC EXAMINATION OF WELDED JOINTS.

E. Unacceptable Welds and Repairs to Welding:

1. Welds containing any of the following types of imperfections shall be deemed defective Work:

a. Cracks of any type.

b. Zones of incomplete (in excess of 1/32 inch) fusion or penetration.

c. Elongated slab inclusions longer than 1/4 inch.

d. Groups of slag inclusions in welds having an aggregate length greater than thickness of parent metal in a length 12 times the thickness of the parent metal.

e. Undercuts greater than 1/32 inch.

f. Overlaps, abrupt ridges or valleys.

2. When a defective weld is detected by examination as outlined above, two additional welds shall be radiographed at locations selected by the Project Inspector. If the two selected welds demonstrate compliant welding, then the two tested welds shall be deemed to be in compliance. Welding revealed by radiographs to be defective Work shall be removed, repaired, and tested by radiograph.

3. If either of the two selected welds demonstrates welding deemed to be defective Work, all welding in that portion of the Work shall be deemed defective Work and either: all welds shall be cutout, prepare new ends for welding and weld to comply with this Specification, or radiograph all welds, removing and repairing only such welding deemed to be defective Work.

4. Repair welding shall be performed in a manner in full compliance with ASME B31. The welded joints or repairs shall be spot examined with UT or radiographic tests in accordance with foregoing requirements.

   REFERENCE, ASME BOILER AND PRESSURE VESSEL CODE, SECTION VIII, UW-52.

5. Owner shall cause to be performed additional random UT and radiographic examinations of welds. Owner shall be responsible for the costs of any UT and radiographic examinations found to be in compliance with specified requirements.

6. Installer shall be responsible for the costs of UT and radiographic re-examinations of welds deemed defective Work and not in compliance with this Specification, and shall repair or replace said welds in accordance with specified requirements.

F. Welding Rods: Submit a written list of materials and proposed type of welding rods.

G. Backing Rings: Backing rings may be submitted for installation provided the Product Data is submitted with the material list.

H. Qualification Tests for Low-pressure Welding:

1. Tests shall be performed on 3-inch standard weight pipe ASTM A53, Grade A, and shall be welded by acetylene and electric arc. Each sample shall consist of 2 pieces, each 10 inches long, with 30-degree bevel at point weld.

2. Two 20-inch samples shall be performed in the 2G and two 20-inch samples in the 5G positions, with positions defined in Section IX, ASME Boiler and Pressure Vessel Code. Welds shall have the reinforcement ground or machined flush to the surface of the pipe before testing. Samples shall be tested as full section tensile.

3. Weld shall develop a load of 90 percent of 50,000 psi, i.e., 45,000 psi or shall develop a fracture in parent metal.

4. Each qualified welder shall carry an identification card listing welder's name, date of test, and type of welding tests passed; signed by the welder and the laboratory.

5. A valid certificate of qualification issued in compliance with requirements of the ASME Boiler Pressure Vessel Code Section IX shall qualify a welder for issuance of a certificate for low-pressure pipe welding.

I. Certificates of Qualification for Welding of Unfired Pressure Vessels:

1. Certificates of qualification shall be issued by a laboratory recognized by the Owner in compliance with the requirements of the ASME Boiler Pressure Vessel Code Section IX. Qualifications shall be for both acetylene and arc welding of Schedule 40 ASTM A53, Type B ,steel welded or seamless pipe in the Horizontal Position (2G) and the Horizontal Fixed Position (5G) as defined by said code.

2. Certificate described above is not valid unless it has been issued while welder was working for his current employer, and unless welder has performed type of work described by certificate in the preceding three months. Requirements for possession of a valid certificate shall not be waived for welders fabricating unfired pressure vessels when the Specifications require compliance with ASME code or when welding pipe carries working pressures greater than 75 psi and temperatures greater than 250 degrees F.

J. Pipe Joints and Connections:

1. Pipe and tubing shall be cut per IAPMO Installation Standards. Pipe shall have rough edges or burrs removed so that a smooth and unobstructed flow shall be provided.

2. Hot tapping of gas lines is strictly prohibited.

2. Threaded Pipe: Joints in piping shall be installed according to the following service schedule:

a. Soap Piping: Litharge and glycerine, or Expando, Gasoila, or equal.

b. Plastic Piping: Teflon pipe joint compound tape.

c. Oxygen Piping: Wash treads with S.P., rinse, blow-dry and apply litharge and glycerine.

d. Cleanout Plugs: No compound shall be used. After inspection and test, plugs shall be removed, cleaned, greased, and replaced.

b. Other services furnish sealant, suitable and as reviewed by the Architect.

3. Threads on pipe shall be cut with sharp, clean, unblemished dies and shall conform to ANSI/ASME B2.1 for tapered pipe threads.

4. Joint compounds shall be smoothly placed on male thread and not in fittings. Threaded joints shall be installed tight with tongs or wrenches and sealant of any kind is not permitted. Failed joints shall be replaced with new materials. Installation of thread cement or sealant to repair a leaking joint is not permitted.

5. Sharp-toothed Stillson, or similar wrenches, is not permitted for the installation of brass pipe or other piping with similar finished surfaces.

K. Copper Tubing and Brass Pipe with Threadless Fittings:

1. Silver brazed joints shall be used for attaching fittings to non-ferrous metallic refrigerant piping.

2. Non-pressure gravity fed condensate lines may be soldered with 95/5 solder.

3 Silver brazing alloy, Class BCUP-5. Surfaces to be joined shall be free of oil, grease, and oxides. Socket of fitting and end of pipe shall be thoroughly cleaned with emery cloth and wiped to remove oxides. After cleaning and before assembly or heating, flux shall be installed to each joint surface and spread evenly. Heat shall be applied in accordance with instructions in the Copper Tube Handbook issued by Copper Development Associates. Joints constructed of rough bronze fittings shall be provided as recommended by manufacturer.

4. Do not overheat piping and fittings when installing silver brazing.

5. Joints in non-ferrous piping for services not covered above shall be installed with solder composed of 95/5 tin/antimony, ASTM B32, Grade 5A. Surfaces to be jointed shall be free of oil, grease, and oxides. Sockets of fitting and end of pipe shall be cleaned with emery cloth to remove oxides. Solder flux shall be sparingly installed and solder added until joint is completely filled. Do not overheat. Excess solder, while plastic, shall be removed with a small brush in order to provide an uninterrupted fillet completely around joint. Random inspection of joints shall be conducted by Project Inspector to ensure joints are lead-free.

6. Grooved end joints for copper piping shall be assembled in accordance with the latest manufacturer recommendations. Pipe ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. Grooving tools shall be as manufactured by Victaulic, RIDGID, MAG Tool, or equal.

L. Ring-Type Pipe: Joints shall be installed in accordance with manufacturer's instructions with grooved couplings, fittings and rubber rings. Couplings and pipe shall be compatible and of the same manufacturer. Rings shall be accurately located and installed by grooves in coupling. Pipe shall be installed with zero deflection unless otherwise specified. Pressure pipe shall be furnished with thrust blocks at each offset point.

M. Welded Pipe Joints:

1. Joints in welded steel pipelines shall be installed by oxyacetylene or electric arc process. Welding shall be continuous around pipe and provided as specified.

2. Butt welds shall be of the single V-type, with ends of pipe and fittings beveled approximately 37 ½ degrees. Piping shall be aligned before welding is started with the alignment maintained during welding.

3. Welds for flanges and socket fittings shall be of the fillet type with a throat dimension not less than pipe wall thickness.

N. Grooved End Pipe Joints: Grooved end joints for carbon steel piping shall be assembled in accordance with the latest manufacturer recommendations. Pipe ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to grove for proper gasket sealing. Grooving tools shall be as manufactured by Victaulic, RIDGID, MAG Tool, or equal.

O. Joints shall be Vic-Press 304TM, or equal, made with Victaulic Series ‘PFT’ tools and the appropriate sized jaw. Pipe shall be certified for use with Vic-Press 304TM system, and shall be square cut, properly deburred and cleaned, and marked at the required location to insure full insertion into the fittings and/or couplings.

P. Polyethylene (Plastic) Pipe:

1. Joints shall be installed by the heat fusion method, in accordance with manufacturer's recommendations and IAPMO installation standard IS 12, for natural gas.

2. Pipe Riser at Meter, Regulator and Building Wall: Prefabricated, anodeless type, utilizing a grade level transition between underground polyethylene pipe and gas supply steel pipe of riser outlet, R. W. Lyall Co., or equal. Below grade to above grade transition shall be installed in a welded, epoxy coated, steel casing.

3. Connections to Existing Pipe Line or Branch:

a. Steel-to-plastic (PE): Provide manufacturer’s prefabricated standard transition fitting, transition from epoxy-coated steel pipe to plastic, R. W. Lyall Co., or equal.

b. Plastic-to-plastic, PVC to PE: Provide manufacturer’s prefabricated standard transition fitting, transition from PVC to epoxy-coated steel pipe to PE; R.W. Lyall Co., or equal..

c. Plastic-to-plastic, PE to PE: Provide manufacturer's standard fused tapping tee assembly with shut-off feature.

4. Provide PE reinforcing sleeves where PE pipe is fused to multi-saddles, service punch tee, reducing tees, transition fittings and anodeless risers.

Q. Valves: Valves shall conform to the following:

1. Piping systems shall be furnished with valves at points indicated on Drawings and specified, arranged to provide complete regulating control of piping system throughout building and the Project site.

2. Valves shall be installed in a neat grouping, so that parts are easily accessible and maintained.

3. Valves shall be full size of line in which they are installed, unless otherwise indicated on Drawings or otherwise specified, and shall be one of types specified.

4. Provide chain operators on valves 2-inch and larger located 7 feet or more above the servicing floor level.

5. Valves for similar service shall be of one manufacturer.

6. Except where otherwise specified, valves shall be Belimo, Victaulic, Stockham, Crane, Jenkins, Milwaukee, Hammond, American, NIBCO, Hoffman, or equal.

7. Ball valves below grade in yard boxes shall have stainless steel handles.

8. Hose bibs in dense garden areas shall be ¾ inch in size with one hose bib in the lunch pavilion 1 inch in size. Other hose bibs shall be ¾ inch lock shield type. Bibs shall be furnished with vacuum breaker protection.

9. Safety valves and pressure relief valves shall have stamp of approval as required by ASME and shall be provided with annual test lever. Where a hot water storage tank is heated by means of a coil, pressure relief valve shall have a steam BTU discharge rating of the coil. Discharge pipe from safety or pressure relief valves shall be not less than one pipe size larger than inlet pipe size of valve. Discharge pipe shall terminate as indicated and shall be free of traps. In addition to locations specified, pressure relief valves shall be installed in the following locations:

a. On discharge side of each pressure-reducing valve.

b. On each water heater connected to a hot water storage tank and other pressure vessels.

c. On cold water line to each water heater or hot water storage tank when there is a check valve, backflow prevention valve or similar device between water heater or hot water storage tank and meter or relief valve at the pressure reducing valve assembly.

d. On discharge side of each air compressor.

e. On each air receiver connected to an air compressor.

10. Temperature relief valves and combination temperature and pressure relief valves shall be as specified and furnished as set forth in this Section. Discharge pipe from relief valves shall be not less than discharge area of valve or valves it connects, based on discharge area of valves, and shall terminate as indicated and free of any traps. Valves shall be installed at following locations:

11. A combination temperature and pressure relief valve or combination of valves on each heating hot water storage tank. Temperature sending element shall extend into water inside tank.

12. Manual air vent valve assemblies shall be installed at each high point of hot water space heating and chilled water piping systems. Valves shall discharge through 1/4 inch diameter copper tubing and drain to nearest floor sink. Automatic type air vent valve shall only be installed where specifically indicated. Radiator, convectors, and finned pipe convectors shall be fitted with packless radiator valves, angle or straight pattern. Each convector or radiator installed as part of a space hot water heating system shall be furnished with a manual-type air vent valve.

R. Strainers: Strainers shall be installed on each water main (except for fire line) downstream of the meter, above grade, when a pressure regulator assembly is not installed. Main strainer shall be of Y-flange or groove type. On closed loop chilled and heating hot water systems pump systems, a strainer shall be installed at each pump inlet and upstream of each flow control valve assembly. The control valve assembly may include a modulating temperature control valve and a flow-limiting valve, manufactured by Griswold, AutoFlow, Flow Control Industries, Inc., or equal.

S. Hangers and Supports:

1. Piping shall be securely fastened to building structure by approved iron hangers, supports, guides, anchors, and sway braces to maintain pipe alignment to prevent sagging and to prevent noise or excessive strain on piping due to uncontrolled or seismic movement under operating conditions. Hangers and supports shall conform to Manufacturer's Standardization Society Specification SP-69. Hangers shall be relocated as required to correct unsatisfactory conditions that may become evident when system is placed into operation. Appliances, heat exchangers, storage tanks, and similar equipment shall be securely fastened to structure in accordance with seismic requirements. Outdoor metal hangers and supports shall be hot-dipped galvanized steel, unless otherwise specified.

2. Hose faucets, compressed air outlets, and similar items at ends of pipe branches shall be rigidly fastened to building construction near point of connection.

3. Piping shall not be supported by wire, rope, wood, plumbers' tape, or other non-recognized devices.

4. Hangers and supports shall be designed to support weight of pipe, fittings, weight of fluid and weight of pipe insulation, and shall have a minimum factor of safety of five, based on ultimate tensile strength of material installed.

5. Burning or welding of any structural member under load is not permitted. Field welding not specified on Drawings or reviewed Shop Drawings is not permitted without review by Architect and DSA.

6. Burning holes in beam flanges or other structural members is not permitted without review by the Architect and DSA.

7. Pipe hangers on piping covered with low temperature insulation shall be installed on outside of insulation and not in contact with pipe unless otherwise detailed on Drawings. Insulation shall be protected by 18 gage galvanized steel shield, with a minimum length of 10 inches, installed completely around pipe covering between covering and hanger. Installing hangers directly on pipe and butting adjoining sections of insulation against hanger is permitted provided void and hanger rod are properly insulated and sealed so that no sweating occurs at hangers.

8. Hanger rods shall be fastened to structural steel members with suitable beam clamps. Clamps shall be Tolco, Carpenter & Patterson, Fee and Mason, or equal, as follows:

    a. Tolco I beam, Fig.62 for maximum 1000 pounds.

    b. Tolco I or WF beam, Fig. 329, for maximum of 1290 pounds.

9. Hanger rods shall be fastened to concrete inserts in concrete slabs or beams. Inserts shall be Tolco, Carpenter & Patterson, Fee and Mason, or equal, as follows:

    a. Tolco Fig.310 for maximum of 600 pounds.

    b. Tolco Fig. 309 for maximum of 1140 pounds.

10. For fastening to wood ceilings, beams, or joists, furnish Grinnell Fig. 128R, Grinnell Fig. 153, Tolco 78, or equal pipe hanger flange fastened with drive screws. Under wood floors, 3/8 inch hanger rods shall be hung from 2-inch by 2-inch by 1/4 inch angle clips 3 inches long, with 2, staggered 10d nails, clinched over joist.

11. Hanger rod sizes for copper, iron, or steel pipe: 3/8 inch for pipe sizes ½ inch through 2-inch, ½ inch for pipe sizes 3-inch, 4-inch and 5-inch, 5/8 inch for pipe size 6-inch, and ¾ inch for 8-inch and 10-inch pipe.

12. Turnbuckles, if furnished, shall provide a load carrying capacity equal to that of the pipe hanger with which they are being installed.

13. Pipe hangers shall be of same size, or nearest larger manufactured size available, as pipe or tubing on which they are being installed.

14. Hangers, clamps, and guides furnished for support of non-metallic pipe shall be padded with 1/8 inch thick rubber, neoprene, or soft resilient cloth.

15. Where special pipe-supporting requirements in the Specifications conflict with any standard requirements specified herein, the Specification requirements shall govern.

16. Vertical Piping:

    a. Vertical pipe risers shall be securely supported with riser clamps of recognized type. Risers in reinforced concrete buildings shall be furnished with extension clamps fastened to pipe above each concrete floor slab with extended arms of clamp to rest on slab. Clamps shall be provided with lead or Teflon liners when installed on copper tubing. Clamps shall be plastic-coated when installed on non-ferrous pipe or tubing.

    b. Copper tubing in sizes 1 ½-inches and larger and steel pipelines passing up through building shall be supported at each floor of building or every 15 feet whichever is less.

    c. Copper tubing sizes 1 ¼-inches and smaller shall be supported at not intervals not more than 6 feet on center. Special provisions shall be installed for vertical lines subject to expansion and contraction caused by operating temperature differences.

    d. Vertical cast iron pipelines shall be supported from each floor and at its base. Malleable iron or steel pipe clamps with minimum thickness of 1/4 inch shall be furnished and fastened around pipe for support.

17. Horizontal Piping:

    a. Pressure piping on roofs shall be supported from stands, trapezes, or structures so that the bottoms of pipes clear the roof surface by 10 inches.

    b. Insulated steam and space heating hot water insulated condensate lines, insulated domestic hot water supply and return piping shall be supported with Tolco Figure 4, B-Line Figure B3140, Grinnell Figure 212, or equal, steel hangers with welded eye rods to permit hinge movement at point of attachment of hangers. Hinge movement at point of support shall be provided by welded eye linked rods Tolco Figure 101L, B-Line Figure B3211X, Grinnell Figure 278, or equal.

    c. Domestic cold water piping, water supply and return piping, condenser water piping, insulated refrigerant piping gas piping, compressed air piping, cast iron soil piping, galvanized steel vents, waste and downspout piping and glass to be supported with Tolco Figure 1, B-Line Figure B3100, Grinnell Figure 260, or equal, hangers with rods, turnbuckles and inserts suitable for above hangers.

    d. Maximum hanger and support spacing shall conform to CPC schedule for horizontal piping installed above grade.

18. A hanger or support shall be installed close to the point of change in direction of a pipe run, in either a horizontal or vertical plane.

19. When practicable, supports and hangers for cast iron soil pipe shall be installed as close as possible to joints and when hangers or supports are not located within one foot of a branch line fitting, an additional hanger or support shall be installed at fitting.

20. In systems where grooved piping is used, couplings shall be provided with angle pattern bolt pads to comply with support and hanging requirements of ANSI/ASME B31.1, ANSI/ASME B31.9, and NFPA Pamphlet 13.

T. Flashings:

1. Each pipe, duct, or gas-fired equipment vent passing through roof shall be installed with waterproof flashing.

2. Flashing or flanges on pipes, vents, and ducts passing through a tile or slate roof shall be constructed of sheet lead. Flashing for pipes and heater vents passing through a roof shall be 4 pound soft sheet lead. Flashing and flanges for ducts and heater vents passing through exterior walls shall be 22 gage sheet metal. Flanges and flashing shall be installed waterproof at point of connection with pipe or duct. No soldered joints on roof flashings will be allowed.

3. Lead flashing and flanges shall be constructed of 4 pound sheet lead with burned joints. Flange of lead flashing or lead flange on a duct shall extend out onto roof a minimum of 12 inches from pipe or duct. Lead flashing shall extend up the pipe or duct not less than 7 inches.

4. Sheet metal flashing shall be constructed of 24 gage galvanized sheet steel. Flanges on these flashings shall extend out onto roof a minimum of 10 inches from pipe or duct. Flanges on ducts through exterior walls shall extend out from duct a minimum of 2 ½ inches. Flanges on gas-fired equipment single-wall vents shall be of ventilated type. Type B gas vents through a roof shall be furnished with non-ventilated flashing as per NFPA Pamphlet 211.

5. Cast iron, steel, brass, and copper pipe, which terminates less than 18 inches above roof, shall be furnished with a combination counter-flashing and vandal-proof hood for protection against water, birds and foreign matter. Cast iron, steel, brass and copper pipe, which does not terminate within 18 inches of roof, shall be furnished with a counter-flashing sleeve. Pipe, which terminates more than 18 inches above roof, shall be furnished with protection against entrance of water, birds, and foreign matter.

6. Counter-flashing and combination counter-flashing sleeves and vandal-proof hoods shall be cast iron, vandal-proof, threaded, sealed or approved gas-heated sleeve type. Counter-flashing sleeves on each of these items shall extend down over flashing a minimum of ¾ inch.

7. Flashing and flanges on ducts shall be installed waterproof at point of connection to the duct by riveting and soldering. Storm collars shall be securely screwed and installed waterproof around appliance vent pipe immediately above flashing.

8. Vent piping above roof shall be furnished with a combination counter-flashing sleeve and vandal-proof hood.

U. Equipment Installation: Install roof or floor mounted equipment on level platforms, housekeeping pads or curbs and provide sound, vibration and seismic control measures per Section 23 0548 even if not indicated on Drawings.

END OF SECTION

SECTION 22 0553

PLUMBING IDENTIFICATION

PART 1 – GENERAL

1.01 SUMMARY

A. SECTION INCLUDES

1. Marking and identification on mechanical piping systems, ducts, controls, valves, and apparatus.

B. RELATED REQUIREMENTS

1. Division 01: General Requirements

2. Section 21 1313: Fire-Suppression Sprinkler Systems.

3. Section 22 0513: Basic Plumbing Materials and Methods.

4. Section 22 1000: Plumbing.

1.02 SUBMITTALS

A. Submit in accordance with Division 01 and Section 22 0500: Common Work Results for Plumbing.

B. Submit product data and installation instructions for each item specified.

C. Submit Samples of materials.

1.03 QUALITY ASSURANCE

A. Comply with provisions of:

1. Section 22 0500: Common Work Results for Plumbing.

2. ANSI/ASME A13.1: Scheme for the Identification of Piping Systems.

3. APWA: Uniform Color Code.

4. IAPMO: Uniform Plumbing Code (UPC)

PART 2 – PRODUCTS

2.01 MATERIALS

A. General: Piping systems, controls, valves, apparatus, etc., except those that are installed in inaccessible locations in partitions, walls, and floors, shall be permanently identified.

2.02 VALVES

A. Furnish prepared chart or diagram for each piping system, indicating by identifying letter or model number of each valve in the system, its location, and function.

B. Install charts in aluminum frame with clear glass front and secure on wall where designated by the Project Inspector.

C. Bind copies of each chart in operating instructions manual.

D. Provide each valve with a brass, aluminum, or plastic disc, not less than 1-1/4 inches diameter bearing engraved numbers corresponding to those indicated on chart. Fasten discs to valve with No. 14 brass wire.

E. Provide an additional tag for safety valves and other valves that could be hazardous to safety and health of occupants. Distinguish these tags from regular valve tags by color (such as yellow with black letters, and marked "Danger"); submit Sample tag to the Architect for review.

2.03 INSTRUMENTS AND CONTROLS

A. Identify panel-mounted instruments and controls with engraved bakelite nameplates permanently affixed to panel boards.

B. Identify alarm indicating devices and alarm reset devices by nameplates.

C. Identify automatic valves, flow switches, and pressure switches, with embossed aluminum or plastic tape affixed to controller, indicating service and setting.

2.04 EQUIPMENT

A. Identify each major piece of equipment with engraved bakelite nameplates permanently affixed to the equipment, indicating the room numbers it services, Equipment identification designation shall be the same to its designation indicated on the “As-Built Drawings”. Room numbers in the nameplates shall correspond to the final room numbers.

2.05 ABOVE GRADE PIPE IDENTIFICATION

A. Identify pipes by means of colored labels with directional flow arrows and identification of the pipe content, in conformance to ANSI/ASME A13.1 or the UPC.

B. Materials: Precoiled acrylic plastic with clear polyester coating, all-temperature, self-adhering, as manufactured by Brady, Brimar Industries, Seton, Stranco, Inc., or equal.

C. Size:

Outside Diameter of Pipe or Insulation (in inches)	Length of Color Field (in inches)	Size of Letter (in inches)
¾ to 1 ¼	8	½
1 ½ to 2	8	¾
2 ½ to 6	12	1 ¼
8 to 10	24	2 ½
over 10	32	3 ½

D. Locations:

1. On accessible piping, whether insulated or not (including mechanical rooms, attic and ceiling spaces); except that labels shall be omitted from piping where contained material is obvious due to its connection to fixtures (such as faucets, water closets, etcetera.).

2. Near each valve and branch connection in such accessible piping.

3. At each pipe passage through wall or floor.

4. At not more than 20 feet spacing on straight pipe run between bands required in 2 and 3 above.

5. At each change in direction.

E. Application: Install on clean surfaces free of dust, grease, oil, or any material that will prevent proper adhesion. Replace non-adhering or curling labels with new labels.

F. Color Schedule:

Content of Pipe	Legend	Background Color	Lettering Color
Domestic cold water	Domestic. C.W.	Green	White
Non-potable cold water	Caution: Non-potable Water Do Not Drink (1)(2)	Purple	Black
Domestic hot-water 140ºF	Domestic H.W. 140ºF	Blue	Black
Sanitary waste	San waste	Green	White
Sanitary vent	San vent	Green	White
Storm drain or downspout	Storm drain	Green	White

Indirect drain	Ind drain	Green	White
Sump pump discharge	Pump discharge	Green	White
Fire sprinkler supply	Fire Sprinkler supply	Red	White
Fire sprinkler drain	Sprinkler drain	Red	White
Fuel oil	Diesel oil	Yellow	Black
Gas	Gas	Yellow	White
Reclaimed Water	Caution: Reclaimed Water Do Not Drink (1)(3)	Purple	Black

H. Notes on Schedule:

1. Note (1) indicates 2 ¼ inch by 1 inch yellow label with ½ inch letters reading UNSAFE WATER at one end of primary label.

   Note (2) words should read "CAUTION: NONPOTABLE WATER DO NOT DRINK." with international *do not drink* symbol.

2.06 UNDERGROUND PIPE

A. Detectable Marking Tape:

1. Provide and install detectable marking tape along buried piping. Tape shall be specifically manufactured for marking and locating underground utilities with electronic equipment. Tape shall be acid and alkali resistant, and manufactured with integral wires or foil backing, encased with protective cladding. Tape shall be a minimum of two inches in width.

2. Manufacturer: Reef Industries, Inc., Advantage Brands, Inc., Northtown Company, Mutual Industries, Inc., or equal.

3. Detectable marking tape shall be color-coded per APWA Color Code:

   a. Yellow: Oil and gas.

   b. Blue: Water, irrigation and slurry lines.

   c. Green: Sewer and drain lines.

B. Tracer Wire:

1. Solid copper wire type THWN, 12 AWG gauge, with heat and moisture resistant insulation.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Correct detrimental conditions prior to commencing the Work of this Section. Install markers and identification tags as specified with materials and installation procedures recommended by manufacturer.

B. Place tracer wire on top of non-metal utility lines allowing some slack. Do not wrap tracer wire around pipe. Fasten tracer wire in place at approximately 10 feet on centers with non-metal ties.

C. Install underground detectable pipe marking tape continuously buried 8 to 10 inches above the buried utility pipe. Wrap tape on pipe risers up to a height of 12 inches above grade.

3.02 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 22 0700

PLUMBING INSULATION

PART 1 – GENERAL

1.01 SUMMARY

A. SECTION INCLUDES

1. Insulation for plumbing piping.

B. RELATED REQUIREMENTS

1. Division 01: General Requirements.

2. Section 22 0500: Common Work Results for Plumbing.

3. Section 22 0513: Basic Plumbing Materials and Methods.

4. Section 22 0553: Plumbing Identification.

5. Section 22 1000: Plumbing.

1.02 REFERENCES

A. American Society for Testing and Materials International (ASTM):

1. ASTM C302 - Standard Test Method for Density and Dimensions of Preformed Pipe-Covering-Type Thermal Insulation.

2. ASTM C411 - Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

3. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

4. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.

5. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.

6. ASTM C1104 - Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.

7. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

8. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. Underwriters Laboratories, Inc.

1. UL 723 - Test for Surface Burning Characteristics of Building Materials.

C. National Fire Protection Association:

1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

D. California Code of Regulation Title 24.

1. California Green Building Standards Code.

1.03 SUBMITTALS

A. Submit in accordance with Division 01 and Section 22 0500: Common Work Results for Plumbing.

1. Complete material list of items to be furnished and installed under this Section.

2. Manufacturer's specifications and other data required demonstrating compliance with the specified requirements.

3. Shop Drawings, catalog cuts and manufacturer's data indicating insulation, jacketing, adhesives, and coating. Insulating materials shall be certified by manufacturer to comply with the California quality standards for insulating materials.

4. Display sample cutaway sections.

5. Manufacturer's recommended method of installation procedures, which will become part of this Section.

1.04 QUALITY ASSURANCE

A. Qualifications of Manufacturer and Installer, Materials, Fabrication, Execution, and Standard of Quality: Comply with provisions stated under Section 22 0500: Common Work Results for Plumbing and Section 22 0513: Basic Plumbing Materials and Methods.

B. Insulation Work shall be in accordance with the California Building Energy Efficiency Standards, CBC, and California Mechanical Code and the California Green Building Standards Code.

C. Test Ratings:

1. Comply with provisions stated under Section 22 0500 and 22 0513 with emphasis on ASTM E84, NFPA 255, or UL 723. ASTM C167, ASTM C302, UL label or

listing of satisfactory test results from the National Institute of Standards and Technology, or a satisfactory certified test report from an acceptable testing laboratory. Approval by the State Fire Marshal is required.

2. Furnish labels, legibly printed with the name of the manufacturer or listings indicate that fire hazard ratings do not exceed those specified for materials proposed for installation. Flame spread index of not more than 25 and smoke developed rating not exceeding 50.

3. Tests shall be performed on each item individually when insulation, vapor barrier covering, wrapping materials, or adhesives are installed separately at the Project site.

4. Test insulation, vapor barrier covering, wrapping materials and adhesives as an assembly when they are factory composite systems.

D. Regulatory Requirements: Insulation furnished and installed under this Section shall meet minimum legal requirements of the Building Energy Efficiency Standards adopted and incorporated in the California Energy Commission, Title 24, Part 2, Chapters 2 through 53 and the California Green Building Standards Code unless otherwise noted, for the piping,

E. Chemically based products such as sealers, primers, fillers, adhesives, etcetera must meet the California air quality regulations.

1.05 PRODUCT HANDLING

A. Protection, Replacement, Delivery and Storage: Comply with provisions stated under Sections 22 0500: Common Work Results for Plumbing and 22 0513: Basic Plumbing Materials and Methods.

PART 2 – PRODUCTS

2.01 MATERIALS

A. General:

1. Insulating material shall be fire resistant, non-corrosive, shall not break, settle, sag, pack or disintegrate under vibration, nor absorb more than 1 percent moisture by weight.

2. Insulating material shall be furnished with thickness indicated in Table 1, and shall furnish thermal resistance in the range of R-4.0 to 4.6 in accordance with inch at 75 degrees F. For any other value of R, insulation thickness shall be calculated accordingly and submitted for review.

3. Asbestos in any quantity in insulating material is not permitted.

4. Provide insulation materials, adhesives, coatings, sealants, fitting covers, and other accessories with a fire hazard rating not to exceed 25 for flame spread, 25 for fuel contributed and 50 for smoke developed, except for materials listed as follows:

   a. Nylon anchors for installing insulation to equipment.

   b. Treated wood blocks.

5. Flame-proofing treatments subject to moisture damage are not permitted.

TABLE 1 - MINIMUM PIPING INSULATION THICKNESS (1)

Insulation Thickness Required (in inches)

Piping System Type	Temp. Range (degrees F)	Runouts up to 2 (2)	1 and less	1.25 to 2	2.5 to 4	5 to 6	8 and larger
Service Water Heating Systems (recirculating, piping supply and return)							
Hot Water	Up to 180	0.5	1.0	1.0	1.5	1.5	1.5
Condensate Drain	½ inch minimum insulation thickness.	0.5	0.5	0.5	0.5	0.5	0.5
From A/C Equipment:	Insulate condensate drain lines within building, in room, inside walls and above ceilings.	0.5	0.5	0.5	0.5	0.5	0.5

NOTES: (1) For piping exposed to ambient temperatures, increase thickness by 0.5 inch.

(2) Runouts to individual terminal units, not exceeding 12 feet in length.

B. Lagging Adhesives: Shall be nonflammable and fire-resistant and shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. Insulation finished with canvas shall be provided with laps adhered in accordance to manufacturer's recommendation. A finish coat of same material shall be applied to entire outer surface of lagging cloth at coverage specified by manufacturer.

C. Canvas Jackets: Provide 6 ounce, in accordance with square foot minimum, 48 by 48 thread count canvas jacketing.

D. Insulation Jackets:

1. Exterior insulation exposed to weather shall be weatherproofed with Childers aluminum jacketing as basis of design, or Pabco, RPR, or equal. Jacketing shall be manufactured from 1100, 3105 or 5010 aluminum alloy with 3/16 inch corrugations. Smooth or embossed jackets may be permitted in special situations

to match an existing installation. Jacketing shall be furnished with an integrally bonded moisture barrier over entire surface in contact with insulation. A minimum thickness of 0.016 aluminum jacketing is to be provided on ducts and piping. A minimum thickness of 0.020 shall be provided on tanks, equipment, and heat exchangers.

2. Insulated elbows, of 90 degrees and 45 degrees, with a nominal iron pipe size of ½ inch to 8-inch shall be provided with Childers aluminum Ell-Jacs insulation covers as basis of design, or Pabco, RPR, or equal, manufactured from 1100 aluminum alloy of 0.024 inch thickness. Insulated elbows with a nominal pipe size of 10-inch to 18-inch shall be provided with Childers 4-piece aluminum Ell-Jacs as basis of design, or Pabco, RPR, or equal.

3. Tees, Flanges, and Valve Insulation in Conjunction with Aluminum Jacketing: Furnish Childers Aluminum Special Fabrications Insulation Covers as manufactured by Childers Products Company, Pabco, RPR, or equal.

E. Adhesives: Adhesives shall be water based, UL Classified, meet the requirements of NFPA 90A and NFPA 90B, have been tested according to relevant ASTM requirements, and be acceptable to the State Fire Marshal. Name, type and method of installation shall be submitted for review.

F. Valve and Fitting Cover: When installed in conjunction with PVC jacketing, furnish Zeston 25/50 rated polyvinyl chloride fitting covers as manufactured by Johns Manville, Knauf Insulation, Speedline, or equal.

2.02 DOMESTIC HOT WATER PIPING SYSTEM INSULATION

A. General: Insulate domestic hot water supply and return piping, including valves, strainers and fittings with insulation thickness as indicated on Table 1.

B. Materials:

1. Classes of Insulation:

a. Class A: Glass fiber molded pipe insulation suitable for service temperatures up to 850 degrees F. Pipe insulation shall be one piece, preformed, and provide a minimum R factor of 4.0 at 75 degrees F mean temperature. Insulation shall be faced with all-purpose fire retardant vapor barrier jacket. Pipe insulation shall be Johns Manville Micro-Lok, Knauf Redi-Klad 1000, Owens Corning FIBERGLAS Pipe Insulation SSL II-ASJ, or equal.

b. Class B: Flexible open-cell melamine (foam insulation) suitable for service temperature -150 degrees F to 400 degrees F. Thermal conductivity at 75 degrees F, K= 0.26. Pipe insulation, one-piece pre-formed, laminated to heavy non-reinforced PVC jacket, with locking track, factory installed to jacket, to snap insulation and jacket onto pipe. Similar to TechLite 079 Series as manufactured by Accessible Products Co., or equal. Installation shall comply with manufacturers recommendations.

c. Class C: Mineral fiber pipe insulation suitable for service temperatures up to 1200 degrees F. Pipe insulation shall be one-piece, preformed up to 3 inches thick, and provide a minimum R factor of 4.0 at 75 degrees F mean temperature. Insulation shall be faced with all-purpose fire-retardant vapor barrier jacket. Pipe insulation shall be 8 pounds in accordance with cubic foot density by Roxul Techton 1200, Fibrex COREPLUS 1200, Industrial Insulation Group, LLC (IIG) MinWool-1200, or equal.

2. Locations and Class of Insulation Required:

TABLE 2 – LOCATIONS AND CLASS OF INSULATION REQUIRED

LOCATION	CLASS OF INSULATION
Equipment Room	A, B or C
Other Locations	A, B or C

3. Fittings on indoor piping shall be covered with flush, hand-wrapped Class A, B, or C insulation, to match the adjoining pipe insulation and covered with polyvinyl chloride fitting covers: Zeston 2000 25/50 by Johns Manville, Knauf Insulation Proto PVC Fitting Cover, Speedline Polyco Smoke Safe, or equal.

4. Adhesive: Fibrous Adhesive to bond calcium silicate to itself and non-porous surfaces.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Except as specified herein, install material in accordance with recommendations of manufacturer. Do not install insulation materials until tests specified in other sections are completed. Remove foreign material such as rust, scale, or dirt. Surfaces shall be clean and dry. Maintain insulation clean and dry at all times.

B. On cold surfaces where a vapor barrier must be provided and maintained, insulation shall be installed with a continuous, unbroken moisture and vapor seal. Hangers, supports, anchors, or other projections that are fastened to cold surfaces shall be insulated and vapor sealed to prevent condensation.

C. Surface finishes shall be extended in such a manner as to protect raw edges, ends, and surfaces of insulation.

D. Pipe or duct insulation shall be continuous through walls, ceiling or floor openings, or sleeves; except where firestop or firesafing materials are required.

E. Metal shields shall be installed between hangers or supports and the piping insulation. Rigid insulation inserts shall be installed between the pipe and the insulation shields. Inserts shall be of equal thickness to adjacent insulation and shall be vapor sealed accordingly.

F. Insulation shall not be installed in the following locations unless otherwise noted:

1. On unions, flanged connections or valve handles.

2 Over edges of any manhole, clean-out hole, clean-out plug, and to restrict opening or identification of access.

3. Over any label or stamp indicating make, approval, rating, inspection, or similar data, unless provision is made for identification and access to label or stamp.

3.02 INSTALLATION OF DOMESTIC HOT WATER PIPING SYSTEM INSULATION

A. General: Domestic hot water, tempered water supply and return piping and condensate return piping, after having been tested, shall be cleaned and insulated.

B. Application: Insulate condensate return piping, domestic hot water supply and return, including tempered supply and return piping in accordance with manufacturer's instructions and as specified herein.

1. Install insulation on valve bodies up to valve bonnet. Fill void in saddles, in accordance with Section 22 0513: Basic Plumbing Materials and Methods, with insulation and seal joints.

2. Install insulating material to fittings, valves, and strainers and smooth to thickness of adjacent covering. Leave strainer clean-out plugs accessible. Covers fabricated from polyvinyl chloride shall be furnished.

C. Insulation Jackets in Exposed Indoor Locations:

1. Cover completed insulation with canvas jacket tightly pasted to covering with lagging adhesive. Lap jacket seams 1 1/2-inch minimum. Finish entire jacket with coating of undiluted adhesive.

2. Equivalent factory applied pre-sized, glass fiber reinforced, or glass fiber jackets may be furnished. Seal jacket seams with adhesive in accordance with manufacturer's instructions.

3. Johns Manville Zeston 2000, Knauf Insulation Proto PVC Fitting Cover, Speedline Polyco Smoke Safe, or equal, fitting covers may be furnished, with molded or segmented insulation equal to specified insulation applied to fittings. Secure covers in accordance with manufacturer's instructions.

4. In addition to above requirements, cover exposed insulated piping within a distance of 8 feet above floors with 26 gage galvanized steel jacket. Omit jacket in areas accessible only to maintenance personnel, such as mechanical equipment rooms, utility corridors, accessible pipe tunnels and manholes.

D. Concealed Indoor Locations: Cover insulation over fittings, valves, and strainers with canvas. Provide pipe insulation with factory or field applied standard jacket of 4 ounce minimum canvas, fiberglass cloth, or glass fiber reinforced jacket. Seal jacket laps with adhesive in accordance with manufacturer's instructions.

E. Exposed Outdoors: In addition to canvas or fiberglass cloth cover, pipe insulation exposed to weather shall be provided with an additional 0.016 inches thick aluminum jacket with 2-inch lap connected with one inch hem overlap joint located on side of pipe and turned down to shed water. Jacket shall be strapped 12 inches on center with ½-inch wide stainless steel strapping and wing seals. Aluminum jacket shall be mitered to fit fittings.

3.03 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.04 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

END OF SECTION

SECTION 22 1000

PLUMBING

PART 1 - GENERAL

1.01 SUMMARY

A. SECTION INCLUDES

1. Labor, materials, tools, and equipment to install plumbing systems as indicated.

B. RELATED SECTIONS

1. Division 01 - General Requirements.

2. Section 07 9200: Joint Sealants.

3. Section 10 4400: Fire Extinguishers, Cabinets and Accessories.

4. Section 22 0500: Common Work Results for Plumbing.

5. Section 22 0513: Basic Plumbing Materials and Methods.

6. Section 22 0553: Identification for Plumbing piping and Equipment.

7. Section 22 0700: Plumbing Insulation.

8. Section 23 8000: Heating, Ventilating and Air Conditioning Equipment.

9. Section 02 3150: Excavation, Backfill and Compacting.

10. Section 02 5300: Site Sanitary Sewer System.

1.02 SUBMITTALS

A. Provide in accordance with Division 01 and Section 22 0500: Common Work Results for Plumbing.

B. Provide necessary documentation to Owner for processing rebates for water efficient fixtures.

1.03 QUALITY ASSURANCE

A. Unless otherwise noted, the California Plumbing Code is hereby made part of this section.

B. Conform to provisions of Section 22 0500: Common Work Results for Plumbing.

C. Manufacturer of plumbing products must have ANSI/NSF Standard 61, Section 9 certification to demonstrate compliance with the federal requirements for lead contribution to drinking water, Safe Drinking Water Act SDWA and AB 1953.

1.04 PRODUCT HANDLING

A. Conform to provisions of Section 22 0513: Basic Plumbing Materials and Methods.

PART 2 - PRODUCTS

2.01 PIPING SYSTEMS

A. Materials: Refer to Section 22 0513: Basic Plumbing Materials and Methods.

B. Insulation for Piping: Refer to Section 22 0700: Plumbing Insulation.

2.02 FIXTURES AND DRAINS

A. General: Fixtures specified shall be furnished complete with trim and fittings. Cast iron plumbing fixtures shall be acid resistant enamel, and identified by casting letters "AR" or words "acid-resistant" into metal. Fixtures shall be white unless otherwise specified. Cast iron fixtures shall be white enamel inside and on back, rim and apron, with exposed unfinished surfaces painted white. Fixtures of same general classifications shall be of same make.

B. Finished Brass:

1. Unless otherwise specified, finished brass of a similar type shall be of same manufacturer and model throughout buildings.

2. Finished and exposed brass equipment, except floor, shower and urinal drains shall be chromium-plated and polished. Floor, shower and urinal drains, unless otherwise specified, shall be nickel-bronze metal.

C. Traps, Trap Arms and Tailpieces:

1. Fixture traps shall be all cast brass, chromium-plated and polished. **(No tubular traps).** Exceptions as follows:

a. Traps that are an integral part of a fixture.

b. Traps concealed in floors, walls and furring.

c. Traps standard for service sinks and Industrial Shop equipment.

d. Laboratory traps and tailpieces shall be as specified in section 22-0513.

2. Concealed traps and 17 gage tailpieces may be rough brass finish, except as otherwise specified. Laboratory traps and tailpieces shall be as specified in Section 22 0700: Basic Plumbing Materials and Methods. Furnish chromium-plated and polished cast brass wall flanges with setscrews and chromium-plated and polished brass casing on discharge side of each trap.

3. Tailpieces shall be not lighter than 17 gage, brass, chromium-plated, and polished. Furnish and install chromium brass plated wall flanges with set screws and chromium-plated 20 gage brass casing on discharge side of each chrome-plated all cast trap.

D. Faucet and Shower Valve Handles: Faucet and shower valve handles shall be solid brass, chromium-plated and polished, and fastened to their stems by Allen type hollow head stainless steel set screws through the side of the handle extending into the stem. Handles with sharp edges or projections shall not be furnished.

E. Fixture Supplies:

1. Supplies for water heaters shall be unplated rigid copper water tube with threaded adaptors for connections to valves and other threaded connections. All other supplies shall be chromium-plated brass with hospital threads or shall be furnished with fittings and valves, which completely cover threads.

2. Exposed supplies for showers shall be chromium-plated brass pipe up to header with hospital threads or shall be furnished with fittings and valves, which completely cover threads.

3. Supplies to water closet tanks, lavatories, and drinking fountains shall be furnished with chromium-plated and polished screwed type angle compression stops with square shank stems and lock shields extending beyond stem. Instead of solid supply piping, polished chrome-plated risers of 3/8 inch outside diameter with ferrule stop end and metal nosepiece may be furnished. The installation of braided stainless or easy hooker's supplies is not permitted. Exception: Supplies that rise vertically from floor shall be furnished with straight type instead of angle type stops.

4. Each supply or pipe that penetrates a finished surface and plumbing pipes passing through a countertop or part of a cabinet shall be furnished with a chromium-plated brass flange except flanges furnished by manufacturer of flush valves as an assembly.

5. Water supplies of plumbing fixtures shall be protected against back-siphonage in event of a vacuum in piping system.

6. Discharge outlets of supply faucets for lavatories and sinks shall clear top of overflow rim by at least one inch.

7. Toilet and urinal flush valves shall be furnished with recognized atmospheric vacuum breakers, installed a minimum of 6 inches above fixture.

2.03 ACCESS PLATES (To cleanouts, valves, water hammer arrestors and hose faucets)

A. Schedule Numbers:

AP-1: Square, unless otherwise noted, steel, prime coated; frame, 18 gage minimum. Door shall be 16 gage minimum with concealed hinge or be removable, with vandal-proof lock operated by Allen wrench. Provide for painted and stucco walls.

SMITH	ZURN	ELMDOR	MILKOR	WATTS	MIFAB	JOSAM
Fig 4760 AK	Z-1462-VP	DW-AKL	MOR DW AK1	CO-300-S-6	UA-A	58650-VP OR EQUAL

AP-2: Round type, stainless steel, vandal-proof, 5/16 inch No. 18 or 1/4 inch No. 20 flat-head machine screw into cleanout plug. Plate shall be prime coated minimum 18 gage steel or polished chrome-plated brass, 18-8 No. 302 stainless steel, or polished nickel bronze. Provide for painted walls, screwed into cleanout plug.

SMITH	ZURN	JOSAM	WADE	WATTS	MIFAB	OR EQUAL
4710U	Z-1469-VP	58600	8480R	CO-480-RD-6	C1400-RD-6	

AP-3: Square, polished face chrome-plated bronze, aluminum alloy or brass chrome-plated brass frame with 14 gage polished 18-8 No. 302 stainless steel or brass chrome-plated secured cover with vandal-proof screws. Provide for tile walls.

SMITH	ZURN	WADE	WATTS	MIFAB	JOSAM	OR EQUAL
4735U	Z-1460-VP	58630	CO-300-S-6	C1400-S-3-6	58640-VP	

AP-4: Square, floor type, cast nickel-bronze aluminum alloy or brass, with carborundum or scoriated, secured top. Provide for floor access to solid interceptor in Science Room, Ceramic Room, and Agriculture Room.

SMITH	ZURN	JOSAM	WATTS	MIFAB	OR EQUAL
4910U	Z-1461-VP	58630	CO-300-S-6	C1300-S-6	

2.04 BACKWATER SEWER VALVE ASSEMBLY

A. Schedule Numbers:

BSV-1: Cast iron with access cover with line size gate valve upstream and downstream.

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
7022-S	Z-1090	BV-200	BV-1000	67500	

2.05 CLEANOUT ASSEMBLIES

A. Cleanout plug shall be line size.

B. Schedule Numbers:

CO-1: Iron body cleanout tee full line size up to 4 inches and round access plate, plugs shall be brass, countersunk with tapped boss for 5/16 inch No. 18 or ¼ inch No. 20 screws. Provide for finished walls at base of waste stack, above urinal and service sink. AB&I and TYLER may be used as iron body cleanouts. Trim and accessories shall be Smith or Zurn or equal.

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
4532-U	Z-1446-BP	CO-460-RD-34B	C1460-RD-6	58600-CO	

CO-2: Iron body with approved UPC plug, top and adjustable sleeve, cut-off ferrule, polished scoriated brass nickel bronze secured cover. AB&I and TYLER may be used as iron body cleanouts. Trim and accessories shall be Smith or Zurn or equal Provide for finished floors inside buildings, in covered areas, and in concrete paving.

Square:

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
4053L-U-NB	ZN-1400-T	CO-200-S	C1220-S-1-6l	55000-1-SQ	

Round:

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
4033-L-U-NB	ZN-1400	CO-200-R	C1220-1-6	55000-1	

CO-3: Secured cover, extra heavy-duty, adjustable sleeve, cut-off ferule, UPC. Brass approved type plug, scoriated tractor type cover. Provide for areas outside building on concrete paving.)

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
4233-U	ZN-1400-HD	CO-200-RX-4	C1220-4-6	55000-22	

CO-4: Tapped soil tee with brass plug, full line size. Provide for above grade, outside building at base of exposed downspout.

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
4512	Z-1445-BP	CO-460-34A	C1460	58910	

CO-5: Raised threaded head brass plug. Provide for yard box YB-3.

ZURN	WAATS	SMITH	JOSAM	OR EQUAL
Z-1470-A	CO-590	4285	58540-20	

2.06 CIRCULATING PUMPS, HOT WATER HEATING SYSTEM

A. Schedule Numbers:

CPH-1: Centrifugal, single stage, close coupled with adjustable cast iron base, bronze enclosed impeller, lead-free mechanical shaft seal suitable for water temperature range from 20 degrees to 300 degrees F. Screwed or flanged connections. GPM and TDH capacities as indicated.

BELL & GOSSETT	WEIMAN	PACIFIC	TACO	OR EQUAL

2.07 DRINKING FOUNTAINS

A. Also see Electric Water Coolers, below.

B. Drinking Fountains shall be provided with brass free waterways and lead mitigating water filtering systems (DFWF).

C. Schedule Numbers:

DFWF-1: In-line head and Cartridge assembly, for single bubbler drinking fountains assembly with ANSI/NSF 61 section 9 and annex G approved 1/4 Turn Cartridge with 0.5 Micron sediment/Carbon prefilter. Filter is to be preceded by a 3800gal capacity in-line Water meter that can be set to 1500gal capacity after which the meter must interrupt and shut off water supply. Provide for Single Bubbler applications.

FILTER	MODEL	
CUNO	FM DWS 1500	OR EQUAL
METER	MODEL	
WATER MINDER	WM3000B	OR EQUAL

DFWF-2: In-line head and Cartridge assembly for multi-bubbler drinking fountains, with ANSI/NSF 61 section 9 and annex G approved 1/4 Turn Cartridge with 0.5 Micron sediment/Carbon prefilter. Filter is to be preceded by a 3800gal capacity in-line Water meter that can be set to 3000gal after which the meter must interrupt and shut off water supply and then be reset for additional 3000gal capacity for a total of 6000gal thereby the meter must again interrupt and shut off water supply. Provide for Multi- Bubbler applications.

FILTER	MODEL	
AQUA PURE	3MFF100	OR EQUAL
METER	MODEL	
WATER MINDER	WM3000B	OR EQUAL

DF-1: See plans.

2.08 DRUM TRAPS

A. Schedule Numbers:

DT-1: Extra heavy cast iron, bolted top.

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
8714	ZA1180	SI-742-X	MI-SOLID-S	61030	

DT-2: Aluminum solid interceptor, furnish for on-floor installation.

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
8710-AA	Z-1180	SI-742	MI-SOLID-S-AL	61030-26	

2.9 DIELECTRIC UNIONS

A. Schedule Numbers:

1. Dielectric style Unions using ferrous and no-ferrous metals are prohibited. Dielectric flanges are admitted for use – see DU-2.

DU-1: Brass union with 6-inch brass nipple.

DU-2: Brass union or Brass flanged fittings are to be used in between pipes made of dissimilar metals to prevent accelerated corrosion and deterioration in the piping systems due to galvanic and stray current.

WATTS	WILKINS	ZURN	OR EQUAL
3100-CXC,	DUX SERRIES	DUXL	

2.10 FAUCETS

A. Access compliant faucets: Force to activate controls shall be no greater than 5 pounds. Self closing metering, where specified, to remain open 10 seconds minimum when activated.

B. Schedule Numbers: See plans

2.11 FLOOR DRAINS

A. Schedule Numbers: See plans.

2.12 FLEXIBLE HOSES

A. Schedule Numbers:

FLH-1: Braided stainless steel metal hose (for gas use). US Flex, Metraflex, Nelson Dunn or equal.

FLH-2: Braided bronze metal hose (for non pressure condensate connection use). US Flex, Metraflex, Nelson Dunn or equal.

2.13 FLUSH VALVE ASSEMBLY

A. Schedule Numbers: See plans.

Valves shall be furnished so that flush will remain constant and not require any adjustment.

1. Each flush valve shall be provided with a loose key, square shank, lock shield angle service stop connected to flush valve with a union connection.

2. Provide l7 gage pressed brass escutcheons for wall and fixture. Escutcheons shall be fastened to not turn or rattle.

3. Each flush valve shall be furnished with a vacuum breaker providing one inch opening to atmosphere, which will not leak under any degree of back pressure and will not restrict rate of flow more than 10% at 10 pounds pressure and will operate noiselessly.

4. Tailpiece shall be not lighter than 17 gage, and shall be part of flush valve assembly.

5. Exposed metal parts of flush valve assembly shall be nickel or chromium-plated on a brass or copper base.

2.14 FLOOR SINKS

A. Schedule Numbers: See plans.

2.15 HOSE BIBBS

A. Schedule Numbers: See plans.

2.16 LAVATORIES

A. Access compliant faucets for Lavatories: Force to activate controls shall be no greater than 5 pounds. Self closing metering, when specified, to remain open 10 seconds minimum when activated.

B. Cast Iron Lavatories shall be acid resistant enamel, and shall conform to Commercial Standards CS 77.63. Unites furnished in conjunction with strainer installation or faucet installation shall be brass. Exposed brass nuts shall be chrome plated.

C. Exposed trim shall be free from sharp edges or points. Fixture shall be furnished with other listed manufacturer specified trim. Instead of solid supply pipe, polished chrome-plated risers, 3/8 inch outside diameter with ferrule stop end and metal nosepiece may be furnished.

D. Insulate cold water, hot water and drain lines under all access compliant lavatories with approved type insulation.

PLUMBEREX	LAV-GUARD	OR EQUAL

Schedule Numbers: See plans.

2.17 PIPE HANGERS

A. Refer to Section 22 0513: Basic Plumbing Materials and Methods.

B. Schedule Numbers:

1. PH-1: Complete with clamps, inserts, etcetera.

SUPERSTRUT	UNISTRUT	TOLCO	B-LINE	OR EQUAL

2.18 P-TRAPS

A. Schedule Numbers:

PT-1: Cast brass complete, chrome-plated.

ZURN	AB&A	KOHLER	OR EQUAL
Z-8712-LC	107	K-9018	

2.19 STOP VALVES

A. Stops shall be loose key type, ½-inches IPS inlet and outlet chrome-plated brass casting, except as noted.

B. Schedule Numbers:

STV-1: Angle:

CHICAGO,	CRANE	NIBCO	OR EQUAL
442-LKABCP	8.5113.	77	

STV-2: Partition:

CHICAGO	T& S BRASS	OR EQUAL
1771-ABCP	B-1028	

STV-3: Straight Type, with Loose Key:

CHICAGO	CRANE	T&S BRASS	OR EQUAL
45-LKABCP (1/2 inch)	8-5111	B-O418	

2.20 TRAP PRIMERS

A. Schedule Numbers: See plans.

2.21 URINALS

A. Schedule Numbers: See plans.

2.22 WATER CLOSETS

A. General: Water closets shall be vitreous china with Polyvinyl chloride bolt caps. Fixtures with auto-flush valves shall be provided with manual override button.

B. Schedule Numbers: See plans.

2.23 WATER TEMPERATURE CONTROLLERS

A. Schedule Numbers:

WTC-1: Remote bulb type, plain steel case, baked enamel finish, glass fronted cover, mercury to mercury switch. 80 degrees F. to 240 degrees F. range of not more than 10 degrees F. differential.

MERCOID	HONEYWELL	JOHNSON CONTROLS	OR EQUAL
DA-4-35	T675A1540	A19 SERIES	

WTC-2: Immersion type, black hard steel case, separate well type, outside adjustment, temperature range 40 degrees to 180 degrees F. range of not more than 10 degrees F. differential.

HONEYWELL	PENN	JOHNSON CONTROLS	OR EQUAL
T-6031D 1007	A19ABC-11	A19 SERIES	

2.24 WATER HAMMER ARRESTORS

WHA-1: Headers for Lavatories, Wash Sinks, Wash Fountains, Kitchen Sinks, Service Sinks, Urinals and Water Closets. For sizing purposes size according to manufacturer's recommendations.

SIOUX CHIEF	PPP	JR SMITH	WATTS	JOSAM	OR EQUAL
655 and 656 SERIES	SC SERIES	5005 TO 5050 SERIES	Series 05 and 150	75000	

2.25 YARD BOXES

A. Schedule Numbers:

YB-1 Yard Boxes: 14 ¾-inch by 20-inch by 12-inch, cast concrete, with cast iron traffic cover marked "GAS"

Provide for use over gas stops.

BROOKS 36-H MB with No. 36-T Cast iron Cover	EISEL 363.5	OR EQUAL

YB-2: Same as YB-1, marked "WATER" Provide for use over water valves.

BROOKS 36- H MB with No. 36-T Cast iron Cover	EISEL 363.5	OR EQUAL

YB-3: Same as YB-1, marked "SEWER"

BROOKS 36- H MB with No. 36-T Cast iron Cover	EISEL 363.5	OR EQUAL

2.26 FIXTURE CONNECTIONS

A. Branches to individual fixtures shall be of the following sizes unless larger sizes are indicated on Drawings:

	Copper,	Copper,	Trap and	Soil/	
Fixture	Cold	Hot	Connections	Waste	Vent
WC Flush Valve	1 inch	-----	4-inch	4-inch	2-inch
Lavatories	½ inch	½ inch	1 ½-inch by 1 ¼-inch	2-inch	1 ½-inch
Drinking Fountains:					
Multiple	3/8 inch	-----	1 ½-inch by 1 ½-inch	2-inch	1 ½-inch
Single	3/8 inch	-----	1 ½-inch	2-inch	1 ½-inch

Fixture	Water Supply	Soil/ Horizontal	Vent
Urinals, Wall-Hung Flush Valve			
Standard	¾ inch	2-inch	1 ½-inch
Access Compliant Use	1 inch	2-inch	1 ½-inch
Sill cocks	¾ inch minimum	-----	-----

B. Water headers serving water closets shall be copper water tube, with following size throughout length:

1. 1-1/2 inches for 2 flush valves.

2. 2 inches for 3 to 9 flush valves.

C. Water headers serving urinals shall be of following size throughout length:

1. 1" for 1 or 2 flush valves.

2. 1-1/4" for 3 flush valves.

3. 1-1/2" for 4 to 8 flush valves.

D. Water headers serving showers shall be same as listed above for urinals.

E. Water headers serving lavatories shall be of following size throughout length:

1. 1/2 inch for 2 lavatories.

2. 3/4 inch for 3 and 4 lavatories.

3. One inch for 5 and 6 lavatories.

2.27 HEIGHT OF FIXTURES

A. Heights for standard fixtures.

Fixture	Adult and High School	Middle	Elem.	Kindergarten and Younger
Water Closets	15-inch	15-inch	15-inch	10-inch
Lavatories	32-inch	32-inch	30-inch	25-inch
Drinking Fountains	42-inch	40-inch	32-inch	30-inch
Urinals, lip height	24-inch	21-inch	18-inch	N/A

B. Heights for access compliant fixtures.

Fixture	dult	Elementary	Kindergarten and Younger
Toilets, center line from wall	18-inch	15-inch	12-inch
Toilets, height to top of seat	17 to 19 - inches	15-inch	10-inch-12-inch
Lavatories, sink top height	34-inch maximum	29-inch maximum	24-inch maximum
Lavatories, sink knee clearance	27-inch minimum	24-inch minimum	19-inch minimum
Urinals, lip height	17-inch maximum	15-inch maximum	N/A
Urinals, flush handle height	N/A	N/A	N/A

Drinking fountains, bubbler height.	36-inch maximum	32-inch maximum	30-inch maximum
Drinking fountains, knee clearance	27-inch minimum	24-inch minimum	22-inch minimum

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions under which Work of this section will be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General:

1. Unless otherwise specified, plumbing fixtures, equipment and appliances that require connections to plumbing line shall be connected. This shall include fixtures specified or indicated as furnished by others, furnished by Owner, or specified in other related sections. Install supplies, stops, valves, traps, wall flanges, or pipe casing for connection of this equipment.

2. Install equipment as indicated on reviewed and accepted Shop Drawings.

3. Avoid interference with Work of other trades. Do not deviate from Drawings without review of the Architect.

B. Examination: Check each piece of equipment in system for defects verifying that parts are properly furnished and installed.

C. For piping Work, refer to Section 22 0513: Basic Plumbing Materials and Methods.

D. Plumbing Fixture and Equipment Installation:

1. Unless otherwise indicated, fixtures shall be installed with 5/16 inch brass bolts or screws of sufficient length to securely fasten fixture to backing, wall, or closet ring.

2. Fixtures installed against concrete or masonry walls shall have their hangers fastened with 5/16 inch brass bolts, Philip Shield type anchors, or 2 unit cinch anchors. Wood or plastic plugs are not permitted.

3. Fixtures installed against wood or metal stud walls shall have their hangers fastened to metal backing plates with 5/16 inch brass bolts screwed into plate. Fixture hangers for urinals shall be fastened centered vertically on metal backing plate with three 5/16 brass bolts each for small individual hangers and six, for larger one piece hangers. Lavatories shall be hung with not less than four 5/16

inch brass bolts or not less than five 1/4 inch brass bolts. Each sink hanger shall be hung with not less than four 5/16 inch brass bolt or not less than five 1/4 inch brass bolts.

4. Pan type drinking fountains shall be hung with 5/16 inch cadmium plated bolts with a bolt in each bolt opening in hanger. Hangers for pan type drinking fountains shall provide 2 inches (plus or minus 1/4 inch) between pan and wall. Spaces due to irregularities between fixtures and tile walls shall be neatly filled with white cement or silicone filler.

5. Backing for hanging of plumbing fixtures and equipment shall be installed in supporting wall at time rough piping is installed. Backing for stud walls shall be steel plate 1/4 inch thick, not less than 4 inches wide. Backing for urinals shall be ¼-inches thick by 6-inch wide steel plate. Steel plate shall be attached to stud at each end of plate and to each stud it crosses. Plate shall be attached to metal studs by bolting with two ¼ inch U-bolts per stud with bolts through plate and around stud flange or by welding with a 1/8 inch fillet weld full width of stud flange, top and bottom of plate. At wood studs, plate shall be carefully recessed flush with face of stud and attached to each stud with 2 No. 14 flat-head wood screws, 2 inches in length into pre-drilled 1/8 inch holes. Backing for stud walls supporting wall-hung closets shall be as detailed.

6. Rough-in for fixtures, equipment and appliances shall be as indicated on Drawings and as specified, including those items indicated as furnished by others, furnished by Owner, or future capacity. When connections to equipment from capped or plugged lines are required, caps or plugs shall be removed at time equipment is set and stops or valves installed and connections provided as specified.

7. Piping materials for trap arms shall be Brass, Cast Iron or DWV copper

8. Piping shall be stubbed out to exact location of fixtures and stubs shall be installed symmetrical with fixtures. Hot and cold water supplies for center set faucets on lavatories shall be installed on 8-inch centers, unless otherwise specified or required.

9. Kitchen equipment requiring backflow protection with hot and cold water connections shall be installed with approved backflow prevention assemblies; BPV-3 and drain into floor sink with air gap.

E. Cleanouts in Drain, Waste, Vent and Sewer Lines:

1. Cleanouts shall be installed at locations stated in the California Plumbing Code and accessible at following locations:

   a. At locations above first floor as stated on construction documents and 5 feet outside of the building.

b Install an accessible main line upper terminal cleanout in all restrooms above water closet over flow. (Install above upper terminal water closet where there are more than one water closet in a restroom).

c. Above faucets of each sink with brass plug.

d Above service sink with brass plug.

e. At each Drinking Fountain with brass plug.

f. At each urinal and locate above urinal with brass plug.

g. Above overflow level of pot sinks with brass plug.

h. In vertical line at base of each downspout connected to an underground storm drain system extend cleanout to exterior of building.

i. At upper end of a horizontal vent line when any part of horizontal line is below overflow level of fixture it serves.

j. Not to exceed 100-foot intervals in sewer and waste lines exterior of building.

k. At property line connection.

l. Where indicated on Drawings.

2. Cleanouts shall be extended to grade as follows:

a. Not to exceed 100-foot intervals in straight runs of pipe outside buildings.

b. At horizontal changes of direction in aggregate greater than 135 degrees (underground).

c. At property lines.

d. Where cleanouts occur under concrete.

e. Where marked for future connections.

3. Cleanouts in building shall be extended to floor level or above floor level or above floor level in walls or furring when cleanouts are not accessible or where clearance is less than 18 inches.

4. Cleanouts in finished areas in building shall be concealed except that cleanouts above service sinks in janitor's rooms or closet, and cleanouts above service sinks or in exposed piping in boiler or heater equipment rooms, may be exposed. Cleanouts for urinals shall be installed above urinal and shall terminate behind an access plate.

5. Cleanouts in floors of covered areas and those extended to grade in concrete areas shall be floor level type with extensions body brass plugs and detachable nickel-bronze or aluminum alloy scoriated.

6. Concealed cleanouts in vertical lines shall be service weight soil cleanout tees with brass plugs and round cover plates unless otherwise specified or indicated. A snug fitting sleeve of galvanized sheet metal shall be placed around hub of tee and shall extend to flush with finished soil, or cleanout shall be extended to finished wall.

7. Cleanouts extended from below floor to a wall or furring or on horizontal lines above floor that terminate at a wall or furring shall be iron body type with brass plugs and round cover plates.

8. Cover plates over cleanouts in painted walls shall be steel, bonderized and prime coated. Cover plates cover cleanouts in tile walls shall be chromium-plated brass or nickel bronze. Plates shall be attached to cleanout plugs with 5/16 inch No. 18 or 1/4 inch No. 20 stainless steel vandal-proof type screws. Plates shall be one inch larger in diameter than fitting opening.

9. Cleanouts at bases of downspouts shall be tapped soil tees with brass plugs as hereinafter specified, full size of line.

10. Cleanouts extended to grade in exterior sewer lines other than floors or concrete areas shall be a cleanout assembly with secured top, extra heavy-duty, adjustable sleeve, cut-off ferrule, countersunk threaded brass plug and scoriated tractor type cover.

11. Other cleanouts shall be iron body type.

12. Cleanout extensions shall be no-hub cast iron soil pipe. Exterior cleanouts, those in concrete excepted, shall terminate in a 14-inch by 6-inch thick concrete block with cleanout assembly and top of block flush with finish grade.

13. Fittings in lines utilized as cleanouts shall be approved soil fittings including no-hub pipe. Tees and crosses in vent headers excepted.

14. Pipe joint compound shall not be installed on cleanout plug. After lines are tested and approved, each cleanout plug shall be removed, greased, and replaced.

3.03 EXCAVATION, TRENCHING AND BACKFILLING

A. Perform trenching, excavation, and backfilling required for Work of this section as specified herein and in Section 31 2323: Excavating, Backfilling, and Compacting for Utilities.

3.04 SERVICE CONNECTIONS

A. Determine exact location of required water, drain, and sewer connections and provide proper connections.

B. Potable water lines shall be purged completely before connecting to sources of water for the Project. Determine quality of water supply before connection.

3.05 WATER HAMMER ARRESTORS

A. Install water hammer arrestors indicated on Drawings and in following locations (only non-ferrous arrestors may be installed in copper water system):

1. Water lines to lavatory headers, water closet and urinal headers, service sinks, kitchen sinks, wash fountains, drinking fountains, laboratories with medical type faucets and on wash sinks having three or more stations and all other quick closing fixture such as clothes washers, as close to fixture as possible.

2. Between last two fixtures when three or more fixtures, other than those listed in Number 1 above, are served by a common header.

B. When possible, arrestor shall be installed in wall or furring. When arrestor is installed in wall or furring, furnish an access plate large enough to permit removal of arrestor. Access plate shall be a minimum of 2 inches larger in each direction than the arrestor.

C. Fixture water lines shall be provided with mechanical water arrestor hammer dampening devices. Air chambers are not approved.

3.06 CONDENSATE DRAINS - FROM AIR CONDITIONING UNITS

A. Connect drain piping from drain pan of air conditioning unit to condensate disposal location indicated. When coil or unit housing is shock or vibration isolated, connection shall be furnished through a flexible connector not less than 10 inches long. Drain line shall pitch to flow out at not less than one inch in 8 feet. Drain line size shall be per UPC (3/4 inch up to 3 ton only). Drain line shall not be reduced smaller than unit outlet connection.

B. Condensate drain piping installed within building whether in air conditioned space or not shall be insulated. Refer to Section 22 0700: Plumbing Insulation, for type of material required.

C. Condensate Trap:

1. A condensate trap shall be installed for each air conditioning coil. Trap shall be assembled from 2 brass unions: one between A/C unit and inlet of trap, and one at outlet of trap that connects to main drain.

2. Trap configuration shall be per manufacturer's recommendations based on total unit casting static pressure (simulated plugged filter condition), but not less than 3 inch water seal.

3. Running trap design is not permitted.

4. Secondary drain shall not be trapped.

D. Condensate trap shall be checked at equipment operational tests for proper water drainage flow from air conditioning unit. Cooling condensate pan shall be filled with water, filters covered with plastic (plugged filter simulated), unit panels replaced, and unit motor running at design condition. Pan shall drain without hesitation to bottom of inlet connection. Tests are made prior to installation of ceiling.

E. Secondary Overflow Drain:

1. Drain pan installed underneath air conditioning units in concealed ceiling space or units that incorporate dam fitting shall be furnished with secondary drain piped to outside planter area with outflow location clearly visible.

2 If outside building location is not available or feasible, secondary drains shall be piped to a classroom sink, if sink is not available pipe to a room corner away from cabinets, computers, desks, door ways/entrances or stairs.

3 Secondary vertical pipe that penetrates through suspended ceiling shall be furnished with a coupling or threaded adapter so ceiling tile can be removed without damage.

3.07 CONDENSATE DRAINS - FROM WINDOW TYPE HEAT PUMP AND EXTERIOR WALL MOUNT HEAT PUMP UNITS

A. Whether indicated on Drawings or not, window units and wall mount units without built in bottom drain pan for evaporator and condenser coils shall be provided with galvanized steel condensate pan at bottom of unit with drain line that drains into drywell. Install copper 1/2 inch diameter pipe for window type air conditioners and 3/4 inch diameter pipe for exterior wall-mounted heat pump units.

3.08 MAKE-UP WATER SYSTEMS

A. Provide and connect make-up water systems for equipment in other sections.

3.09 CLEANING - PLUMBING PIPING SYSTEMS AND FIXTURES

A. Plumbing lines and fixtures shall be flushed to remove dirt and foreign material until water runs clear and no foreign substance or odor is present. Strainers and screens on faucets shall be removed during this cleaning operation.

B. After satisfactory cleaning of strainer and screen replacements has been witnessed by the Project Inspector, post and maintain signs stating: "CAUTION - Water at this construction project has not yet been certified for human consumption." Signs shall be furnished with letters at least 1/2 inch in height, and shall be conspicuously posted at entrances to the

Project site. Signs shall be paneled, black and yellow, in conformance with OSHA Section 1910.1455.

3.10 DISINFECTING DOMESTIC WATER PIPING SYSTEMS

A. Newly installed or replaced piping and/or fixtures dispensing potable water shall be disinfected and undergo an approved bacteriological analyses before water system is allowed for public use.

B. Work shall be performed by Technicians Certified by the American Water Works Association (AWWA) and/or the State of California Department Health Services, Grade II Water Treatment Operator Certification or higher issued by the Department of Health Services (DHS) for the State of California. Comply with Title 22, Code of Regulations Division 4, Chapter 13, and Article 2 Operator Certification Grades.

C. Method:

1. A Reduced Pressure Backflow assembly shall be in installed to protect from cross contamination of the local water purveyor's meter service supply when at any time there is any type of water connection with the piping to be disinfected (Chlorinated) and the water meter service supply.

2. System is to be flushed to remove any materials that may have entered the system.

3. Using a chemical feed metering pump and a chlorine tank, the chlorine solution is injected into the water system.

D. Disinfection and De-chlorination procedure (24 or 3 Hour Contact Time):

1. 24-hour Test Method:

a. Prior to disinfection, post signs on all water outlets of the system to be disinfected. Sign or tags shall read, "Water System Being Chlorinated- "Danger Do Not Drink Water" or similar warning.

b. Piping system shall then be adequately flushed with water to remove any particles and eliminate air pockets.

c. Using the continuous feed method, sodium hypochlorite conforming to ANSI/ AWWA B300 will be injected into the water system at a minimum of 50 PPM. A water flow meter provided by the water treatment technician will be used to determine the rate of injection and a chlorine test kit, Hach or equivalent, will be used to monitor the residual.

d. Chlorine residual test will be taken at all appropriate points and outlets to verify 50 PPM residual levels.

e. The chlorinated system shall be shut down for any use and the chlorinated water shall remain in the water system for retention of 24 hours.

f. After 24 hours, chlorine residual levels will again be tested at various points throughout the system to insure a minimum of 25 PPM residual. If the system has not met the minimum of a 25 PPM residual, the above disinfection process shall be repeated.

g. After satisfactory completion of the residual testing, flush out system until Hach or equivalent test reveal the water outlets have a free chlorine residual concentration less than 0.5 PPM. The procedure shall be in accordance with the AWWA standard C651-05.

h. The OAR may allow temporary use of the water system for construction purposes pending results of the bacteriological test analysis. Sign or Tags shall be left on all outlets stating water system is not safe for consumption until laboratory results are complete and meet these specifications.

2. 3 Hour Test Method:

a. If the water systems must be turned on for use as soon as possible, a 3 hours chlorine contact time to allow for disinfection is permitted with the OAR's approval.

b. Prior to disinfection, post signs on all water outlets of the system to be disinfected. Sign or tags shall read, "Water System Being Chlorinated- "Danger Do Not Drink Water" or similar warning.

c. Piping system shall be then adequately flushed with water to remove any particles and eliminate air pockets. Using the continuous feed method, sodium hypochlorite conforming to ANSI/ AWWA B300 will be injected into the water system at a minimum of 200 PPM. A water flow meter provided by the water treatment technician will be used to determine the rate of injection and a chlorine test kit, Hach or equivalent, will be used to monitor the residual.

d. Chlorine residual test will be taken at all appropriate points and outlets to verify 200 PPM levels. The chlorinated system shall be shut down for any use and the chlorinated water shall remain in the water system for retention of 3 hours.

e. After satisfactory completion of a 3 hour disinfection period, flush out system until Hach or equivalent test reveal the water outlets have a free chlorine residual concentration less than 0.5 PPM. The procedure shall be in accordance with the AWWA standard C651-05.

f. The OAR may allow temporary use of the water system for construction purposes pending results of the bacteriological test analysis. Sign or Tags shall be left on all outlets stating water system is not safe for consumption until laboratory results are complete and meet these specifications.

E. Bacteriological Test:

1. After final flushing and satisfactory results from the residual free chlorine concentration test, Bacteriological test samples shall be collected. The intent of the following is to provide insurance for an accurate representation to a complete Bacteriological test of the water system. At least two samples shall be taken from each floor of each building.

2. Bacteriological test samples shall be delivered to a State of California Department of Health Services Certified Laboratory to perform qualitative and quantitative bacterial analyses on the water samples for the presence of any Total Coliform bacteria and Plate Count. This count must be less than 500 cfu/mL.

3. The procedure shall be repeated if it shown by bacteriological examination made by an approved agency that the level of Disinfection does not meet these specifications.

4. After satisfactory results for the bacteriological test are provided to the OAR, warning sign or tags shall be removed.

3.11 VALVES ON PLUMBING SYSTEM

A. Furnish and install gates, ball, globes, angles, and check valves on plumbing Work at following locations whether indicated on drawings or not.

B. Hot and cold valves shall be:

1. Lead free complying with AB1953.

2. Above the ground copper water system, 2-inch and larger, may utilize Victaulic butterfly valves and fittings for their connections. A 2-inch or larger Victaulic valve may be in a wall if an adequately sized access panel is provided for maintenance or removal.

C. Valves shall be accessible and installed within an access panel approximately 3 feet above floor and no more than 7 feet above floor, or in a marked yard box to prevent tampering.

1. Immediately after each water meter, in addition to any valve furnished by utility company, there shall be an accessible valve on the inlet side for a strainer assembly, dual backflow device assembly and/or possibly a dual pressure reducing valve assembly.

2. A gate or ball valve on each water supply before it enters building. Valves shall be accessible from outside building and shall be installed in a marked yard box, unless otherwise indicated on drawings. Ball valves 2 ½-inch size or larger shall omit gate valve handle and furnish 2-inch square operating nut.

3. At multi story buildings, provide an isolation-valve or multiple valves for both hot and cold water in access panel to isolate and control each floor level.

4. For classrooms, shops, offices and boiler or mechanical room, install a gate or ball valve to control hot and cold water lines to each group of fixtures, a group of fixtures shall be considered to be 2 or more fixtures in the same room. When practical, valves shall be installed on the same wall as group of fixtures. Valves shall control only fixtures in rooms in which they are installed.

5. For restrooms, a gate or ball valve shall be installed in each restroom to isolate the hot and cold water supply into a restroom regardless of the number of fixtures. These valves shall control and be accessible only from within the restroom in which fixtures are installed. Valves shall be installed on the same wall as the group of fixtures it serves. Valves shall control only fixtures in restroom in which they are installed. Back to back restrooms shall be isolated separately and individually.

6. Install a gate or ball valve on each building branch line, which serves two or more fixtures, when these fixtures are not provided with a group isolation valve as specified above. These valves shall be located approximately 3 feet but not more than 7 feet above finish floor.

7. Install a gate, ball valve or partition stop for a drinking fountain or a group of drinking fountains.

8. Install a gate, ball valve or partition stop for hot and cold water supply to plumbing fixtures with no accessible supply stops, such as wall mounted faucets.

9. Install a gate, ball valve or partition stop for stops adjacent to, and controlling water flow to each sill cock and hose bib except as follows:

    a. A sill cock immediately below an exterior drinking fountain may be controlled by the same gate, ball valve or partition stop as drinking fountain.

    b. Valves or stops will not be required for individual hose bibs when these hose bibs are on a branch line serving only hose bibs and branch line is furnished with a shut-off valve.

10. Install a lose key angle stop, on each exposed fixture supply, and for each flush valve unless otherwise specified,

11. Install gate or ball valve at each location where a water line is connected to a piece of equipment other than items mentioned above.

12. Install a check valve on each hot water return line where it connects to a hot water storage tank or a water heater.

13. Handles, hand wheels (including dishwasher fill valve handles) and operating nuts shall be furnished of steel, brass, or cast iron and shall be removable. Unless specified to be loose key type, handles shall be securely fastened to their stems. On exposed outdoor valves, omit operating handles and provide operating nuts.

14. Provide a handle or a key for each five, or fraction thereof, loose key valves, bibs, or stops and deliver them to the project OAR.

3.12 ELECTROLYSIS PREVENTION

A. Brass nipples, 6 inches, with recognized brass unions; flanges shall be furnished and installed at locations described herein. Flanges shall be installed with complete insulating component consisting of gasket bolt sleeves and bolt washers. Dielectric insulators shall be installed at following locations:

1. Where special applications indicated on Drawings require an insulation flange or brass union, with 6-inch brass nipple to be installed in a condensate line, or steam line, flange insulation shall be of a high temperature type, suitable for continuous operation at temperatures up to 220 degrees F. for condensate and 400 degrees F. for steam.

2. Where steel or cast iron in ground connects to copper or brass piping above ground, transition from steel or cast iron pipe to copper or brass pipe shall be provided in an accessible location.

3. Underground dielectric connections shall be furnished in accessible yard boxes.

4. Above ground dielectric connections shall be exposed; or if in finished rooms shall be located in accessible access boxes.

3.13 UNDERGROUND PIPE MARKERS

A. Pipe markers shall be furnished according to Section 22 0553: “Plumbing Identification”

B. Under ground Caution Tape shall be placed 12 to 18 inches above the utility line. The Caution Tape shall be a designated color and marked with the appropriate name for the specific type of utility pipe as follows:

1. Yellow – with the words: CAUTION GAS LINE BELOW

2. Blue – with the words: CAUTION WATER LINE BELOW

3.14 HOT WATER CIRCULATING PUMPS

A. Floor-mounted pumps shall be provided with a 4-inch high concrete base with ½ inch reinforcing bars at 12-inch centers each way and doweled into concrete floor.

B. Piping shall be supported from building structure so as to prevent any strain on pump casing.

C. In-line pumps, unless otherwise specified, shall be centrifugal type with non-overloading characteristics and shall not overload motor above its horsepower rating under operating conditions with ratings based on continuous operation.

D. Centrifugal water pumps shall be rated according to Hydraulic Institute Test Code for Centrifugal Pumps. Pumps shall be furnished with bronze water chamber, bronze impeller and mechanical seal. Rotating parts shall be statically and dynamically balanced.

E. Flanged connections shall be provided on pumps with discharge connections larger than 2 inches. Smaller sizes may be threaded connections.

F. Hot water circulating pump shall be arranged so that pump can be automatically turned off when hot water system is not in operation.

3.15 WATER TEMPERATURE CONTROLLERS

A. Furnish and install a water temperature controller in hot water line adjacent to, and for control of, circulating pumps on hot water return lines when said pump is indicated on Drawings or herein specified. Bulb of temperature controller shall be installed so as to be directly in path of flowing water and so as not to obstruct flow of water.

B. Furnish and install a water temperature controller in hot water storage tanks for control of circulating pump on hot water circulating line when said pump is indicated on Drawings or specified herein.

3.16 DEPTH OF SEWER LINES

A. Minimum depth of below grade sewer lines shall be 24 inches to centerline of pipe. Sewer lines shall slope ¼ inch per foot minimum, unless otherwise indicated. Minimum depth at Owner property line shall be 6 feet, unless otherwise required.

3.17 BACKFLOW PREVENTION DEVICES

A. Backflow Devices: Installation of backflow devices shall be tested and certified by Los Angeles County backflow device tester before Substantial Completion. Tests shall be performed in presence of Project Inspector. Test reports shall be turned over to Project Inspector for mailing to proper agency.

3.18 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose off Project site.

3.19 PROTECTION

A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 23 0500

COMMON WORK RESULTS FOR HVAC

PART 1 – GENERAL

1.01 SUMMARY

A. SECTION INCLUDES

1. This Section provides the basic mechanical requirements that apply to the Work of Division 23.

B. RELATED REQUIREMENTS

1. Division 01: General Requirements.

2. Division 26: Electrical.

1.02 REGULATORY REQUIREMENTS

A. Materials, fabrication, equipment, and installation shall comply with industry standards and code requirements. Where manufacturer's recommendations exceed industry standards, the manufacturer's recommendation shall establish the minimum standard. As a minimum, standards from the following organizations shall apply:

1. AMCA - Air Movement and Control Association.

2. ANSI - American National Standards Institute.

3. ASME - American Society of Mechanical Engineers.

a. ASME Boiler and Pressure Vessel Code.

b. ASME B31 - Code for Pressure Piping.

4. AHRI - Air-Conditioning, Heating, and Refrigeration Institute.

5. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers.

6. ASTM - American Society for Testing and Materials.

a. ASTM A53 - Specification for Welded and Seamless Pipe.

7. CSA - Canadian Standards Association.

8. FM Global - Factory Mutual Global

9. IAPMO - International Association of Plumbing and Mechanical Officials.

10. NFPA - National Fire Protection Association.

11. OSHA - Occupational Safety and Health Administration.

12. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association.

13. UL - Underwriters Laboratories Inc.

14. Intertek (ETL Certification).

B. Materials, fabrication, equipment, and installation shall comply with federal, state, and local codes including, but not limited to, the following:

1. CBC, California Building Code, and CMC, California Mechanical Code.

a. Latest edition as adopted by the City of Los Angeles, the County of Los Angeles, and the State of California including amendments effective on the Effective Date of the Contract.

2. California Code of Regulations, Title 8, Industrial Relations, Division 1, Chapter 4, Division of Industrial Safety.

3. OSHA - Occupational Safety and Health Administration.

4. CDPH – California Department of Public Health.

5. SCAQMD - South Coast Air Quality Management District.

C. Specifications or Drawings shall not be construed to permit deviation from the requirements of governing codes unless approval has been obtained from legally constituted authorities having jurisdiction, and the Architect. The Contract Documents may contain more stringent requirements than those legally required.

D. Permits and Fees: Refer to the General and Supplementary Conditions.

1.03 SUBMITTALS

A. Provide submittals in accordance with Section 01 3300: Submittal Procedures and with specific requirements of Division 23 sections, as applicable.

B. After Architect's approval, the above information shall become the basis for inspecting and testing materials and actual installation procedures performed in the Work.

C. Shop Drawings: Submit one additional copy when control diagrams having line voltage connections are indicated. Shop Drawings shall be specifically prepared for the Work of this Project. Drawings prepared in accordance with requirements of Section 01 3113: Project Coordination and Section 01 3300 may be provided by the Architect to serve as a background for the Shop Drawings. Shop Drawings shall comply with the requirements of Section 01 3113 and Section 01 3300 and shall indicate at a minimum:

1. Complete system layout of equipment, components, ductwork, and piping, indicating service clearances, duct and pipe sizes, fitting types and sizes, top or bottom of duct and pipe elevations, distances of ducts, pipes and equipment from building reference points and hanger / support locations. All the above items shall be coordinated on the shop drawings according to the requirements of Section 01 3113.

2. Schedule and description of equipment, ductwork, piping, fittings, valves, dampers, and controllers.

1.04 PROJECT RECORD DOCUMENTS

A. Comply with provisions of Section 01 7700: Contract Closeout.

B. Project Record Drawings:

1. Provide a complete set of mechanical and control system drawings in AutoCAD and, if available, BIM, complete with external reference drawings, fonts, blocks and plotter pen color/line thickness settings on CD-ROM. Also submit one set of full size reproducible plots on vellum and three sets of prints.

2. Before Contract Completion, deliver corrected and completed prints to the OAR. Delivery of project record documents to the OAR does not relinquish responsibility of furnishing required information omitted from project record documents.

C. Operation and Maintenance Manuals:

1. Submit operation and maintenance manuals in required form and content. If no revisions are required, furnish one additional copy. If revisions are required, one copy shall be returned with instructions for changes; perform such changes and return manuals. Manuals shall be bound in accordance to Section 01 7700. Deliver manuals to the OAR. Submit an electronic copy of the entire manual in PDF file format.

2. Contents of Manual:

   a. Title sheet with Project name, including names, addresses and telephone number of Contractor, installer, and related equipment suppliers.

   b. Manufacturer's operating instructions including, but not limited to, the following:

      1) Identification of components and controls.

      2) Pre-start checklist and start-up procedures.

      3) Normal operation settings and checklists.

      4) Pre-shut down checklist and shut down procedures.

      5) Trouble shooting checklist and guidelines.

      6) Recommendations for optimum performance.

      7) Warnings and safety precautions on improper or hazardous operational procedures or conditions

   c. Manufacturer's product data and parts and maintenance booklet for each item of equipment furnished under Division 23 that includes the following as a minimum:

      1) Manufacturer’s model, identification and serial numbers.

      2) Exploded view of assembly drawings identifying each component or part with the relevant part number.

      3) Directory of manufacturer’s representatives, service contractors and part distributors.

      4) Maintenance and trouble-shooting instructions, including schedule for preventive maintenance, periodic inspection and cleaning criteria.

   d. Project Record Drawings: Complete set of mechanical and control system drawings in 50 percent reduced print format shall be furnished with the manual. Submit the above record drawings on CD-ROM in AutoCAD and, if available, BIM, complete with external reference drawings, fonts, blocks, and plotter pen color/line thickness settings.

   e. Testing, Adjusting, and Balancing reports: Submit as specified in Section 01 4525.

   f. South Coast Air Quality Management District (SCAQMD) permits to install and operate boilers, water heaters and other fuel burning equipment and third-party source test reports as required by SCAQMD to allow start-up and operation of equipment.

   g. Los Angeles County industrial waste permits.

   h. Valve directory complete with location, function, size, and model of each valve with reference to the project record drawings.

i. Equipment and component identification chart complete with location, function, size, and model of each equipment or component with reference to the project record drawings.

1.05 COORDINATION

A. Contract Documents indicate extent and general arrangement of Work under Division 23. Contractor shall coordinate work in accordance with Section 01 3113 requirements and make adjustments as required to provide maximum headroom, a neat arrangement to keep passageways and openings clear to provide accessibility and provisions for maintenance, and to meet code requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Deliver materials to Project site in their original unopened containers with labels intact and legible at time of delivery. Store in strict accordance with manufacturer's recommendations.

B. Do not store plastic pipe or materials in direct sunlight.

1.07 PRELIMINARY OPERATION

A. OAR may require any portion of mechanical Work to be operated before Substantial Completion. Such operation shall be in addition to regular tests, demonstrations and instructions required under the Contract Documents, and shall be performed as required.

B. Notify the Project Inspector at least 24 hours in advance of lighting or re-lighting pilots.

1.08 TRAINING OF OWNER PERSONNEL

A. Training of Owner’s personnel shall include:

1. A minimum of 8 hours of on-site overview of the overall Mechanical System.

2. Refer to Division 23 sections for specific training on each of the components of the Mechanical System.

3. A minimum of 8 hours of on-site overview identifying location and function of all Control Valves and Actuator assemblies.

4. A minimum of 40 hours of (in classroom) software training for a minimum of 20 LAUSD personnel on EMS/BMS if such systems are utilized in the project. Training shall be conducted at control contractor training facility with computer setup for each person attending.

B. Contract shall include the cost of training Owner operation and maintenance personnel in operating, adjusting, maintenance, trouble-shooting, and Project site repair of each component, equipment, or system provided under this Contract.

C. Operational and maintenance training shall be conducted on the Project site, unless indicated otherwise.

D. Upon completion of Owner training, a completion certificate indicating the nature of the training and a description of the systems, complete with equipment and component lists shall be issued to each trainee. The certificate should be issued in duplicate with one copy retained by OAR.

E. An attendance sheet with the names and signatures of all participants attending the training shall be submitted to the OAR and kept as part of the project documents.

1.09 GUARANTEES AND DAMAGE RESPONSIBILITY

A. Sound of water flowing in piping shall not be transmitted to building structure. Operation of mechanical system shall not produce operational sounds that can be heard outside of rooms enclosing apparatus or equipment.

PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Unless otherwise specified, materials and equipment shall be new, in good and clean condition. Equipment, materials, and components shall be of the make; type and model number noted on Drawings or specified. Pieces of equipment of the same type shall be by the same manufacturer.

B. Whenever an item is listed by a single proprietary name, with or without model number and type, it shall be for purpose of design only, to indicate characteristics and quality desired. Proprietary designation listed on Drawings, or listed first in Specifications, is used as a basis for design to establish a standard for quality and performance and space requirements.

C. HVAC equipment products from different manufacturers are never identical. Equipment approved as being equal is interpreted as being equivalent in capacity, performance and quality. The dimensions, weight, configuration and utility requirements could be quite different from the equipment used as the basis of design. Due to these differences, additional coordination and adjustments by the Contractor are required. For the equipment to be deemed truly equal, the additional coordination and adjustments by the Contractor should not incur any additional cost to the Owner and any additional labor to the design team.

D. Equipment and materials indicated or required to be installed outdoors shall be of the type that is designed, manufactured, listed or approved by authorities having jurisdiction for outdoor installation by being resistant to the adverse effects of weather. All the additional protective measures against outdoor weather required by the manufacturers' installation instructions and prevalent practice shall be provided.

E. For substitution of materials or products, refer to the General Conditions.

PART 3 – EXECUTION

3.01 SERVICE INTERRUPTIONS, OFF-SITE, GAS AND WATER

A. Schedule Work so there shall be no service interruptions of existing systems or systems during normal hours of operation of affected systems and facilities.

B. When service interruptions are mandatory, arrange in advance with the OAR as to time and date of such interruptions.

C. Systems, which are interrupted, shall be returned back into operation in such manner that they will function as originally intended.

3.02 CUTTING, NOTCHING, AND BACKING

A. Conform to California Building Code, Title 24, Part 2, for notches and bored holes in wood and for pipes and sleeves embedded in concrete and for cuts in steel, as detailed on structural Drawings.

B. Where pipes or ducts pass through, or are located within one inch of any construction element, install a resilient pad, 1/2 inch thick minimum, to prevent contact.

C. Furnish all necessary provisions for recesses, chases, and accesses and provide blocking and backing as necessary for proper reception and installation of mechanical Work.

3.03 LOCATION OF PIPING AND EQUIPMENT

A. Location of piping, apparatus and equipment as indicated on Drawings is approximate and shall be altered to avoid obstructions, preserve headroom, and provide free and clear openings and passageways.

B. Trenches parallel to footings shall not be closer than 18 inches to the face of footings and shall not be below a plane having a downward slope of 2 horizontal to one vertical, from a line 9 inches above bottom of footing.

C. Pipe in tunnels shall be installed close to one side of tunnel to provide maximum space for passage. Pipe shall not be installed through crawl hole unless otherwise specified or detailed on Drawings.

D. Place equipment in locations and spaces indicated, disassemble and/or reassemble equipment as required by Project conditions.

3.04 TESTS AND TESTING

A. Tests shall be as required under the applicable sections of Division 23, including this Section.

B. Tests required by other sections of the Contract Documents include the following:

1. Test and balance of mechanical equipment and systems: Refer to Section 01 4525: Testing, Adjusting, and Balancing for HVAC.

2. Hydrostatic test of boilers: Refer to Section 01 4525: Testing, Adjusting, and Balancing.

3. Test of smoke and fire detectors: Refer to Division 26: Electrical.

C. Additional tests may be required in the case of products, materials, and equipment if:

1. Submitted items are altered, changed, or cannot be determined as exactly conforming to the Contract Documents.

2. Performance testing and results may also be required on certain items which are as specified, including fan, and pump performance.

D. Piping Tests:

1. Perform tests required to demonstrate that operation of mechanical systems and their parts are in accordance with Specifications covering each item or system, and furnish materials, instruments and equipment necessary to conduct such tests. Tests shall be performed in presence of the Project Inspector, and representatives of any governmental agency having jurisdiction. Work shall not be concealed or covered until required results are provided.

2. If required tests are not performed, Owner may provide in accordance with the Contract Documents.

3. Pressure gages furnished in testing shall comply with CPC. Air shall be bled from lines requiring hydrostatic or water tests.

4. Systems shall be pressure-tested in accordance with pipe testing schedule below. Pipe test shall indicate no loss in pressure after a minimum duration of 4 hours at test pressures indicated. Where local codes require higher test pressures than specified herein for fire sprinkler systems, local codes shall govern.

5. Fuel gas lines shall be first tested with piping exposed, before backfilling trenches or lathing; second with piping in finished arrangement, backfilled and paved where required, and walls finished.

6. Refrigerant piping may be tested with a halide detector or calibrated electronic testing equipment.

7. Piping systems may be tested as a unit or in sections, but entire system shall successfully meet requirements specified herein, before final testing by the Project Inspector.

8. Repair of damage to pipes and their appurtenances or to any other structures resulting from or caused by these tests, shall be provided.

E. Pipe Testing Schedule:

System Tested	Test Pressure (psig)	Test With:
Steam piping, hot water heating system piping and chilled water piping	150	Water
Vacuum pump or condensate pump discharge and condensate return piping	150	Water
Refrigeration piping		
R-22	400	Dry nitrogen
R-134a	300	Dry nitrogen
R-401a	300	Dry nitrogen
R-401b	300	Dry nitrogen
R-404a	500	Dry nitrogen
R-407c	500	Dry nitrogen
R-410a	600	Dry nitrogen
R-507	500	Dry nitrogen
Radiant panel piping	150	Water

F. Equipment Performance Assurance Tests:

1. Before operating any equipment or systems, a thorough check shall be performed to determine that systems have been flushed and cleaned as required and that equipment has been properly installed, aligned, lubricated, and serviced. Factory instructions shall be checked to verify installations have been completed and recommended lubricants have been installed in bearings, gearboxes, crankcases, and similar equipment. Particular care shall be furnished in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Equipment shall also be checked for damage that may have occurred during shipment, after delivery, or during installation. Damaged equipment, products, and materials shall be replaced or repaired as required.

2. Upon completion of the above, adjust the system settings to within normal operating conditions to prevent the system from being damaged upon start-up.

3. Run-test the equipment after start-up for five consecutive days. Tests shall include operation of heating, ventilating, and air conditioning equipment and systems for a period of not less than two 8 hour periods at 90 percent of the full specified heating and cooling capacities. If equipment passes, install new filters. If equipment fails, it shall be adjusted and retested until system meets all applicable codes.

4. Equipment Start-up Reports: For each equipment or system on which start-up is performed, submit 8 copies of start-up report for review by the Architect.

a. The start-up report shall include the manufacturer's standard start-up form completed and signed by the start-up technician.

5. Provide, maintain, and pay costs for equipment, instruments, and operating personnel as required for specified tests.

6. Provide electric energy and fuel required for tests.

7. Final adjustment to equipment or systems shall meet specified performance requirements.

8. Equipment, systems, or Work deemed defective during testing shall be replaced or corrected as required. Test until satisfactory results are provided.

G. Specific Coordinated Plan for Test and Balance:

1. Provide a narrative of the operational intent that clearly describes the function and sequence of operation of each component, equipment, or system installed. Instruct designated Owner personnel in the operation of the installed systems.

2. Prior to final test and balance, mechanical equipment and systems shall be operated and tested as indicated in Paragraph 3.04.F above to demonstrate satisfactory overall operation of the installed systems.

3. Immediately before starting tests, air filter media shall be cleaned or renewed. Roll-type filters shall be advanced to provide new clean media. Cleanable type media shall be thoroughly cleaned and re-oiled with new, clean oil as recommended by manufacturer if they are of viscous impingement type. Disposable type filters shall be replaced with new filters. Replaceable media shall be replaced with new media.

4. An accurate means of measuring air flow and temperatures shall be furnished to balance air supply, return, and exhaust systems so uniform temperatures occur in every room and design airflow is obtained through registers, diffusers, and grilles.

5. Systems shall be adjusted to provide airflows indicated including maximum fresh air and maximum return air. Dampers shall be checked for proper settings and operation. Air and water inlet and leaving temperatures at coils shall be checked. Complete operational data including airflows, room temperatures, fan speeds, motor currents, plenum, and duct static pressures shall be tabulated.

6. Welding performed as part of this Division may be subject to radiographic inspections at random in accordance with requirements specified in Section 23 0513: Basic HVAC Materials and Methods.

3.05 NOISE AND VIBRATION REDUCTION

A. Correct noise or vibration caused by mechanical systems. Provide all necessary adjustments to specified and installed equipment and accessories to reduce noise to the lowest possible level

B. Correct noise or vibration problems caused by failure to install work in accordance with Contract Documents. Include all labor and materials required as a result of such failure. Pay for re-testing of corrected noise or vibration problems by the project acoustical consultant including travel, lodging, test equipment expenses, etc.

3.06 PROTECTION, CARE AND CLEANING

A. In addition to storage criteria of the General Conditions, and provisions under Section 01 5000: Construction Facilities and Temporary Controls, the following shall be provided:

1. Provide for the safety and good condition of materials and equipment until Substantial Completion. Protect materials and equipment from damage.

2. Protect installed Work.

3. Replacements: In case of damage, immediately provide repairs and/or replacements as required.

4. Protect covering for bearings, open connections to tanks, pipe coils, pumps, compressors and similar equipment.

5. Interior of ductwork shall be maintained free of dirt, grit, dust, loose insulation, and other foreign materials.

6. Air handling equipment shall not be operated until building is cleaned and air filters are installed.

7. Fixtures, piping, finished brass or bronze, and equipment shall have grease, adhesive, labels, and foreign materials removed. Chromium, nickel plate, polished bronze or brass Work shall be polished. Glass shall be cleaned inside and out.

8. Before initial start-up and again before Substantial Completion, piping shall be drained and flushed to completely remove grease and foreign matter. Pressure regulating assemblies, traps, strainers, boilers, flush valves, and similar items shall be thoroughly cleaned. Tag system with an information tag listing responsible party and date of element, before initial start-up and again before Substantial Completion. Compressed air, oil, and gas piping shall be blown out with oil-free compressed air or inert gas. Refrigerant piping shall be cleaned as specified.

END OF SECTION

SECTION 23 0513

BASIC HVAC MATERIALS AND METHODS

PART 1 – GENERAL

1.01 SUMMARY

A. SECTION INCLUDES

1. This Section prescribes basic materials and methods generally common to the Work of Division 23.

B. RELATED REQUIREMENTS

1. Division 01: General Requirements.

2. Division 23: Heating, Ventilating, and Air-Conditioning.

3. Division 26: Electrical.

4. Section 01 4525: Testing, Adjusting, and Balancing for HVAC.

5. Section 31 2323: Excavation and Fill for Utilities.

6. Section 33 1100: Site Water Distribution Utilities.

1.02 SUBMITTALS

A. Provide in accordance with Division 01, Section 23 0500 and specific requirements of each section of Division 23.

1.03 QUALITY ASSURANCE

A. Standards: Comply with applicable national, state, and local codes and standards: ASTM, ASME, and ANSI. Federal Specifications, AWWA, CISPI, NFPA, FM Global, UL, CPC (California Plumbing Code), CMC (California Mechanical Code), CSA.

B. Qualifications of Manufacturer: Products used in the Work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production as reviewed by the Architect.

1.04 COORDINATION

A. Coordinate related Work in accordance with provisions of Section 01 3113: Project Coordination.

PART 2 – PRODUCTS

2.01 GENERAL

A. Provide the following products if they are indicated in the Contract Documents or if they are required for the proper installation, function or operation of equipment, systems or components indicated in the Contract Document.

B. Provide the following products as a complete assembly with required accessories for a complete and functioning entity in compliance with governing codes and applicable standards as specified in Section 23 0500, manufacturer's instructions or as required.

1. Omission of minor details in the Contract Documents does not waive and/or otherwise relinquish compliance with the above requirements.

2.02 MANUFACTURERS AND MATERIALS

A. Air Compressor: (Not Used)

B. Air and Dirt Separators: (Not Used)

C. Balancing Valves: (Not Used)

D. Boiler Blow-Off Valve: (Not Used)

E. Ball Valves: Bronze, 2 inches and smaller:

BV-1 Class 150, 600 psi, CWP, 2 piece construction reinforced Teflon seats, full port, adjustable packing gland, stainless ball and stem, threaded ends.

Hammond UP-8303A/UP-8305/UP-8513, NIBCO T-685-80-LF/TS-685-66-LF, Milwaukee UPBA400S/450S, or equal.

BV-2 Class 150, 600 psi CWP, 2-piece construction, bronze body, reinforced Teflon seats, adjustable packing gland, (no threaded stem designs allowed), threaded ends.

Hammond UP8301A, NIBCO T-585-70, Milwaukee BA-400, or equal.

Ball Valves in Insulated Piping: Use extended operating handle of non-thermal conducive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation and memory stops that are fully adjustable after insulation is applied. NIBCO Nib-Seal Handle.

F. Butterfly Valves: (Not Used)

G. Check Valves:

1. Bronze, 2-inch and smaller:

CHV-1 Class 125, 200 CWP swing check, Teflon disc, threaded ends. .

NIBCO T-413-Y, Milwaukee 509-T, Hammond IB-940, or equal.

CHV-2 (Not Used)

2. Cast Iron 2-1/2 and larger:

CHV-3 Class 125, 200 psi, CWP, IBBM, renewable seat and disc, bolted cap, threaded ends:

Crane 372, Stockham G-927, NIBCO T-918-B, or equal.

CHV-4 Class 125, 200 psi, CWP, IBBM, renewable seat, bronze or cast iron disc, bolted cap, flanged ends:

Stockham G-931, Crane 373, NIBCO F-918 B, Milwaukee F-2974-M, Hammond IR-1124-HI, or equal.

CHV-5 (Not Used)

CHV-6 (Not Used)

CHV-7 (Not Used)

H. Expansion Tank: (Not Used)

I. Flow Control Valve – Manual: (Not Used)

J. Venturi Flow Measuring Device: (Not Used)

K. Electronic Flow Readout Meter: (Not Used)

L. Gate Valves:

1. Bronze, 2 inches and smaller:

GV-1 Class 125, 200 psi CWP, bronze body and bonnet non-rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

Hammond IB645, Crane 1701, Milwaukee 105, American 3F, NIBCO T-113, or equal.

GV-2 Same as GV-1, except solder ends:

NIBCO S 113, Milwaukee 115, Hammond IB 647, or equal.

GV-3 Class 125, 200 psi WOG, rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

Stockham B-100, Crane 428, NIBCO T-111, Milwaukee 148, Hammond IB-640, or equal.

GV-4 (Not Used)

GV-5 (Not Used)

GV-6 (Not Used)

2. Iron Body Gate Valves; 2 1/2 inches and larger:

GV-7 Class 125, O S and Y, IBBM, bolted bonnet, solid disc, flanged ends:

Hammond IR1140HI, Stockham G623, Crane 465-1/2, NIBCO F-617-0, Milwaukee F 2885M, or equal.

GV-8 (Not Used)

M. Globe Valves:

1. Bronze, 2-inch and smaller:

GLV-1 Class 125, 200 psi, CWP, screw-in bonnet, Teflon disc, threaded ends:

Hammond IB440, Milwaukee 502, Stockham B-13-T, NIBCO T-211-Y, Crane 5TF, or equal.

GLV-2 Class 125, 200 psi, CWP, screw in bonnet, Teflon disc, solder ends.

Hammond IB-418, Milwaukee 1502, NIBCO S-211-Y, or equal.

GLV-3 (Not Used)

GLV-4 (Not Used)

2. Iron Globe Valves, 2 ½-inch and larger:

GLV-5 Class 125, 200 psi, CWP, OS&Y, IBBM, renewable seat and disc, bolted bonnet, flanged ends:

Hammond IR116 HI, Stockham G-512, Crane 351, Milwaukee F2981 M, NIBCO F-718-B, or equal.

GLV-6 (Not Used)

N. Heater Vent Pipe:

1. Schedule Number:

HVP-1 Shall be UL approved for service specified. Concealed heater vent pipe, including pipe in or through attic spaces, shall be Los Angeles City approved double wall metal vent

pipe. For recessed wall heaters, furnish B.W. type. All others may be Type B, or B.W. Clearances must comply with Los Angeles City code and conditions of UL listing.

American Metal Products Co., Inc., Simpson Dura-Vent, AmeriVent, Hart & Cooley Mfg. Co., Metalbestos, or equal.

O. Liquid Level Gage:

LLG-1 Refrigerant type, carbon steel with stainless steel trim or all forged steel construction, back-seating standard design. Upper and lower valve furnished with ball check valves; 1/2 inch diameter glass on center. Four 3/16 inch diameter gage glass guard rods or slotted steel guard.

Peneberthy, Henry, Conbraco, or equal.

P. Piping:

1. Piping shall be continuously and permanently marked with manufacturer's name, type of material, size, pressure rating, and the applicable ASTM, ANSI, UL, or NSF listing. On plastic pipe, date of extrusion must also be marked.

2. Underground non-ferrous pressure pipes shall be installed with proper color tracer wires. Refer to color code provisions in Section 23 0553: HVAC Identification.

3. Refer to HVAC Piping: Section 23 2013 for heating and chilled water piping and fittings.

Q. Pipe Isolators:

PLA-1 Absorption pad shall be not less than 1/2 inch thick, unloaded. Pad shall completely encompass pipe.

Holdrite, LSP, Stoneman, Potter-Roemer, Trisolator, PR-Isolator, or equal.

PLA-2 Plastic cushion to form an insulating liner and eliminate metal to metal contact when securing copper tubes and pipes in air conditioning and refrigeration insulation preventing galvanic erosion. (Acoustical Type for Sound Absorption)

Hydra-Zorb Cushion Clamps, LSP Products Group Acousto Clamp, or equal.

R. Pressure Gage: Aluminum or steel case, minimum 4-1/4 inches dial; pressure type or combination vacuum-pressure type, with provisions for field calibration. Dial indicator to indicate pressure in psi with accuracy to within plus or minus 0.5 percent of maximum dial reading. Furnish gages with restriction screw, size 60, to eliminate vibration impulses. Black case and ring, bourdon tube of seamless copper alloy with brass tip and socket. Three way gage cock, constructed of brass with stuffing box, 1/2 inch couplings, with fixed or movable cap nut to shut off pressure gage.

PG-1 Pressure type, black drawn steel case, 4 ½-inch glass dial, range approximately twice line pressure.

Marsh Keckley, Trerice, Weksler, Weiss, or equal.

S. Safety Relief Valves:

SRV-1 Combination temperature and pressure relief type. CSA approved. Set to open at 125 psi pressure.

Watts 40L, Cash-Acme NCLX-1, Wilkins TP220, or equal.

SRV-2 Same as SRV-1, except provide on storage type water heater with anode in dip tube.

Watts 10 x L, CashAcme NCLX-1, Wilkins TP220, or equal.

SRV-3 (Not Used)

T. Strainers:

STR-1 Description: Wye type with monel or stainless steel strainer cylinder (manufacturer's standard mesh), and gasketed machine strainer cap. Where indicated on Drawings, provide with valved (globe valve) blowout piping, same size as blowout plug.

1. 2-inch and smaller:
   C.M. Bailey No.100-A, 250 lb., cast iron body, threaded, Keckley 'B', Spirax Sarco Y-type, or equal.
2. 2 ½-inch and larger:
   C.M. Bailey No.100-A, 125 lb., cast iron body, flanged, or Victaulic style 732, 300 psi, ductile iron body, grooved, fusion bonded epoxy coated.
   C.M.Bailey, Armstrong, Muessco, Keckley 'A', or equal.

STR-2 Y pattern cast iron bodies, 125 psi, monel screen. Open area at least twice the cross-sectional area of IPS pipe in which strainer is installed and may be woven wire or perforated type. Screwed ends for sizes up to 2 inches, flanged ends fusion bonded epoxy coated for 2 1/2 inches and larger perforations, in accordance with the following:

1. Steam service - 40 square mesh.
2. Other services - 16 square mesh.

Bailey No.100, Armstrong, RP&C, Keckley, or equal.

U. Temperature Control Valves:

TCV-1 Motor-operated valve, Forged brass bodies rated at no less than 400 psi working pressure; Chrome plated brass ball and stem, female NPT union ends, dual EPDM lubricated O-rings and TEFZEL characterizing disc.

Operated by Electronic Valve Actuator, manufactured, brand labeled or distributed by Belimo, TA, Honeywell, or equal.

TCV-2 Valves, automatic, electric, 3-way control.

Packed type bronze body and trim. Metal-to-metal seats designed for tight shut-off. Constant total flow throughout full plug travel. Valve designed for 150 psig steam working pressure. Valve operated by spring return motor with gear train. Valves screwed for sizes 2 inches and smaller.

Honeywell, Powers, Barber-Colman, Leonard, or equal.

TCV-3 (Not Used)

V. Thermometers

1. Industrial:

T-1 Straight type with fixed or ratable stem, extruded or cast brass or cast aluminum case and brass separable well 6 inches minimum scale, angle or straight type range 30 degrees - 240 degrees F.

Weksler, Trerice, Weiss, Ashcroft, Marshalltown, or equal.

T-2 Round type 3 ½-inch minimum dial range of 100 between 30 degrees and 155 degrees F, color coded red above 150 degrees F. Brass chrome plated case.
Ashcroft, U.S. Gage, Marsh, Weiss, or equal.

2. Remote:

T-3 Liquid-filled capillary type with bulbs as required for remote and insertion mounting dials of 3 ½-inch minimum diameter, non-ferrous internal parts, external means for re-calibration, glass or plastic lens and steel or non-ferrous case suitable for wall, duct or panel mounting range 30 degrees to 240 degrees F.

W. Traps: (Not Used)

X. Valves (Air Vent):

VAV-1 Hot or chilled water air release valves shall be cast brass rated for 150 psig design pressure and 270 F operating temperature.

Spirotherm, Bell & Gossett, Taco, or equal.

VAV-2 Hot or chilled water space heating system air valve, brass with nickel trim 1/4 inch connection, disc type for manual or automatic venting.

Hoffman 500, Spirotherm, Watts, or equal.

VAV-3 Brass petcock, 1/4 inch connection by 1/4 inch copper tube to high point of coil or line by means of a tapped cap on top of 6 inches vertical nipple. Petcock to be installed approximately 5 feet 6 inches above finish floor.

Amtrol, Watts, Dole, or equal.

Y. Vacuum Valves:

VV-1 Vacuum valves; for vacuum serve, 125 psig working pressure, cast iron body, spring loaded lubricated plug type.

General Controls, Honeywell, Val-Matic, or equal.

Z. Flanges: Flanges shall be furnished and installed at each flanged connection of each type of equipment, tanks, and valves. Faces of flanges being connected shall be furnished alike. Connection of a raised face flange to a flat-faced flange is not permitted. Flanges shall conform to following schedules:

TYPE OF PIPE	FLANGE
Screwed black or galvanized grooved steel pipelines.	125 pound black cast iron screwed flange, flat faced or grooved flange adapters, Victaulic Style 741, Tyco-Grinnell Fig. 71, Gruvlok Fig. 7401, or equal.
Welded or grooved steel pipe, except high pressure steam lines.	150 pound black forged steel welding flanges, 1/16 inch raised face ASTM A105, Grade II or grooved flange adapters, Victaulic Style 741, Tyco-Grinnell Fig. 71, Gruvlok Fig. 7401, or equal.
Copper and brass pipe or tubing.	150 pound cast bronze, flat-faced flange with solder end or grooved flange adapters, Victaulic Style 641, Tyco-Grinnell Fig. 61, Gruvlok Fig. 6084, or equal.

1. Gasket material for flanged connections shall be full faced or ring type to suit facing on flanges and shall be furnished in accordance with following schedule

SERVICE	TYPE
Cold water	1/16 inch thick neoprene
Steam, hot water	1/l6 inch Teflon

Grooved end flange adapters supplied with pressure responsive elastomeric Gaskets supplied with grooved flange adapters shall be pre-lubricated by the manufacturer. Grade of gasket to suit intended service.

AA. Unions:

1. Unions shall be furnished and installed in accordance with the following requirements (unless flanges are furnished):
   a. At each threaded or soldered connection to equipment and tanks, except in Freon or fuel gas, piping systems, whether indicated or not.
   b. Immediately downstream of any threaded connection to each manually operated threaded valve or cock, and each threaded check valve, yard box or access box except those in Freon piping systems, whether indicated or not.
   c. At each threaded connection to threaded automatic valves (except those in Freon piping systems) such as reducing valves and temperature control valves, whether indicated or not.
   d. If grooved piping is used, couplings shall serve as unions. Additional unions are not required
2. Unions shall be located so that piping can be easily disconnected for removal of equipment, tank, or valve.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions under which Work of this Section shall be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Provide all materials and equipment for the Work. Furnish and install necessary apparatus, parts, materials, and accessories.

B. Pipe Installation:

1. Install piping parallel to wall and provide an orderly grouping of proper materials and execution.

2. Piping shall clear obstructions, preserve headroom, provide openings and passageways clear, whether indicated or not. Verify the Work of other Divisions to avoid interference.

3. If obstructions or the Work of other Divisions prevent installation of piping or equipment as indicated by the Drawings, perform minor deviations as required by the Architect.

4. Install piping after excavation or cutting has been performed. Piping shall not be permanently enclosed, furred in, or covered before required inspection and testing is performed.

5. Exposed polished or enameled connections from fixtures or equipment shall be installed with no resulting tool marks or threads at fittings. Residue or exposed pipe compound shall be removed from exterior of pipe.

6. Piping shall be concealed in chases, partitions, walls, and between floors, unless otherwise directed or specifically noted on Drawings. When penetrating wood studs, joists, and other wood members, provide such members with reinforcement steel straps of Continental Steel & Tube Co., ULINE, Independent Metal Strap, or equal.

7. Reduce fitting where any change in pipe size occurs. Bushings shall not be furnished unless specifically reviewed by the Architect, or indicated on Drawings.

8. Piping subject to expansion or contraction shall be anchored in a manner, which permits strains to be evenly distributed. Swing joints or expansion loops shall be installed. Seismic restraints shall be installed so as not to interfere with expansion and contraction of piping. Seismic loops required at all building separations.

9. Immediately after lines have been installed, openings shall be capped or plugged to prevent entrance of foreign materials. Caps shall be left in place until removal is necessary for completion of installation.

10. Couplings shall not be installed except where required pipe runs between other fittings are longer than standard length of type of pipe being installed and except where their installation is specifically reviewed by the Architect.

11. Water piping shall be installed generally level, free of traps, unnecessary offset, arranged to conform to building requirements, clear of ducts, flues, conduits, and other Work. Piping shall be arranged with valves installed to provide for complete drainage and control of system. Piping shall not be installed which causes an objectionable noise from flow of water therein under normal conditions. Refer to Section 23 0500: Common Work Results for HVAC.

12. Water lines may be installed in same trench with sewer lines, provided bottom of water line is 12 inches minimum above top and to the side of sewer line.

13. Hot and chilled water circulating piping installed for space heating or cooling shall pitch up to a high point at a slope of 1/4 inch in 10 feet in the direction of flow. Where supply and return lines are exposed, both lines shall pitch in same direction. Otherwise, where possible, lines shall pitch up toward compression tank.

14. Changes in pipe sizes shall be furnished with eccentric reducers, flat on top. Offsets to clear obstruction shall not be installed so as to produce air pockets.

C. Pipe Sleeves and Plates:

1. Provide and install pipe sleeves of Schedule 40 black steel pipe or Schedule 40 PVC plastic pipe in concrete or masonry walls, footings, and concrete floors below grade. Provide and install adjustable submerged deck type sleeves at locations where pipes pass through concrete floors, except concrete slab floors on grade, and at locations where soil pipe for floor type water closets passes through concrete floors.

2. Sleeves shall provide 1/2 inch clearance around pipes, except plastic pipe shall have 1-inch clearance. Caps of deck type sleeves shall be removed just prior to installation of pipe. Area around sleeves shall be smooth and without high or low spots. Sleeves in walls shall not extend beyond exposed surface of wall. Sleeves in concrete floors and walls shall be securely fastened to forms to prevent movement while concrete is being placed.

3. Piping installed on a roof shall clear the roof surface by 10 inches minimum, with or without insulation. Bottom of individual fittings may infringe on 10 inches clear space but not groups of fittings or fittings located within 27 inches of each other.

4. Stiles shall be provided to facilitate crossing of piping when parallel piping runs are laterally greater than 12 inches out-to-out, or any pipe is higher than 18 inches, and more than 40 feet long or runs between 2 or more major pieces of equipment or housings greater than 20 feet apart. Stiles shall be not less than 20 inches wide with a minimum tread depth of 10 inches. Where stiles are required, they shall be located so greatest obstructed distance is 30 feet.

5. Where pipes pass through waterproofed walls, floors, or floors on grade, sealant with Link-Seal Modular Seals, or equal, between pipe and sleeve to provide a waterproof

joint. Where earth is in contact with pipe on both sides of a wall or foundation, the waterproof joint is not required. Commercial rubber compression units may be furnished instead of sealed sleeves if reviewed by the Architect.

6. A swing joint, or other required device, shall be furnished and installed in hot water lines with 10 feet of sealant or compression joint to allow for expansion.

7. Pipe sleeves shall be provided where pipes intersect footings or foundation walls and sleeve clearances shall provide for footing settlement, but not less than one inch all around pipe.

D. Welding of Pipe and Qualifications of Welder:

1. Joints above grade or accessible conduit or tunnels in steel piping may be either welded or screwed unless specifically indicated otherwise on Drawings or specified. Joints in below grade steel piping, whether in insulation or not, shall not be welded, unless otherwise indicated.

2. Welded joints in pipe shall be continuous around pipe and shall comply with ASME B31: Code for Pressure Piping, unless otherwise specified.

3. Each pipe weld shall be stamped with welder's identification mark. Welding shall be performed by welders possessing a valid certificate of qualification for welding carbon steel welding pipe in horizontal position (2G) and horizontal fixed position (5G) in accordance with the requirements of Section IX of the ASME Boiler and Pressure Vessel Code, by an Owner-recognized, DSA approved testing laboratory.

4. Before any welder performs welding on the Work, furnish the Project Inspector with a copy of welder's valid qualification papers and obtain verification. Welder qualification is not valid unless it has been issued while welder was performing work for current employer, and has performed type of work described by qualification in the preceding 3 months.

5. Welding performed under these Specifications is subject to special tests and inspections including rigid Ultra Sonic Testing (UT) and radiographic inspection at random, in accordance with Technique for Radiographic Examination of Welded Joints by an Owner recognized, DSA approved testing laboratory.

E. Unacceptable Welds and Repairs to Welding:

1. Welds containing any of the following types of imperfections shall be deemed defective Work:

a. Cracks of any type.

b. Zones of incomplete (in excess of 1/32 inch) fusion or penetration.

c. Elongated slab inclusions longer than 1/4 inch.

d. Groups of slag inclusions in welds having an aggregate length greater than thickness of parent metal in a length 12 times the thickness of the parent metal.

e. Undercuts greater than 1/32 inch.

f. Overlaps, abrupt ridges or valleys.

2. When a defective weld is detected by examination as outlined above, two additional welds shall be radiographed at locations selected by the Project Inspector. If the two selected welds demonstrate compliant welding, then the two tested welds shall be deemed to be in compliance. Welding revealed by radiographs to be defective Work shall be removed, repaired, and tested by radiograph.

3. If either of the two selected welds demonstrates welding deemed to be defective Work, all welding in that portion of the Work shall be deemed defective Work and either: all welds shall be cutout, prepare new ends for welding and weld to comply with this Specification, or radiograph all welds, removing and repairing only such welding deemed to be defective Work.

4. Repair welding shall be performed in a manner in full compliance with ASME B31. The welded joints or repairs shall be spot examined with UT or radiographic tests in accordance with foregoing requirements.

5. Owner shall cause to be performed additional random UT and radiographic examinations of welds. Owner shall be responsible for the costs of any UT and radiographic examinations found to be in compliance with specified requirements.

6. Installer shall be responsible for the costs of UT and radiographic re-examinations of welds deemed defective Work and not in compliance with this Specification, and shall repair or replace said welds in accordance with specified requirements.

F. Welding Rods: Submit a written list of materials and proposed type of welding rods for review by the Architect.

G. Backing Rings: Backing rings may be submitted for installation provided the Product Data is submitted with the material list.

H. Qualification Tests for Low-pressure Welding:

1. Tests shall be performed on 3-inch standard weight pipe ASTM A53, Grade A, and shall be welded by acetylene and electric arc. Each sample shall consist of two pieces, each 10 inches long, with 30-degree bevel at point weld.

2. Two 20-inch samples shall be performed in the 2G and two 20-inch samples in the 5G positions, with positions defined in Section IX, ASME Boiler and Pressure Vessel Code. Welds shall have the reinforcement ground or machined flush to the surface of the pipe before testing. Samples shall be tested as full section tensile.

3. Weld shall develop a load of 90 percent of 50,000 psi, i.e., 45,000 psi or shall develop a fracture in parent metal.

4. Each qualified welder shall carry an identification card listing welder's name, date of test, and type of welding tests passed; signed by the welder and the laboratory.

5. A valid certificate of qualification issued in compliance with requirements of the ASME Boiler Pressure Vessel Code Section IX shall qualify a welder for issuance of a certificate for low-pressure pipe welding.

I. Certificates of Qualification for Welding of Unfired Pressure Vessels:

1. Certificates of qualification shall be issued by a laboratory recognized by the Owner in compliance with the requirements of the ASME Boiler Pressure Vessel Code Section IX. Qualifications shall be for both acetylene and arc welding of Schedule 40 ASTM A53, Type B, steel welded or seamless pipe in the Horizontal Position (2G) and the Horizontal Fixed Position (5G) as defined by said code.

NOTE: Certificate described above is not valid unless it has been issued while welder was working for his current employer, and unless welder has performed type of work described by certificate in the preceding three months. Requirements for possession of a valid certificate shall not be waived for welders fabricating unfired pressure vessels when the Specifications require compliance with ASME code or when welding pipe carries working pressures greater than 75 psi and temperatures greater than 250 degrees F.

J. Pipe Joints and Connections:

1. Pipe and tubing shall be cut per IAPMO Installation Standards. Pipe shall have rough edges or burrs removed so that a smooth and unobstructed flow shall be provided.

2. Threaded Pipe: Joints in piping shall be installed according to the following service schedule:

a. Refrigerant and Soap Piping: Litharge and glycerine, or Expando, Gasoila, or equal.

b. All other services Furnish sealant, suitable and as reviewed by the Architect.

3. Threads on pipe shall be cut with sharp, clean, unblemished dies and shall conform to ANSI/ASME B1.20.1 for tapered pipe threads.

4. Joint compounds shall be smoothly placed on male thread and not in fittings. Threaded joints shall be installed tight with tongs or wrenches and sealant of any kind is not permitted. Failed joints shall be replaced with new materials. Installation of thread cement or sealant to repair a leaking joint is not permitted.

5. Sharp-toothed Stillson, or similar wrenches, is not permitted for the installation of brass pipe or other piping with similar finished surfaces.

K. Copper Tubing and Brass Pipe with Threadless Fittings:

1. Silver brazed joints shall be used for attaching fittings to non-ferrous metallic refrigerant piping.

2. Non-pressure gravity fed condensate lines may be soldered with 95/5 solder.

3 Silver brazing alloy, Class BCUP-5. Surfaces to be joined shall be free of oil, grease, and oxides. Socket of fitting and end of pipe shall be thoroughly cleaned with emery cloth and wiped to remove oxides. After cleaning and before assembly or heating, flux shall be installed to each joint surface and spread evenly. Heat shall be applied in accordance with instructions in the Copper Tube Handbook issued by Copper Development Associates. Joints constructed of rough bronze fittings shall be provided as recommended by manufacturer.

4. Do not overheat piping and fittings when installing silver brazing.

5. Joints in non-ferrous piping for services not covered above shall be installed with solder composed of 95/5 tin/antimony, ASTM B32, Grade 5A. Surfaces to be jointed shall be free of oil, grease, and oxides. Sockets of fitting and end of pipe shall be thoroughly cleaned with emery cloth to remove oxides. Solder flux shall be sparingly installed and solder added until joint is completely filled. Do not overheat. Excess solder, while plastic, shall be removed with a small brush in order to provide an uninterrupted fillet completely around joint. Random inspection of joints shall be conducted by Project Inspector to ensure joints are lead-free.

6. Grooved end joints for copper piping shall be assembled in accordance with the latest manufacturer recommendations. Pipe ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. Grooving tools shall be as manufactured by Victaulic, RIDGID, MAG Tool, or equal.

L. Ring-Type Pipe: Joints shall be installed in accordance with manufacturer's instructions with grooved couplings, fittings and rubber rings. Couplings and pipe shall be compatible and of the same manufacturer. Rings shall be accurately located and installed by grooves in coupling. Pipe shall be installed with zero deflection unless otherwise specified. Pressure pipe shall be furnished with thrust blocks at each offset point.

M. Welded Pipe Joints:

1. Joints in welded steel pipelines shall be installed by oxyacetylene or electric arc process. Welding shall be continuous around pipe and provided as specified.

2. Butt welds shall be of the single V-type, with ends of pipe and fittings beveled approximately 37 ½ degrees. Piping shall be aligned before welding is started with the alignment maintained during welding.

3. Welds for flanges and socket fittings shall be of the fillet type with a throat dimension not less than pipe wall thickness.

N. Grooved End Pipe Joints: Grooved end joints for carbon steel piping shall be assembled in accordance with the latest manufacturer recommendations. Pipe ends shall be clean and free

from indentations, projections, and roll marks in the area from pipe end to grove for proper gasket sealing. Grooving tools shall be as manufactured by Victaulic, RIDGID, MAG Tool, or equal.

O. Joints shall be Vic-Press 304TM, or equal, made with Victaulic Series 'PFT' tools and the appropriate sized jaw. Pipe shall be certified for use with Vic-Press 304TM system, and shall be square cut, properly deburred and cleaned, and marked at the required location to insure full insertion into the fittings and/or couplings.

P. Valves: Valves shall conform to the following:

1. Piping systems shall be furnished with valves at points indicated on Drawings and specified, arranged to provide complete regulating control of piping system throughout building and the Project site.

2. Valves shall be installed in a neat grouping, so that parts are easily accessible and maintained.

3. Pressure Independent Characterized Control valve type shall be suitable for service on which installed.

4. Valves shall be full size of line in which they are installed, unless otherwise indicated on Drawings or otherwise specified, and shall be one of types specified.

5. Provide chain operators on valves 2-inch and larger located 7 feet or more above the servicing floor level.

6. Valves for similar service shall be of one manufacturer.

7. Except where otherwise specified, valves shall be Belimo, Victaulic, Stockham, Crane, Jenkins, Milwaukee, Hammond, American Valve, NIBCO, Hoffman, or equal.

8. Ball valves below grade in yard boxes shall have stainless steel handles.

9. Temperature relief valves and combination temperature and pressure relief valves shall be as specified and furnished as set forth in this Section. Discharge pipe from relief valves shall be not less than discharge area of valve or valves it connects, based on discharge area of valves, and shall terminate as indicated and free of any traps. Valves shall be installed at following locations:

    a. A combination temperature and pressure relief valve or combination of valves on each heating hot water boiler. Temperature sending element shall extend into water inside boiler.

10. Manual air vent valve assemblies shall be installed at each high point of hot water space heating and chilled water piping systems. Valves shall discharge through 1/4 inch diameter copper tubing and drain to nearest floor sink. Automatic type air vent valve shall only be installed where specifically indicated. Radiator, convectors, and finned pipe convectors shall be fitted with packless radiator valves, angle or straight

pattern. Each convector or radiator installed as part of a space hot water heating system shall be furnished with a manual-type air vent valve.

Q. Strainers: Strainers shall be installed on each water main (except for fire line) downstream of the meter, above grade, when a pressure regulator assembly is not installed. Main strainer shall be of Y-flange or groove type. On closed loop chilled and heating hot water systems pump systems, a strainer shall be installed at each pump inlet and upstream of each flow control valve assembly. The control valve assembly may include a modulating temperature control valve and a flow-limiting valve, manufactured by Griswold, AutoFlow, Flow Control Industries, Inc., or equal.

R. Hangers and Supports:

1. Piping shall be securely fastened to building structure by approved iron hangers, supports, guides, anchors, and sway braces to maintain pipe alignment to prevent sagging and to prevent noise or excessive strain on piping due to uncontrolled or seismic movement under operating conditions. Hangers and supports shall conform to Manufacturer's Standardization Society Specification SP-69. Hangers shall be relocated as required to correct unsatisfactory conditions that may become evident when system is placed into operation. Appliances, heat exchangers, storage tanks, and similar equipment shall be securely fastened to structure in accordance with seismic requirements. Outdoor metal hangers and supports shall be hot-dipped galvanized steel, unless otherwise specified.

2. Piping shall not be supported by wire, rope, wood, plumbers' tape, or other non-recognized devices.

3. Hangers and supports shall be designed to support weight of pipe, fittings, weight of fluid and weight of pipe insulation, and shall have a minimum factor of safety of 5, based on ultimate tensile strength of material installed.

4. Burning or welding of any structural member under load is not permitted. Field welding not specified on Drawings or reviewed Shop Drawings is not permitted without review by Architect and DSA.

5. Burning holes in beam flanges or other structural members is not permitted without review by the Architect and DSA.

6. Pipe hangers on piping covered with low temperature insulation shall be installed on outside of insulation and not in contact with pipe unless otherwise detailed on Drawings. Insulation shall be protected by 18 gage galvanized steel shield, with a minimum length of 10 inches, installed completely around pipe covering between covering and hanger. Installing hangers directly on pipe and butting adjoining sections of insulation against hanger is permitted provided void and hanger rod are properly insulated and sealed so that no sweating occurs at hangers.

7. Hanger rods shall be fastened to structural steel members with suitable beam clamps. Clamps shall be Tolco, Carpenter & Patterson, Fee and Mason, or equal, as follows:

   a. Tolco I beam, Fig.62 for maximum 1000 lbs.

b. Tolco I or WF beam, Fig. 329, for maximum of 1290 lbs.

8. Hanger rods shall be fastened to concrete inserts in concrete slabs or beams. Inserts shall be Tolco, Carpenter & Patterson, Fee and Mason, or equal, as follows:

   a. Tolco Fig.310 for maximum of 600 lbs.

   b. Tolco Fig. 309 for maximum of 1140 lbs.

9. For fastening to wood ceilings, beams, or joists, furnish Anvil Fig. 128R, Anvil Fig. 153, Tolco 78, or equal pipe hanger flange fastened with drive screws. Under wood floors, 3/8 inch hanger rods shall be hung from 2-inch by 2-inch by 1/4 inch angle clips 3-inch long, with two staggered 10d nails, clinched over joist.

10. Hanger rod sizes for copper, iron, or steel pipe: 3/8 inch for pipe sizes 1/2 inch through 2-inch, 1/2 inch for pipe sizes 3-inch, 4-inch and 5-inch, 5/8 inch for pipe size 6-inch, and 3/4 inch for 8-inch and 10-inch pipe.

11. Turnbuckles, if furnished, shall provide a load carrying capacity equal to that of the pipe hanger with which they are being installed.

12. Pipe hangers shall be of same size, or nearest larger manufactured size available, as pipe or tubing on which they are being installed.

13. Hangers, clamps, and guides furnished for support of non-metallic pipe shall be padded with 1/8 inch thick rubber, neoprene, or soft resilient cloth.

14. Where special pipe-supporting requirements in the Specifications conflict with any standard requirements specified herein, the Specification requirements shall govern.

15. Vertical Piping:

   a. Vertical pipe risers shall be securely supported with riser clamps of recognized type. Risers in reinforced concrete buildings shall be furnished with extension clamps fastened to pipe above each concrete floor slab with extended arms of clamp to rest on slab. Clamps shall be provided with lead or Teflon liners when installed on copper tubing. Clamps shall be plastic-coated when installed on non-ferrous pipe or tubing.

   b. Copper tubing in sizes 1 ½-inches and larger and steel pipelines passing up through building shall be supported at each floor of building or every 15 feet whichever is less.

   c. Copper tubing sizes 1 ¼-inch and smaller shall be supported at not intervals not more than 6 feet on center. Special provisions shall be installed for vertical lines subject to expansion and contraction caused by operating temperature differences.

d. Vertical cast iron pipelines shall be supported from each floor and at its base. Malleable iron or steel pipe clamps with minimum thickness of 1/4 inch shall be furnished and fastened around pipe for support.

16. Horizontal Piping:

a. Pressure piping on roofs shall be supported from stands, trapezes, or structures so that the bottoms of pipes clear the roof surface by 10 inches.

b. Insulated steam and space heating hot water supply and return piping shall be supported with Tolco Figure 4, B-Line Figure B3140, Anvil Figure 212, or equal, steel hangers with welded eye rods to permit hinge movement at point of attachment of hangers. Hinge movement at point of support shall be provided by welded eye linked rods Tolco Figure 101L, B-Line Figure B3211X, Anvil Figure 278X, or equal.

c. Chilled water supply and return piping, condenser water piping, insulated refrigerant piping may be supported with Tolco Figure 1, B-Line Figure B3100, Anvil Figure 260, or equal, hangers with rods, turnbuckles and inserts suitable for above hangers.

d. Maximum hanger and support spacing shall conform to CPC schedule for horizontal piping installed above grade.

17. A hanger or support shall be installed close to the point of change in direction of a pipe run, in either a horizontal or vertical plane.

18. When practicable, supports and hangers for cast iron soil pipe shall be installed as close as possible to joints and when hangers or supports are not located within one foot of a branch line fitting, an additional hanger or support shall be installed at fitting.

19. In systems where grooved piping is used, couplings shall be provided with angle pattern bolt pads to comply with support and hanging requirements of ANSI/ASME B31.1, ANSI/ASME B31.9, and NFPA Pamphlet 13.

S. Flashings:

1. Each pipe, duct, or gas-fired equipment vent passing through roof shall be installed with waterproof flashing.

2. Flashing or flanges on pipes, vents, and ducts passing through a tile or slate roof shall be constructed of sheet lead. Flashing for pipes and heater vents passing through a roof shall be 4 pound soft sheet lead. Flashing and flanges for ducts and heater vents passing through exterior walls shall be 22 gage sheet metal. Flanges and flashing shall be installed waterproof at point of connection with pipe or duct. No soldered joints on roof flashings will be allowed.

3. Lead flashing and flanges shall be constructed of 4 pound sheet lead with burned joints. Flange of lead flashing or lead flange on a duct shall extend out onto roof a

minimum of 12 inches from pipe or duct. Lead flashing shall extend up the pipe or duct not less than 7 inches.

4. Sheet metal flashing shall be constructed of 24 gage galvanized sheet steel. Flanges on these flashings shall extend out onto roof a minimum of 10 inches from pipe or duct. Flanges on ducts through exterior walls shall extend out from duct a minimum of 2 ½ inches. Flanges on gas-fired equipment single-wall vents shall be of ventilated type. Type B gas vents through a roof shall be furnished with non-ventilated flashing as per NFPA Pamphlet 211.

5. Cast iron, steel, brass, and copper pipe, which terminate less than 18 inches above roof, shall be furnished with a combination counter-flashing and vandal-proof hood for protection against water, birds and foreign matter. Cast iron, steel, brass and copper pipe, which does not terminate within 18 inches of roof, shall be furnished with a counter-flashing sleeve. Pipe, which terminates more than 18 inches above roof, shall be furnished with protection against entrance of water, birds, and foreign matter.

6. Counter-flashing and combination counter-flashing sleeves and vandal-proof hoods shall be cast iron, vandal-proof, threaded, sealed or approved gas-heated sleeve type. Counter-flashing sleeves on each of these items shall extend down over flashing a minimum of 3/4 inch.

7. Flashing and flanges on ducts shall be installed waterproof at point of connection to the duct by riveting and soldering. Storm collars shall be securely screwed and installed waterproof around appliance vent pipe immediately above flashing.

8. Vent piping above roof shall be furnished with a combination counter-flashing sleeve and vandal-proof hood.

T. Equipment Installation: Install roof or floor mounted equipment on level platforms, housekeeping pads or curbs and provide sound, vibration and seismic control measures per Section 23 0548, unless indicated otherwise whether indicated on drawings or not.

END OF SECTION

SECTION 23 0548

HVAC SOUND, VIBRATION AND SEISMIC CONTROL

PART 1 – GENERAL

1.01 SUMMARY

A. SECTION INCLUDES

Reduction or elimination of excessive noise or vibration within building due to operation of equipment, machinery, piping, and ductwork as specified.

1. Vibration isolators.
2. Seismic restraint devices.
3. Duct silencers.
4. Lining and enclosing ductwork.
5. Acoustic louvers.
6. Sound attenuation boots at supply, return, exhaust and transfer air inlets, outlets and openings.
7. Flexible ducts, conduits and piping.

B. RELATED REQUIREMENTS

1. Division 01: General Requirements.
2. Section 01 4525: Testing, Adjusting, and Balancing for HVAC.
3. Section 23 0500: Common Work Results for HVAC.
4. Section 23 0513: Basic HVAC Materials and Methods.
5. Section 23 3000: Air Distribution.
6. Section 23 3813: Kitchen Ventilation System.
7. Section 23 8000: Heating, Ventilating and Air Conditioning Equipment.

1.02 GENERAL REQUIREMENTS

A. Provide vibration isolators to eliminate or reduce the transmission of vibration noise to any part of building and mitigate vibration frequency and load imposed by equipment. Vibration isolators, base frames, inertia bases and seismic restraints shall be of sufficient size, flexibility and load distribution configuration to assure that deflection, stability and seismic restraint requirements are met without permitting excessive movement when starting. For typical units, no fewer than four isolators shall be provided. Isolators shall be provided to deflect uniformly under operating gravity and equipment thrust loadings to within plus or minus 10 percent of specified deflection values.

B. Static deflections specified are based on the anticipated equipment characteristics. In the event the equipment proposed by the Contractor has characteristics other than those indicated, particularly the rated rpm, the static deflection shall be re-evaluated and the proper mountings and other devices shall be provided.

C. Where fabricated vibration isolator units are indicated, furnish manufacturer's standard catalog products with printed loading ratings or certified submittals

D. Seismic Requirements:

1. Refer to Seismic Restraint Manual: Guidelines for Mechanical Systems, published by SMACNA and approved by DSA, for minimum seismic restraints required on mechanical components design and construction details.

2. Provide seismic restraints for mechanical equipment or components specified. Where equipment is specified with proprietary names, design for seismic restraints is for first proprietary name listed.

3. Provide restraints, bracing and anchorage as required for the mechanical equipment, electrical equipment and components specified in the Contract Documents. Restraints, bracing and anchorage shall be installed to resist the total design earthquake or wind loads in any direction in accordance with CBC and SMACNA guidelines.

4. Provide restraints, bracing, and anchorage for the mechanical equipment and components.

5. For rigidly mounted liquid filled steel pipe, comply with the following:

   a. Provisions of NFPA Pamphlet 13, section for sway bracing.

   b. Provisions of NFPA Pamphlet 13, section for earthquake protection.

   c. Hanger spacing as specified in Section 23 0513 under Hanger Spacing Schedule.

   d. SMACNA Seismic Restraint Manual: Guidelines for Mechanical Systems and approval by DSA.

6. For flexibly mounted liquid filled steel pipe, comply with the following:

   a. Provisions of the California Building Code for flexibly mounted equipment.

   b. Provisions of VISCMA (Vibration Isolation and Seismic Control Manufacturer's Association) Seismic Control Device Installation, Best Practices Manuals.

   c. Installer may provide a DSA or OSHPD approved system such as the SMACNA Seismic Restraint Manual with Addendum No. 1, the Mason Industries Seismic Restraint Guidelines or other proprietary pre-approved system.

7. For ductwork and other mechanical equipment restraints, comply with SMACNA Seismic Restraint Manual: Guidelines for Seismic Mechanical Systems and obtain approval by DSA.

1.03 SUBMITTALS

A. Provide in accordance with Division 01.

1. Catalog cuts and data sheets on specific vibration isolators, seismic restraints, and anchors demonstrating compliance with the Specifications.

2. Shop Drawings for each piece of equipment including dimensions, structural member size, support point, vibration, and seismic restraints.

3. Written approval of frame design to be furnished by the equipment manufacturer.

4. Drawings indicating methods for suspension, support, seismic restraints, guides, etc., for piping, ductwork, etcetera.

5. Drawings indicating methods for isolation of pipes, ducts etcetera, piercing slabs, beams, etcetera.

B. Vibration Test Reports: At completion of installation, submit the following documents. Submission of these documents must be complete before final acceptance of vibration isolation systems is given. Assistance from the vibration isolation equipment Manufacturer may be required.

1. Complete tabulation showing for each vibration isolator:

a. Actual static deflection measured at the project.

b. Specified minimum static deflection.

2. Report certifying:

a. Each piece of operative rotating mechanical equipment does not exceed the specified vibration displacement level.

b. Each piece of isolated equipment or equipment component (ducts, pipes, conduit, etcetera) is not short-circuited by any means.

c. Requirements of Part 2 are satisfied for equipment.

1.04 QUALITY ASSURANCE

A. Standards and Codes: Comply with applicable codes and standards having jurisdiction including, but not limited to:

1. NFPA, Pamphlet 13.

2. ASHRAE Handbook: HVAC Systems and Equipment.

3. SMACNA Seismic Restraint Manual: Guidelines for Mechanical Systems.

4. California Building Code.

5. VISCMA

a. Installing Seismic Restraints for Mechanical Equipment.

b. Installing Seismic Restraints for Duct and Pipe.

B. Qualifications of Manufacturer and Installers: Comply with provisions as set forth in Section 23 0500: Common Work Results for HVAC.

PART 2 – PRODUCTS

2.01 GENERAL

A. Furnish and install vibration dampers, sound isolation pads, flexible connections and similar equipment required to prevent sound of water flowing in pipes, vibration of motors, and motor operated equipment from being transmitted to building structure; and, in case of fans, from being transmitted along ducts. Piping shall be isolated from vibrating equipment by furnishing required flexible connectors.

B. Pumps and similar motor operated equipment shall be installed on anti-vibration units.

C. Fans, except curb-mounted roof-type exhaust fans and wall mounted propeller fans, shall be installed with anti-vibration units, whether indicated on Drawings or not. Fans built into air handling units may be furnished with independent anti-vibration mountings or whole unit may be installed on an external vibration isolation system.

D. Other equipment shall be installed on anti-vibration bases, pads, or hangers, unless specifically noted otherwise on Drawings. Package units, furnished with built in anti- vibration bases, do not require unit bases unless otherwise specified.

1. Unless specified otherwise, anti-vibration bases shall be Mason Industries, M.W. Sausse & Co., the VMC Group, or equal, of the Model Number specified or indicated on the drawings. Furnished base including sub-base, shall be manufactured by same company with fan and integral motor base. Seismic restraints may be incorporated into bases or furnished separately.

2. Inertia anti-vibration bases shall conform to requirements indicated.

3. Unless noted otherwise, furnished anti-vibration bases, including supporting units for inertia bases, shall be of the spring type.

4. Selection of bases or supporting units shall be in accordance with manufacturer's recommendations based on following installed minimum effective isolation efficiencies (where not provided with each piece of equipment):

a.	Centrifugal fans, packaged fan and coil units and cooling towers, less than 800 RPM	80 percent
b.	Centrifugal fans over 800 RPM	90 percent
c.	Centrifugal pumps	95 percent
d.	Reciprocating compressors	95 percent

E. Flexible duct connections shall be provided at inlet and outlets of each fan or HVAC unit, except curb-mounted roof exhaust fans whether indicated on the drawings or not.

F. Flexible pipe or conduit connections shall be provided at piping and conduit connections to HVAC units, pumps, compressors and other moving (reciprocating or rotating) mechanical or electrical equipment provided under this Section whether indicated on the drawings or not.

G. Flexible connections for Freon piping shall be seamless flexible metal hoses of type and length recommended by manufacturer and suitable for system operating pressure.

H. Flexible connections for all other piping shall be flexible metal hose or spool type with flanged ends, unless otherwise specified. Metal hose shall be covered with protective braiding in areas where physical abrasion may occur, or for personnel safety.

I. Spool types shall be similar to American Rubber Co., Mercer Rubber Co., PROCO Products, Inc., or equal, and hose types shall be similar to DME, Inc., U.S. Flex, Pennflex, Anaconda Flexpipe, Keflex, or equal with any required modifications to meet specified requirements. Flanges shall be furnished with steel retaining rings. Units installed on discharge side of pumps shall be furnished for a suitable working pressure of not less than 100 psig, and those on suction side for working pressures of 50 psig or 30 inches Hg vacuum.

J. Units installed in cold water lines (less than 125 degrees F) shall furnish a minimum temperature rating of 180 degrees F and those installed in hot water lines (above 125 degrees F) shall be constructed of special heat resistant materials and be furnished for a minimum temperature rating of 220 degrees F, continuous operation. Units shall be able to withstand a maximum lateral deflection of 3/8 inch. Temperature and pressure ratings shall be molded into body of each spool unit so they are easily identified. Spool types shall be for straight in flow only.

K. Spool type units shall be furnished with control units comprised of a minimum of two tie-rods and anchor plates or internal guide sleeves to prevent excessive elongation or misalignment.

Rubber washers shall be provided under bolt heads and rubber grommets in bolt holes to prevent any metal to metal contact between bolts and flanges.

L. Where hose type units are furnished, restraining anchors or braces shall be provided if excessive or undesirable pipe movement occurs when system is operated.

2.02 GENERAL PROPERTIES OF VIBRATION ISOLATORS.

A. Shall be provided with markings so that, after adjustment, when carrying their load, deflection under load can be verified; thus determining that load is within proper range of device and that correct degree of vibration isolation is being provided according to the design.

B. Isolators to operate in direct proportion to their load versus deflection curve. Load versus deflection curves shall be furnished by manufacturer and must be linear over a deflection range of 50 percent above design deflection.

C. Wave motion through isolator shall be reduced to following extent: Isolation above resonant frequency shall follow theoretical prediction based upon an un-dampened single degree of freedom system with a minimum isolation of 50 decibels above 150 cycles per second.

D. Vibration isolator spring diameters shall be no less than their deflected height. Furnish spring with a 50 percent overload safety factor.

E. Unless otherwise indicated, equipment installed on vibration bases shall provide a minimum operating clearance of one inch between structural steel base and floor or support base. Provide flexible connectors in piping and flexible conduit in power wiring to minimize transmission of vibration.

F. Isolators and springs exposed to weather shall be hot-dipped galvanized or powder coated after fabrication and before installation. Hot-dipped zinc coating shall be not less than two ounces per square foot by weight complying with ASTM A123. In addition, provide limit stops to resist wind velocity.

G. Where indicated, provide structural steel bases with height saving brackets, and minimum of three points of support. Isolators shall be furnished with a method for leveling.

H. Design isolators and seismic restraints for positive anchorage against uplift and overturning.

I. Provide and install, under this Section of the Specifications, structural steel required to properly support equipment and steel required to support horizontal thrust arrestors.

2.03 ISOLATOR TYPES

A. Type A: Steel Spring Isolators: Un-housed steel spring isolators, laterally stable and unrestrained. Design springs so that ratio of horizontal to vertical spring (stiffness) constant is between 0.9 and 1.3. Natural frequency of isolator must be 1/3 to 1/4 of driving frequency that is to be controlled. Isolators to provide a minimum additional travel to solid equal to 50 percent of rated deflection. Isolators shall be furnished with built-in leveling bolts complete with sound isolation pads type B. Static deflection as specified.

B. Type B: Sound Isolation Pad: Provide under each spring isolator a sound isolation pad, utilizing high quality durable neoprene pad material, loaded to 40 psi. Build sound pad up to 2 layers of 1/4 inch thick neoprene material; separate layers with a 16 gage galvanized sheet metal plate. Top layer shall provide a hardness of 40 durometers and the bottom layer shall be 40 durometers. Cold bond sound pads together and to isolator baseplate.

C. Type C: Neoprene-in-Shear Isolators: Isolator shall be neoprene-in-shear type as recommended by manufacturer. Isolator shall provide a static deflection under rated load at 1/4 inch.

2.04 EQUIPMENT FRAMES

A. Provide mounting frames and brackets to carry load of equipment without causing mechanical distortion or stress to the equipment.

B. Type A Frame: Wide flange members, rigidized structural steel frame with brackets. Maximum allowable deflection at any point on load frame relative to unloaded frame shall be 0.005 inch. Members to be constructed of wide flange beams, with a depth of not less than 1/10 of length of span between isolators. Frame shall be M.W. Sausse & Co. type RMSB-W, as basis of design, or Mason Industries, Caldyn, or equal.

C. Type B Frame: Channel members, rigidized structural steel frame with brackets. Frame to be constructed of channel steel with section depth equal to 1/10th length of longest structural member. Frame shall be M.W. Sausse & Co. type RMSB-C, as basis of design, or Mason Industries, Caldyn, or equal.

D. Type C Frame: Steel gusset or bracket welded or bolted directly to machine frame in order to accommodate isolator. Frame shall be M.W. Sausse & Co. type RMSG, as basis of design, or Mason Industries, Caldyn, or equal.

E. Type D Frame: Fabricated of rectangular channel steel forms for floating foundations to be filled with concrete on the Project site. Channel depth to be a minimum of 1/12th of longest dimension, but in no case less than 6 inches. Form shall include 1/2 inch reinforcing bars installed each way in a layer 1 ½ inches above bottom and drilled steel members with sleeves mounted below holes to receive equipment anchor bolts. Weight of concrete and frame shall be two times or more than the weight of the unit it supports. Frame shall be M.W. Sausse & Co. type RMSBI, as basis of design, or Mason Industries, Caldyn, or equal.

2.05 MATERIALS AND CONSTRUCTION

A. Duct Silencers: Provide factory fabricated duct silencers of tubular or rectangular type, for low or medium velocity service, with arrangements, sizes, and capacities as indicated on the Drawings.

1. Construction:

a. Fabricate silencers of galvanized steel with casing seams sealed or welded to be airtight at a pressure differential of 8 inches water gage between inside and outside of unit, and stiffen or brace as necessary to prevent structural failure or deformation at same condition, or audible vibration during normal operation. Outer casings of rectangular silencer modules shall be made of 22 gage galvanized steel in accordance with ASHRAE Guide of recommended construction for high-pressure rectangular ductwork. Seams shall be lock formed and mastic filled. Outer casings of tubular silencers shall be made of galvanized steel in 18 to 22 gage. Internal acoustic elements of rectangular silencers shall incorporate integral die formed entry and exit to minimize pressure drop and self-noise. Interior partitions for rectangular silencers shall be fabricated of not less than 26 gage galvanized perforated steel. Interior construction of tubular silencers shall be compatible with the outside casings.

b. Filler material shall comply with the following:

1) Fire Safety Standards: NFPA 90A and NFPA 90B.

2) Temperature: ASTM C411.

3) Air velocity: ASTM C1071, UL 181.

4) Fire Hazard Classification: ASTM E84, UL 723-Class 1, NFPA 255.

5) Corrosion Resistance: ASTM C739, C665.

6) Fungi Resistance: ASTM G21.

7) Water Vapor Sorption: ASTM C1104, less than 1 percent by weight.

8) Formaldehyde, Phenolic Resins or other Volatile Organic Compounds: 0 percent.

c. Airtight construction shall be provided by furnishing a duct sealing compound installed on the Project site. Silencers shall not fail structurally when subjected to a differential air pressure of 8 inches w.g. inside to outside of casing.

2. Acoustic Performance: Silencer ratings shall be determined in a duct-to-reverberant room test facility, which provides for airflow in both directions through the test silencer in accordance with ASTM Standard E477. The test facility shall be accredited by the National Voluntary Laboratory Accredited Program for the ASTM E477 test standard. Data from a non-accredited laboratory is not permitted. The test set-up and procedure shall eliminate effects due to end reflection, directivity, flanking transmission, standing waves, and test chamber sound absorption. Acoustic ratings shall include dynamic insertion loss (DIL) and self-noise (SN) power levels both for forward flow (air and noise in same direction) and reverse flow (air and noise in opposite directions). Data shall be for test silencers no smaller than the following cross-sections:

   Rectangular, inches - 24 by 24, 24 by 30, or 24 by 36
   Tubular, inches - 12, 24, 36, and 48

   a. Noise reduction values (dynamic insertion loss) in decibels reference 10-12 watts, shall not be less than (of the model, size and length) indicated on Drawings.

   b. Self generated noise in decibels reference 10 to 12 watts, shall not be more than of the model, size and length indicated on Drawings.

3. Aerodynamic performance: Airflow measurements shall be performed in accordance with ASTM specification E477 and applicable portions of ASME, Air Movement and Control Association (AMCA), and Air Diffusion Council (ADC) airflow test codes. Tests shall be reported on the identical units for which acoustic data is presented. Air pressure drops shall not exceed those (of the model, size and length) indicated on Drawings.

4. Certification: With submittals, provide certified test data on dynamic insertion loss, self-noise power levels, and aerodynamic performance for reverse and forward flow test conditions. Test data shall be for a standard product. Rating tests shall be conducted in the same facility, shall utilize the same silencer, and shall be open to inspection if required by the Architect.

5. Rectangular silencers shall be Industrial Acoustics Company of the model number indicated on the drawing, as basis of design, or Vibro-Acoustics, Dynasonics, SEMCO Silentair, TranSonics, Inc., or equal.

B. Duct Liner: As indicated in Section 23 0700: HVAC Insulation.

C. Flexible Ducts: As indicated in Section 23 0700: HVAC Insulation.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Provide isolators, flexible pipe connectors, flexible electrical conduit and flexible duct connectors at all moving mechanical system components to prevent transmission of vibration noise to any part of building whether indicated on the drawings or not.

B. Install isolators to suit imposed load and the vibration frequency to be absorbed. Isolator units shall furnish adequate strength and flexibility to exhibit proper resiliency under machine load and impact without permitting excessive movement when starting.

C. Where commercial vibration isolator and seismic restraint units are specified, furnish manufacturer's standard catalog products with printed loading ratings, or provide substantiating calculations.

D. Install vibration isolators and seismic restraints in accordance with manufacturer's printed installation instructions.

E. Where equipment is belt driven and motor is not installed on equipment, install motor and driven equipment on unitized support, and install entire support isolators. Unitized support to be provided with adjustable slide rails sized for motor weight and frequency. Support shall be Mason Industries type WF, M.W. Sausse & Co., type RMSF, Caldyn, or equal.

F. Do not install any equipment, piping, conduit, ductwork, etc., that makes rigid contact with building or its structural members, unless reviewed by the Architect.

1. Coordinate Work with other trades to avoid rigid contact with building.

2. Correct, before installation, any conflict with other Work that would result in solid contact to equipment or piping due to inadequate space.

3. Obtain inspection from the Project Inspector for concealed Work before enclosure.

4. Notify manufacturer before installation of vibration isolation devices so that manufacturer may instruct and demonstrate technique for proper installation.

G. The furnishing or installation of vibration isolators must not cause any change of position or alignment of equipment, ductwork, or piping, resulting in stresses in piping or ductwork, connections, or misalignment of shafts or bearings. Equipment, piping, and ductwork shall be maintained in a rigid position during installation. Load shall not be transferred to isolator until installation is complete and under full operational load.

H. Air Compressors, Water Chillers, Pumps, Boilers with Integral Combustion Fans and Miscellaneous Equipment, mounted on roof or raised floors: Install each unit with its motor on a vibration isolated base utilizing type B frames, except where a type D frame is indicated on Drawings. Install steel support frame furnished by equipment manufacturer, utilizing equipment anchor bolt templates and isolator height saving brackets. Provide springs as specified for type "A" isolator; static deflection shall be a minimum of 2 inches.

I. Fans (2000 rpm or higher) Air Compressors and Miscellaneous Equipment, mounted on grade: As specified for grade mounted boilers except furnish type C isolators.

J. Air Handling, Air Conditioning Units, Floor Mounted Fans, and Cabinet-Installed Fans: Install entire casing including filters, mixing box, fan section, coil sections, etc., on a continuous, integral, structural steel base, as indicated. Furnish type A, B, or C frames, reinforced as necessary to prevent distortion of frame. Furnish isolator type A; static deflection shall be a minimum of l ½ inches.

K. Suspended Fans and Air Conditioning Unit Fan Coils and Unit Ventilators: Suspend each integral unit from overhead structure on steel spring and elastomer hanger isolators. Support deflection under rated load of 3/8 inch. Provide spring static deflection as follows:

Fan RPM	**Min. Deflection**
200 – 400	3 inches
400 – 700	2 inches
Above 700	1 inches

L. Pipe Isolation: Where indicated and as required, furnish and support each pipe from an isolator. Isolator for the first five support locations away from vibrating equipment shall have the same deflection as the equipment isolators. After that, isolators shall be a neoprene-in-shear type of size as recommended by manufacturer; except where indicated on Drawings, pipe hanger rod shall be furnished with a steel spring isolator and elastomeric element, with lower rod capable of 30 degrees total misalignment without contact on spring housing.

M. Seismic Restraints: Floor or pad mounted equipment that do not require vibration isolators, shall be bolted to floor or other support. Floor mounted equipment with vibration isolators shall be provided with lateral and vertical restraining devices on all sides of base to restrict displacement of equipment. On all sides of suspended equipment, provide bracing for rigid supports and provide aircraft cable restraints for resiliently supported equipment.

N. Ductwork, duct acoustical lining, manual volume dampers and flexible ducts: Do not reduce length of duct runs, duct acoustical lining, manual volume dampers and flexible ducts for economy.

O. Installation of flexible ducts at air inlets and outlets: Do not attach flexible ducts directly to air inlets and outlets unless a straight, smooth and uniform air flow can be achieved with sufficient space to make an elbow with a radius of at least three times the diameter of the duct. If sufficient space is not available to make such an elbow, provide a rigid elbow or a lined plenum.

P. Placement of Air Devices: Do not relocate air devices without the Architect's approval.

3.02 EXAMINATION

A. Arrange for the services of a certified representative of isolation manufacturer to visit the Project site for inspecting installation of devices. In the event the isolators do not meet specified requirements perform necessary revisions. Submit a written report to the Architect, signed by above representative, indicating all devices are properly installed and are operating as specified or required by isolation manufacturer.

END OF SECTION

SECTION 23 0553

HVAC IDENTIFICATION

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: Marking and identification required on mechanical piping systems, ducts, controls, valves, apparatus, etc.

B. Related Requirements:

1. Division 01: General Requirements.

2. Section 23 0513: Basic HVAC Materials and Methods.

3. Section 23 0900: HVAC Instrumentation and Controls.

4. Section 23 3000: Air Distribution.

5. Section 23 8000: Heating, Ventilating and Air Conditioning Equipment.

1.02 SUBMITTALS

A. Submit in accordance with Division 01 and Section 23 0500: Common Work Results for HVAC.

B. Submit product data and installation instructions for each item specified.

C. Submit Samples of materials.

1.03 QUALITY ASSURANCE

A. Comply with provisions of:

1. Section 23 0500: Common Work Results for HVAC.

2. ANSI/ASME A13.1: Scheme for the Identification of Piping Systems.

3. APWA: Uniform Color Code.

Or

4. IAPMO: Uniform Plumbing Code (UPC).

PART 2 – PRODUCTS

2.01 MATERIALS

A. General: Piping systems, controls, valves, apparatus, etc., except those that are installed in inaccessible locations in partitions, walls, and floors, shall be permanently identified.

2.02 VALVES

A. Furnish prepared chart or diagram for each piping system, indicating by identifying letter or model number of each valve in the system, its location, and function.

B. Install charts in aluminum frame with clear glass front and secure on wall where designated by the Project Inspector.

C. Bind copies of each chart in operating instructions manual.

D. Provide each valve with a brass, aluminum, or plastic disc, not less than 1-1/4 inches diameter bearing engraved numbers corresponding to those indicated on chart. Fasten discs to valve with No. 14 brass wire.

E. Provide an additional tag for safety valves and other valves that could be hazardous to safety and health of occupants. Distinguish these tags from regular valve tags by color (such as yellow with black letters, and marked "Danger"); submit Sample tag to the Architect for review.

2.03 INSTRUMENTS AND CONTROLS

A. Identify panel-mounted instruments and controls with engraved bakelite nameplates permanently affixed to panel boards.

B. Identify alarm indicating devices and alarm reset devices by nameplates.

C. Identify damper motors and automatic valves, flow switches, pressure switches, etc., with embossed aluminum or plastic tape affixed to controller, indicating service and setting.

2.04 EQUIPMENT

A. Identify each major piece of equipment with engraved bakelite nameplates permanently affixed to the equipment, indicating the room numbers it services, Equipment identification designation shall be the same to its designation indicated on the “As-Built Drawings”. Room numbers in the nameplates shall correspond to the final room numbers.

2.05 ABOVE GRADE PIPE IDENTIFICATION

A. Identify pipes by means of colored labels with directional flow arrows and identification of the pipe content, in conformance to ANSI/ASME A13.1 or the UPC.

B. Materials: Precoiled acrylic plastic with clear polyester coating, all-temperature, self-adhering, as manufactured by Brady, Brimar Industries, Seton, Stranco, Inc., or equal.

C. Size:

Outside Diameter of Pipe or Insulation	Length of Color Field	Size of Letter
¾ to 1 ¼-inch	8-inch	½-inch
1 ½ to 2-inch	8-inch	¾-inch
2 ½ to 6-inch	12-inch	1 ¼-inch”
8 to 10-inch	24-inch	2 ½-inch”
over 10-inch	32-inch	3 ½-inch

D. Colors: As indicated in schedule.

E. Locations:

1. On accessible piping, whether insulated or not (including mechanical rooms, attic and ceiling spaces); except that labels shall be omitted from piping where contained material is obvious due to its connection to fixtures (such as faucets, water closets, etc.).

2. Near each valve and branch connection in such accessible piping.

3. At each pipe passage through wall or floor.

4. At not more than 20 feet spacing on straight pipe run between bands required in 2 and 3 above.

5. At each change in direction.

F. Application: Install on clean surfaces free of dust, grease, oil, or any material that will prevent proper adhesion. Replace non-adhering or curling labels with new labels, as required by the Project Inspector.

G. Schedule:

Content of Pipe	Legend	Background Color	Lettering Color

Air conditioning condensation drain	A/C condensate drain	Green	White
Refrigerant pipes	Refrigerant Liquid/Refri-gerant Suction	Yellow	Black

2.06 UNDERGROUND PIPE

A. Detectable Marking Tape:

1. Provide and install detectable marking tape along buried piping. Tape shall be specifically manufactured for marking and locating underground utilities with electronic equipment. Tape shall be acid and alkali resistant, and manufactured with integral wires or foil backing, encased with protective cladding. Tape shall be a minimum of two inches in width.

2. Manufacturer: Reef Industries, Inc., Advantage Brands, Inc., Northtown Company, Mutual Industries, Inc., or equal.

3. Detectable marking tape shall be color-coded per APWA Color Code:

a. Blue: Water.

b. Red: Electric power lines, cables, conduit and lighting cables. By Division 26.

c. Orange: Communication, alarm or signal cables. By Divisions 26 and 27.

B. Tracer Wire:

1. Solid copper wire type THWN, 12 AWG gage, with heat and moisture resistant insulation.

2.07 IDENTIFICATION OF AIR CONDITIONING EQUIPMENT

A. Provide identification markers to locate air conditioning equipment above T-bar ceilings. Install 3/4 inch to one inch diameter colored self-adhesive dots to T-bar ceiling grid indicating point of access. The following identification markers shall be recorded on the project record documents:

1. Fire Damper and Combination Fire/Smoke Fire Damper: Red.

2. Manual Volume Dampers, Relief Dampers, Motorized Volume Dampers: Blue.

a. Supply air: Full dot.

b. Return air: Half dot.

3. Fan coil unit: Green.

4. Filter Location if separate from fan coil: Yellow.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Correct detrimental conditions prior to commencing the Work of this Section. Install markers and identification tags as specified with materials and installation procedures recommended by manufacturer.

B. Place tracer wire on top of non-metal utility lines allowing some slack. Do not wrap tracer wire around pipe. Fasten tracer wire in place at approximately 10 feet on centers with non-metal ties.

C. Install underground detectable pipe marking tape continuously buried 8 to 10 inches above the buried utility pipe. Wrap tape on pipe risers up to a height of 12 inches above grade.

3.02 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 23 0700

HVAC INSULATION

PART 1 – GENERAL

1.01 SUMMARY

A. SECTION INCLUDES

1. Condensate drain piping from air conditioning equipment.

2. Refrigerant piping.

3. Supply and return air ducts for heating and cooling systems air ducts.

B. RELATED REQUIREMENTS

1. Division 01: General Requirements.

2. Section 23 0500: Common Work Results for HVAC.

3. Section 23 0513: Basic HVAC Materials and Methods.

4. Section 23 0553: Mechanical Identification.

5. Section 23 3000: Air Distribution.

6. Section 23 8000: Heating, Ventilating and Air Conditioning Equipment.

1.02 REFERENCES

A. American Society for Testing and Materials International (ASTM):

1. ASTM C167 - Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations.

2. ASTM C302 - Standard Test Method for Density and Dimensions of Preformed Pipe-Covering-Type Thermal Insulation.

3. ASTM C411 - Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

4. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

5. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.

6. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

7. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.

8. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

9. ASTM C739 - Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation.

10. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).

11. ASTM C1104 - Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.

12. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

13. ASTM E795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests.

14. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. Underwriters Laboratories Inc.:

1. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors.

2. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

C. National Fire Protection Association:

1. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems .

2. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

3. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

1.03 SUBMITTALS

A. Submit in accordance with Division 01 and Section 23 0500: Common Work Results for HVAC.

1. Complete material list of items to be furnished and installed under this Section.

2. Manufacturer's specifications and other data required demonstrating compliance with the specified requirements.

3. Shop Drawings, catalog cuts and manufacturer's data indicating insulation, jacketing, adhesives, and coating. Insulating materials shall be certified by manufacturer to comply with the California quality standards for insulating materials.

4. Display sample cutaway sections.

5. Manufacturer's recommended method of installation procedures, which will become part of this Section.

1.04 QUALITY ASSURANCE

A. Qualifications of Manufacturer and Installer, Materials, Fabrication, Execution, and Standard of Quality: Comply with provisions stated under Section 23 0500: Common Work Results for HVAC and Section 23 0513: Basic HVAC Materials and Methods.

B. Insulation Work shall be in accordance with the California Building Energy Efficiency Standards, CBC, and Uniform Mechanical Code.

C. Test Ratings:

1. Comply with provisions stated under Section 23 0500 and 23 0513 with emphasis on ASTM E84, NFPA 255, or UL 723. ASTM C167, ASTM C302, UL label or listing of satisfactory test results from the National Institute of Standards and Technology, or a satisfactory certified test report from an acceptable testing laboratory. Approval by the State Fire Marshal is required.

2. Furnish labels, legibly printed with the name of the manufacturer or listings indicate that fire hazard ratings do not exceed those specified for materials proposed for installation. Flame spread index of not more than 25 and smoke developed rating not exceeding 50.

3. Tests shall be performed on each item individually when insulation, vapor barrier covering, wrapping materials, or adhesives are installed separately at the Project site.

4. Test insulation, vapor barrier covering, wrapping materials and adhesives as an assembly when they are factory composite systems.

D. Regulatory Requirements: Insulation furnished and installed under this Section shall meet minimum legal requirements of the Building Energy Efficiency Standards adopted and incorporated in the California Energy Commission, Title 24, Part 2, Chapters 2 through 53, unless otherwise noted, for the piping, ductwork, and equipment.

E. All chemically based products such as sealers, primers, fillers, adhesives, etc. must meet the California air quality regulations.

1.05 PRODUCT HANDLING

A. Protection, Replacement, Delivery and Storage: Comply with provisions stated under Sections 23 0500: Common Work Results for HVAC and 23 0513: Basic HVAC Materials and Methods.

PART 2 – PRODUCTS

2.01 MATERIALS

A. General:

1. Insulating material shall be fire resistant, non-corrosive, shall not break, settle, sag, pack or disintegrate under vibration, nor absorb more than 1 percent moisture by weight.

2. Insulating material shall be furnished with thickness indicated in Table 1, and shall furnish thermal resistance in the range of R-4.0 to 4.6 in accordance with inch at 75 degrees F. For any other value of R, insulation thickness shall be calculated accordingly and submitted for review.

3. Asbestos in any quantity in insulating material is not permitted.

4. Provide insulation materials, adhesives, coatings, sealants, fitting covers, and other accessories with a fire hazard rating not to exceed 25 for flame spread, 25 for fuel contributed and 50 for smoke developed, except for materials listed as follows:

a. Nylon anchors for installing insulation to ducts or equipment.

b. Treated wood blocks.

5. Flame-proofing treatments subject to moisture damage are not permitted.

TABLE 1 - MINIMUM PIPING INSULATION THICKNESS (1)

Insulation Thickness Required (in inches)
Space Heating Systems (Steam, Steam Condensate and Hot Water)

Piping System Type	**Temp. Range (degrees F)**	**Run-outs up to 2** (2)	**1 and less**	**1.25 to 2**	**2.5 to 4**	**5 to 6**	**8 and larger**
Hi Pres Temp	Above 350	1.5	2.5	2.5	3.0	3.5	3.5
Med Pres Temp	251 to 305	1.5	2.0	2.5	2.5	3.5	3.5
Low Pres Temp	201 to 250	1.0	1.5	1.5	2.0	2.0	3.5
Hot Water	Up to 200	0.5	1.5	1.5	1.5	1.5	1.5
Steam Cond.	-	0.5	1.0	1.0	1.0	1.5	1.5

Service Water Heating Systems (recirculating, piping supply and return)							
Hot Water	Up to 180	0.5	1.0	1.0	1.5	1.5	1.5
Space Cooling Systems (Chilled water, Brine and Refrigerant)							
Chilled Water	40-60	0.5	0.5	0.75	1.0	1.0	1.0
Refrigerant/Brine	Below 40	1.0	1.0	1.5	1.5	1.5	1.5
Condensate Drain	1/2 inch Minimum insulation thickness.	0.5	0.5	0.5	0.5	0.5	0.5
From Air Conditioning Equipment:	Insulate condensate drain lines within building, in room, inside walls and above ceilings.	0.5	0.5	0.5	0.5	0.5	0.5

NOTES: (1) For piping exposed to ambient temperatures, increase thickness by 0.5 inch.

(2) Run-outs to individual terminal units, not exceeding 12 feet in length.

B. Lagging Adhesives: Shall be nonflammable and fire-resistant and shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. Insulation finished with canvas shall be provided with laps adhered in accordance to manufacturer's recommendation. A finish coat of same material shall be applied to entire outer surface of lagging cloth at coverage specified by manufacturer.

C. Canvas Jackets: Furnish 6 ounce in accordance with square foot minimum, 48 by 48 thread count canvas jacketing.

D. Insulation Jackets:

1. Exterior insulation exposed to weather shall be weatherproofed with Childers aluminum jacketing as basis of design, or Pabco, RPR, or equal. Jacketing shall be manufactured from 1100, 3105 or 5010 aluminum alloy with 3/16 inch corrugations. Smooth or embossed jackets may be permitted in special situations to match an existing installation. Jacketing shall be furnished with an integrally bonded moisture barrier over entire surface in contact with insulation. A minimum thickness of 0.016 aluminum jacketing is to be provided on ducts and piping. A minimum thickness of 0.020 shall be provided on tanks, equipment, and heat exchangers.

2. Insulated elbows, of 90 degrees and 45 degrees, with a nominal iron pipe size of ½ inch to 8 inches shall be provided with Childers aluminum Ell-Jacs insulation covers as basis of design, or Pabco, RPR, or equal, manufactured from 1100 aluminum alloy of 0.024 inch thickness. Insulated elbows with a nominal pipe size of 10 inches to 18 inches shall be provided with Childers 4-piece aluminum Ell-Jacs as basis of design, or Pabco, RPR, or equal.

3. Tees, Flanges, and Valve Insulation in Conjunction with Aluminum Jacketing: Furnish Childers Aluminum Special Fabrications Insulation Covers as manufactured by Childers Products Company, Pabco, RPR, or equal.

E. Adhesives: Adhesives shall be water based, UL Classified, meet the requirements of NFPA 90A and NFPA 90B, have been tested according to relevant ASTM requirements, and be acceptable to the State Fire Marshal. Name, type and method of installation shall be submitted for review.

F. Valve and Fitting Cover: When installed in conjunction with PVC jacketing, furnish Zeston 25/50 rated polyvinyl chloride fitting covers as manufactured by Johns Manville, Knauf Insulation, Speedline, or equal.

2.02 SPACE HEATING PIPING SYSTEM

(Not Used)

2.03 COOLING PIPING SYSTEM INSULATION

A. General: Insulate refrigerant piping.

B. Materials:

1. Classes of Insulation:

a. Class A: Expanded polystyrene pipe insulation, self-extinguishing type, either molded or extruded; Dow Chemical Co. STYROFOAM, ITW Insulation Systems XPS PIB, Foam-Control EPS, or equal.

b. Class B: Glass fiber molded pipe insulation ASTM C547. Pipe insulation shall be one piece, preformed, and provide a minimum R factor of 4 at 75 degrees F mean temperature. Insulation shall be faced with all-purpose fire retardant vapor barrier jacket. Pipe insulation shall be Johns Manville Micro-Lok, CertainTeed Snap-On, Owens Corning FIBERGLAS SSL II-ASJ, or equal.

c. Class C: Expanded (foamed) urethane (polyurethane) or polyisocyanurate pipe insulation of self-extinguishing type molded or fabricated, Dyplast Products, LLC ISO-C1/2.0, ITW Trymer, Specialty Products & Insulation Co. Polyisocyanurate Pipe Insulation, Armacell Armalok, or equal.

d. Class D: Foamed plastic pipe insulation, self-extinguishing type, ASTM C534 Type 1 - tubular. Pipe insulation shall be one-piece preformed, flexible tubing type and provide a maximum K factor of 0.28 at 75 degrees F mean temperature. Pipe insulation shall be Armacell Armaflex, Aeroflex Aerocel, Rubatex INSUL-TUBE 180, or equal.

2. Locations and Class of Insulation Required: For thickness required, refer to Table 1 of this Section.

TABLE 3 – SERVICE, LOCATION AND CLASS OF INSULATION REQUIRED

SERVICE	LOCATION	CLASS OF INSULATION
Condensate drains from air conditioning equipment	Indoors at all locations including above ceilings and between stud walls	D
Refrigerant suction Liquid line as required	All locations except underground	D
All other piping, except underground	All locations except underground	A, B, C

3. Adhesives:

a. Polystyrene adhesives: Synthetic rubber and resin adhesives specifically designed to adhere extruded and expanded rigid polystyrene and urethane insulation to themselves and to other porous and non-porous substrates.

b. Vapor barrier laps and penetrations: Furnish protective coating and lagging adhesive on butt joints of foil-faced vapor barriers, and where pins and staples puncture facings.

2.04 HIGH TEMPERATURE EQUIPMENT INSULATION

(Not Used)

2.05 LOW TEMPERATURE EQUIPMENT INSULATION

(Not Used)

2.06 DUCTWORK AND PLENUM INSULATION

A. General: Insulate ductwork and plenums with not less than the amount of insulation tabulated in Table 4. Insulation may be omitted under the following conditions:

1. Exposed return air ductwork in conditioned space.

2. Return air ductwork between wall studs inside an interior wall.

TABLE 4 - INSULATION OF DUCTS AND PLENUM

INSULATION TYPES

Duct Location	Heating and Cooling
On roof or exterior of building	L2
Attics, Garages, and Crawl Spaces	F-3 or L-2 See Note 3

In walls, within floor-ceiling spaces	F-1 or L-1 See Note 3
Hot and cold plenums	F-2 or L-2 See Note 3
Within unconditioned space or in basement	F-3 or L-2 See Note 3

B. Insulation Types:

1. F-1: 1 ½ inch blanket fiberglass, factory-laminated with all-service jacket vapor barrier.

2. F-2: 2 inch blanket fiberglass, factory-laminated with all-service jacket vapor barrier.

3. F-3: 3 inch blanket fiberglass, factory-laminated with all-service jacket vapor barrier.

4. L-1: 1 inch internal duct lining. Flexible type for ducts and rigid board for plenums.

5. L-2: 2 inch internal duct lining. Flexible type for ducts and rigid board for plenums. Duct joints shall be waterproofed.

C. Notes:

1. Minimum insulation provided shall be as required by the current California Administrative Code Title 24 for the most restrictive condition.

2. Refer to the materials indicated in this section for external insulation and internal lining.

3. External insulation shall be replaced with internal duct lining (of equivalent thermal resistance value unless noted otherwise) where indicated on the drawings or specified elsewhere for sound attenuation.

4. Provide internal duct lining (1 inch unless noted otherwise) where indicated on the drawings or specified elsewhere for sound attenuation.

D. Materials:

1. Fire-Resistive Insulation Materials and Coatings: Submit State Fire Marshal pre-approved materials only.

2. Adhesives: See Paragraph 2.01.E for applicable products.

3. External Insulation: Provide glass fiber blankets that are factory-laminated with Foil Reinforced Kraft (FRK) vapor barrier facing; Johns Manville Microlite, Owens-Corning SOFTR Duct Wrap, Knauf Insulation Friendly Feel Duct Wrap, or

equal. Provide a minimum installed R value as required by the CEC Building Energy Efficiency Standards; but not less than scheduled below:

TABLE 5
INSULATION OF DUCTS AND PLENUM INSTALLED
THERMAL RESISTANCE R VALUES

Type	Labeled Thickness	Installed R Value (hr.ft^2.°F/Btu)
F1	1 ½-inch”	4.2
F2	2-inch	5.6
F3	3-inch	8.3
L1	1-inch	4.2
L2	2-inch	8.3

4. Internal Lining: Acoustic duct liner and liner board, or equal; Johns Manville Permacote Linacoustic, Johns Manville Spiracoustic Plus, Owens Corning QuietR Rotary Duct Liner, or equal. Internal lining shall conform to:

   a. Fire Safety Standards: NFPA 90A and 90B.

   b. Operating Temperature: ASTM C411.

   c. Air velocity: ASTM C1071, UL 181.

   d. Fire Hazard Classification: ASTM E84, UL 723-Class 1, NFPA 255.

   e. Corrosion Resistance: ASTM C739 and ASTM C665.

   f. Fungi Resistance: ASTM G21.

   g. Water Vapor Sorption: ASTM C1104, less than 1 percent by weight.

   h. Formaldehyde, Phenolic Resins or other Volatile Organic Compounds: 0 percent.

   i. Minimum R value as required by the latest edition of the California Energy Efficiency Standards, but not less than 4.0 at 75 degrees F.

   j. Acoustical Performance: ASTM C423 & ASTM E795 Minimum NRC of 0.75 for interior spaces, minimum NRC of 0.90 for exposed to weather.

   k. Hot and cold plenums separated by single partition: Minimum NRC of 0.75, both sides.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Except as specified herein, install material in accordance with recommendations of manufacturer. Do not install insulation materials until tests specified in other sections are completed. Remove foreign material such as rust, scale, or dirt. Surfaces shall be clean and dry. Maintain insulation clean and dry at all times.

B. On cold surfaces where a vapor barrier must be provided and maintained, insulation shall be installed with a continuous, unbroken moisture and vapor seal. Hangers, supports, anchors, or other projections that are fastened to cold surfaces shall be insulated and vapor sealed to prevent condensation.

C. Surface finishes shall be extended in such a manner as to protect raw edges, ends, and surfaces of insulation.

D. Pipe or duct insulation shall be continuous through walls, ceiling or floor openings, or sleeves; except where fire-stop or fire-safing materials are required.

E. Metal shields shall be installed between hangers or supports and the piping insulation. Rigid insulation inserts shall be installed between the pipe and the insulation shields. Inserts shall be of equal thickness to adjacent insulation and shall be vapor sealed accordingly.

F. Insulation shall not be installed in the following locations unless otherwise noted:

1. On vacuum return lines less than 50 feet long.

2. On unions, flanged connections or valve handles.

3. Over edges of any manhole, clean-out hole, clean-out plug, access door or opening to a fire damper, so as to restrict opening or identification of access.

4. Over any label or stamp indicating make, approval, rating, inspection, or similar data, unless provision is made for identification and access to label or stamp.

3.02 INSTALLATION OF HEATING PIPING SYSTEM INSULATION

(Not Used)

3.03 INSTALLATION OF COOLING PIPING SYSTEM INSULATION

A. General: Refrigerant piping and condensate drain lines, after having been tested, shall be cleaned and insulated.

B. Application: Insulation on refrigerant suction lines and liquid lines, if indicated, and air conditioner interior drain lines shall be jacketed with fire-resistant vapor barrier of laminated aluminum foil consisting of 2 plies with glass-yarn reinforcing. Jacket joints shall be lapped and sealed with an approved adhesive. Insulation shall be secured with aluminum bands not less than 0.005 inch thick by 3/4 inches wide, spaced not over 12 inches on centers, or as recommended by manufacturer.

1. Longitudinal Seams: Butt hinged sections of covering tightly together and seal down jacket flap with adhesive, or with factory-applied, self-sealing lap with pressure-sensitive sealer protected with release paper.

2. End Joints: Wrap joint with a 3-inch wide (minimum) self-sealing tape.

3. Fittings and Valves: Fittings and valves shall be covered with same material of same thickness as pipe insulation, sealed with an approved, vapor-sealing tape or compound and covered with Johns Manville Zeston polyvinyl-chloride cover, Knauf Insulation Proto PVC Fitting Cover, Speedline Polyco Smoke Safe, or equal.

4. Pipe hangers shall be insulated or attached to pipe by an insulating insert, butted between adjoining insulation sections.

C. Additional Jackets:

1. Exposed Indoor Insulation: Cover with 26 gage galvanized sheet metal jacket to 8 feet above floors, except in mechanical equipment rooms and accessible pipe tunnels.

2. Exposed Outdoor Insulation: In addition to canvas or fiberglass cloth cover, provide 0.016 inch thick aluminum jacket with one inch wide aluminum bands and seals. Install appropriate jackets on valves and fittings.

3.04 INSTALLATION OF HIGH TEMPERATURE EQUIPMENT INSULATION

(Not Used)

3.05 INSTALLATION OF LOW-TEMPERATURE EQUIPMENT INSULATION

(Not Used)

3.06 INSTALLATION OF DUCTWORK AND PLENUM INSULATION

A. External Covering:

1. Before installing duct insulation, sheet metal ducts shall be clean, dry, and tightly sealed at joints and seams.

2. Duct exterior insulation shall be firmly wrapped around ductwork with joints lapped a minimum of 2 inches. Insulation shall be securely fastened with 18 gage copper-lined steel wire, or 16 gage soft-annealed galvanized wire spaced approximately 12 inches on centers and at loose ends, presenting a neat and workmanlike appearance. Where duct width is such that wiring will not fasten insulation firmly against duct an adhesive shall be furnished to fasten insulation to duct with wiring being installed at ends of insulation segment.

3. Duct insulation in finished rooms shall be covered with wrapped fiberglass cloth cover. Install on each corner of duct 26 gage galvanized steel small

nose, wide flange corner bead of appropriate height. In unfinished rooms, the insulation shall have a vinyl or similar coating. In all rooms, insulation shall be fastened to the ducts with an approved adhesive instead of wire. Corners shall be cut and formed instead of bending the insulating material. Raw edges shall be taped.

4. Insulation on ductwork transporting conditioned air, both supply and return, and outside air intake ducts shall be furnished with a factory-applied, fire-resistant vapor barrier.

5. Exposed Ducts or Plenum:

a. Install insulation to ducts or plenum furnished with butt joints, without voids and with adhesive over entire surface of duct. Cover insulation with canvas jacket, fastened tightly to insulation with lagging adhesive. Install 2 finish coats of undiluted adhesive.

b. When installing jacket, finished covering shall be even and level, without humps, with constant diameters on round ducts maintained.

c. For non-lined insulated ducts or plenums exposed to weather: Insulation finish shall be 0.016 inch thick aluminum sheet with joints lapped not less than 3 inches, sealed, and secured with 6 gage by 3/8 inches aluminum sheet metal screws, or aluminum handgun-type rivets.

B. Lining General:

1. Floors of cold plenums and fan enclosure plenums shall not be insulated.

2. Cover short damper sections on lined ducts on outside to permit free operation of dampers and linkage.

3. Dimensions of ducts indicated are net inside dimensions and must include thickness of duct liners to obtain the required duct size.

4. Install insulation in square turns, where required, to cover interior surfaces before duct turns are installed.

C. Interior insulation (lining) of ducts shall be as specified in above.

1. Liner material installed during fabrication of duct with sealed face only exposed to air stream. Insulation shall be fastened to sheet metal with an approved fire-retardant adhesive, with minimum 90 percent coverage and edges firmly adhered. Mechanical fasteners shall supplement the adhesive on top sections of ducts more than 12 inches wide and on sides of ducts more than 24 inches high, and shall be spaced on 16-inch centers maximum. Fastener posts shall be cut off approximately ¼ inch from metal disc.

D. Interior insulation in ducts or plenums shall not have exposed edges. Edges open to entering or leaving air streams shall be covered, secured in place and sealed with approved duct liner edge sealers.

3.07 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.08 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

END OF SECTION

SECTION 23 0800

HVAC SYSTEMS COMMISSIONING

PART 1 – GENERAL

1.01 SUMMARY

A. SECTION INCLUDES

1. General requirements for Commissioning (Cx) of HVAC systems and equipment including installation, start-up, testing, documentation, and training according to the Construction Documents.

2. Standard procedures for the execution of commissioning work shall be in conformance with Division 01, Section 01 9113: General Commissioning Requirements. Coordinate work with the Commissioning Agent (CxA).

B. RELATED REQUIREMENTS

1. Division 01: General Requirements.

2. Section 01 4523: Testing and Inspection.

3. Section 01 4525: Testing, Adjusting, and Balancing for HVAC.

4. Section 01 7900: Maintenance and Operations Staff Demonstration and Training.

5. Section 01 9113: General Commissioning Requirements.

6. Section 23 0500: Common Work Results for HVAC.

7. Section 23 3000: Air Distribution.

8. Section 23 8000: Heating, Ventilating and Air Conditioning Equipment.

9. Section 26 0500: Common Work Results for Electrical.

10. Section 26 0513: Basic Electrical Materials and Methods.

11. Section 26 0519: Low Voltage Wires (600 Volt AC).

12. Section 26 0526: Grounding and Bonding.

13. Section 26 0586: Motors and Drives.

14. Section 26 0800: Electrical Systems Commissioning.

15. Project Commissioning Plan (CxP).

1.02 REFERENCES

A. Applicable codes, standards, and references: inspections and tests shall be in accordance with the following applicable codes and standards:

1. InterNational Electrical Testing Association – NETA.

2. National Electrical Manufacturers Association – NEMA.

3. American Society for Testing and Materials – ASTM.

4. Institute of Electrical and Electronics Engineers – IEEE.

5. American National Standards Institute – ANSI.

6. National Electrical Safety Code – NESC.

7. California Building Code – CBC.

8. California Electrical Code – CEC.

9. California Mechanical Code – CMC.

10. Insulated Cables Engineers Association – ICEA.

11. Occupational Safety and Health Administration – OSHA.

12. National Institute of Standards and Technology – NIST.

13. National Fire Protection Association – NFPA.

14. American Society of Heating and Air-Conditioning Engineers – ASHRAE

(The HVAC Commissioning Process, ASHRAE Guideline).

15. Associated Air Balance Council – AABC (National Standards for Total System Balance).

1.03 SUBMITTALS

A. Submittals package shall include the following:

1. Commissioning required submittals in accordance with Division 01 Specification Sections.

2. Copy of the Architect's reviewed and accepted submittals to the CxA via the OAR.

3. List of team members who will represent the Contractor in the Pre-functional Equipment Checks (PEC) and Functional Performance Tests (FPT), at least six weeks prior to the start of Pre-functional Equipment Checks.

4. Detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, a copy of full details of Owner-contracted tests, full factory testing reports, if any, and Warranty information, including responsibilities of Owner to keep Warranty in force clearly defined.

5. Installation and checklist documentation shipped with equipment and field checklist forms to be used by factory or field technicians.

6. Detailed manufacturer's recommended procedures and schedules for PECs, supplemented by Contractor's specific procedures, and FPTs, at least four weeks prior to the start of PEC.

1.04 MEETINGS, SEQUENCING AND SCHEDULING

A. Meetings: Attend the Cx meetings as required under Section 01 9113 and Cx Plan.

B. Sequencing and Scheduling: The work described in this Section shall begin only after work required in related Divisions 23 and 26 Sections has been successfully completed and tests, inspection reports, and Operation and Maintenance manuals required have been submitted and accepted. The start-up and PEC shall be completed and submitted to the Owner at least two weeks prior to beginning FPT.

1. Coordinate HVAC work with the work of other trades prior to scheduling of any Cx procedures.

2. Coordinate the completion of HVAC testing, inspection, and calibration prior to start of Cx activities.

1.05 QUALITY CONTROL

A. Comply with Division 01 quality control specifications.

B. Incorporate manufacturer's recommended Cx procedures for the systems and equipment to be commissioned under this Section.

C. Comply with Section 01 4525: Testing, Adjusting, and Balancing for HVAC.

1.06 EQUIPMENT AND SYSTEMS TO BE COMMISIONED

A. Split Systems.

B. Make Up Air Units, with gas fired heat and evaporative cooling.

C. Fan Coil Units.

D. Single Package Gas Heating Electric Cooling Units.

E. Variable Volume and Temperature System.

F. Exhaust Fans.

G. Ventilators.

H. Pumps.

I. Water Heaters, Gas and Electric.

J. Air Conditioning Units.

PART 2 – PRODUCTS

2.01 TEST EQUIPMENT

A. Equipment to be utilized in the commissioning process shall meet the following requirements:

1. Provide test equipment as necessary for the testing of the equipment and systems to be commissioned.

2. Provide testing equipment and accessories that are free of defects and certified for use.

3. Provide testing equipment with current calibration labels as per NIST Standards.

4. Equipment shall be calibrated on the manufacturer’s recommended intervals with calibration tags affixed to the instrument. In the absence of calibration tags, calibration documentation shall be submitted to the CxA at least thirty days prior to use; this documentation shall include description and serial number of instrument and calibration data and date.

5. Testing equipment shall be maintained in good operating condition for the duration of the project.

PART 3 – EXECUTION

3.01 COMMISSIONING PROCESS REQUIREMENTS

A. Work to be performed prior to commissioning:

1. Complete phases of the work so the system(s) can be started, tested, adjusted, balanced, and otherwise commissioned.

2. If modifications or corrections to the installed system(s) are required to bring the system(s) to acceptance levels due to Contractor's incorrect installation or defective materials, such modifications shall be made at no additional cost to the Owner.

3. Normal start-up services required to bring each system into full operational state:

a. Testing, motor rotation check, control sequences of operation, full and part load performance.

b. Commissioning shall not start until each system is complete and start-up has been performed.

B. Pre-Commissioning responsibilities:

1. Inspection, calibration and testing of the equipment required to commission the following systems:

a. HVAC System(s).

C. Commissioning Process Requirements:

1. Refer to Section 01 9113: General Commissioning Requirements and related Sections for information on meetings, start-up plans, Pre-Functional and FPT, operations and maintenance data, training requirements, and other Cx activities.

3.02 PREPARATION

A. Provide certified HVAC technicians as required, with tools and equipment necessary to perform Cx activities specified.

B. Provide certified testing agency personnel and equipment factory representatives as require in the Cx plan and other related Sections.

C. Verify that work required in this Section and in Section 01 9113 is complete prior to starting of FPT.

D. Verify that complete operational manuals have been reviewed and accepted by the CxA as specified before starting FPT.

3.03 TESTING

A. Testing procedures shall include the following minimum information:

1. Test number.

2. Equipment used for the test, with manufacturer and model number and date of last calibration.

3. Date and time of the test.

4. Indication of whether the record is for a first test or retest following correction of a problem or issue.

5. Identification of the system, subsystem, assembly, or equipment.

6. Conditions under which the test was conducted, including (as applicable); ambient conditions, set points, override conditions, status, and operating conditions that impact the results of the test.

7. Systems and assemblies test results and performance and compliance with contract requirements.

8. Issue number, if any, generated as the result of the test.

9. Name(s) and signature(s) of witnesses and the person(s) performing the test.

B. Contractor shall participate and perform Cx related testing requirements as specified.

C. General Requirements for Mechanical, Controls, and Testing and Balance:

1. Construction and Acceptance Phases:

a. Provide assistance to CxA in preparing FPT procedures specified. Sample test forms are include in the project Cx Plan.

b. Develop full startup and initial checkout plan using manufacturer's start-up procedures and Cx checklists for commissioned equipment. Submit to CxA for review and approval prior to startup.

c. During startup and initial checkout process, execute mechanical-related portions of PEC for the equipment and systems to be commissioned.

d. Perform and clearly document completed startup and system operational checkout procedure. Providing four copies of the results to the Owner.

e. Resolve any open punch list items before FPT. Air testing and balance shall be completed with discrepancies and problems remedied before FPT of respective air -related systems.

f. Provide skilled technicians to execute starting of equipment and to execute PFT. Ensure that technicians are available and present during agreed upon schedules and for sufficient duration to complete necessary tests, adjustments, and solutions to identified problems.

g. Maintain a log of events and issues of tests and related Cx activities. Submit handwritten reports of discrepancies, deficient or uncompleted work by others, contract interpretation requests, and lists of completed tests as specified.

h. Correct open issues and re-test as needed to prove compliance with system operational standards.

i. Prepare Operation and Maintenance Manuals and provide training for the Owner maintenance personnel and end-users per Section 01 7900.

j. Coordinate with equipment manufacturers to determine specific requirements to maintain validity of Warranty and notify the Owner.

k. Execute simulated seasonal FPT, witnessed by the Owner and the CxA, as specified. Document results and perform corrections as needed for system acceptance and make necessary adjustments to Maintenance and Operations Manuals and Record Drawings.

3.04 SENSOR CALIBRATION

A. Field-installed temperature, relative humidity, CO_2, pressure sensors, pressure gages, and actuators (dampers and valves) shall be calibrated using the methods described below. Calibration procedures shall be documented during execution of the Start-up and the PEC. Alternate methods may be used, if approved by the CxA.

B. Test instruments shall have had a NIST certified calibration within the last 12 months. Sensors installed in the unit at the factory with provided calibration certification need not be field calibrated.

C. Sensors:

1. Verify that sensor locations are appropriate and away from causes of erratic operation.
2. Verify that sensors with shielded cable are grounded only at one end.
3. For sensor pairs that determine a temperature difference, make sure they are reading within 0.2 degrees F of each other.
4. For sensor pairs that determine a pressure difference, make sure they are reading within 2 percent of each other.
5. Calibration: Put the equipment in operation. Make a reading with a calibrated test instrument within six inches of the site sensor. Verify that the sensor reading (via the permanent thermostat or gage) is within the tolerance listed in the table below of the instrument-measured value. If not, calibrate or replace sensor.
6. Tolerances:

Sensor	Required Tolerance (+/-)
AHU wet bulb or dew point	2.0 degrees F
Outside air, space air, duct air temps	0.4 degrees F
Watt-hour, voltage, and amperage	1 percent of design
Pressures, air, water and gas	3 percent of sensor range (inc. design value)
Flow rates, air	10 percent of sensor range (inc. design value)
Flow rates, natural gas	5 percent of sensor range (inc. design value)
Relative humidity	4 percent
CO_2 monitor	100 ppm
Sound level	5 db - Type 1 meter (Per Calibrator Mfg.)
Domestic Hot Water Temperature	1.5 degrees F
Domestic Hot Water Pressures Water and Gas	3 percent of sensor range (inc. design value)
Flow Rates, Domestic Water	4 percent of sensor range (inc. design value)
Flow Rates	5 percent of sensor range (inc. design value)

3.05 ADJUSTING

A. Perform work required to rectify installations not meeting contract requirements at no additional cost to the Owner.

B. Corrective work shall be completed in a timely manner to permit completion of the Cx process.

C. If systems' Cx deadline, as defined in the Project Schedule, goes beyond the scheduled completion without resolution of the problem(s), the Owner reserves the right to obtain supplementary services or equipment to resolve the problem.

3.06 TRAINING

A. Provide training plan for systems to be commissioned as required in applicable Division 23 specification sections and Section 01 7900.

END OF SECTION

SECTION 23 0813

ENVIRONMENTAL CONTROLS AND ENERGY MANAGEMENT SYSTEMS COMMISSIONING

PART 1 – GENERAL

1.01 SUMMARY

A. SECTION INCLUDES

1. General requirements for the Commissioning (Cx) of the Environmental Controls and Energy Management System (ECEMS), and interfacing with other systems such as, lighting controls and HVAC systems interconnection, including installation, start-up, testing and documentation according to Construction Documents and Commissioning Plan (CxP).

2. Standard procedures for the execution of commissioning work shall be in conformance with Division 01, Section 01 9113: General Commissioning Requirements. Coordinate work with the Commissioning Agent (CxA).

B. RELATED REQUIREMENTS

1. Division 01: General Requirements.

2. Section 01 4523: Testing and Inspection.

3. Section 01 7700: Contract Closeout.

4. Section 01 7900: Maintenance and Operations Staff Demonstration and Training.

5. Section 01 9113: General Commissioning Requirements.

6. Section 23 0500: Common Work Results for HVAC.

7. Section 23 0513: Basic HVAC Materials and Methods.

8. Section 23 0800: HVAC Systems Commissioning.

9. Section 23 0900: Instrumentation and Controls.

10. Section 23 0923: Environmental Controls and Energy Management Systems.

11. Section 23 3000: Air Distribution.

12. Section 23 8000: Heating, Ventilating and Air Conditioning Equipment.

13. Section 26 0500: Common Work Results for Electrical.

14. Section 26 0513: Basic Electrical Materials and Methods.

15. Section 26 0519: Low Voltage Wires (600 Volt AC).

16. Section 26 0526: Grounding and Bonding.

17. Section 26 0586: Motors and Drives.

18. Section 26 0800: Electrical Systems Commissioning.

19. Section 26 2419: Motor Control Centers and Motor Control Devices.

20. Project Commissioning Plan.

1.02 REFERENCES

A. The latest version of applicable codes, standards, and references: Inspections and tests shall be in accordance with the following applicable codes and standards, except as provided otherwise herein:

1. National Electrical Manufacturers Association – NEMA.
2. American Society for Testing and Materials – ASTM.
3. American National Standards Institute – ANSI.
4. California Electrical Code – CEC.
5. Occupational Safety and Health Administration – OSHA.
6. National Institute of Standards and Technology – NIST.
7. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). – Building Management and Energy Management Systems Commissioning, ASHRAE Guideline.
8. California Building Code – CBC.
9. California Mechanical Code – CMC.
10. InterNational Electrical Testing Association (NETA) Acceptance Testing.

1.03 SUBMITTALS

A. Submittals shall include the following:

1. Required Cx submittals in accordance with Division 01 Specifications.
2. Copy of the Architect's reviewed and accepted submittals to the CxA via the OAR.
3. List of team members who will represent the Contractor in the Pre-functional and Functional Performance Testing, at least two weeks prior to the start of Pre-functional Equipment Checks.
4. Detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, checklist documentation and field checklist forms to be used by factory or field technicians, and a copy of full details of Owner-contracted tests, full factory testing reports, if any, and Warranty information, including responsibilities of Owner to keep Warranty in force, clearly defined.
5. Detailed manufacturer's recommended procedures and schedules for Pre-functional Equipment Checks, supplemented by Contractor's specific procedures, and Functional Performance Tests, at least four weeks prior to the start of Pre-functional Performance Tests.
6. System logic documentation and sequence of operations for review and approval.
7. Provide Level 1 passwords.
8. After facility's commission is complete, submit completed Pre-functional Equipment Checklists and Functional Performance Test checklists organized by system and by subsystem. Bind information in a single package. The results of failed tests shall be included along with a description of the corrective actions taken.

1.04 MEETINGS, SEQUENCING AND SCHEDULING

A. Meetings: Attend Cx meetings as required under Section 01 9113, any other related Sections and the CxP.

B. Sequencing and Scheduling: The work described in this Section shall begin only after work required in related Division 23 and 26 Sections have been successfully completed, and tests, inspection reports and Operation & Maintenance manuals required have been submitted and reviewed. The start-up and Pre-functional Equipment Checklists shall be completed and submitted to the Owner's Authorized Representative (OAR) prior to the Functional Performance Tests.

1. Coordinate electrical work with the work of other trades prior to scheduling of any Cx procedures.

2. Coordinate the completion of electrical testing, inspection, and calibration prior to start of Cx activities.

3. Cx activities shall be scheduled in accordance with project's Section 01 9113 and Cx plan.

1.05 QUALITY CONTROL

A. Comply with Owner's Quality Control Specifications.

B. Incorporate manufacturer's recommended Cx procedures for the systems and equipment to be commissioned under this Section.

C. Typical quality control procedures include but are not limited to the following:

1. Attend CxA progress and coordination meetings.

2. Establish trend logs of system schedules as required in Section 23 0923.

3. Demonstrate system operation and compliance with contract documents.

4. Manipulate systems and equipment to facilitate testing.

5. Provide instrumentation necessary for verification and performance testing.

D. Provide ECEMS technician(s) to work at the direction of the CxA for software optimization assistance for a minimum of 8 hours. Refer to Part 3 for a description of the software optimization.

E. Compensation for Retesting: Compensate Owner for site time necessitated by incompleteness of systems or equipment at time of Functional Performance Testing (FPT). Testing failures, which require on-site time for retesting, will be considered actual damages to the Owner. Parties under contract with the Owner who are affected by the retesting shall be included in the contract modification.

F. Allow sufficient time before final commissioning dates to complete electrical testing, inspection, and calibration to avoid delays in the commissioning process.

G. During the commissioning activities, provide labor and materials to make corrections when required, without undue delay.

1.06 COORDINATION

A. Coordinate the completion of electrical testing, inspection, programming and calibration prior to start of commissioning activities.

B. Coordinate factory field-testing per the requirements of this Section.

C. Coordinate commissioning efforts with CxA prior to commencing any activities.

PART 2 – PRODUCTS

2.01 TEST EQUIPMENT

A. Equipment to be used in the commissioning process shall meet the following requirements.

1. Provide test equipment as necessary for start-up and commissioning of the EMS system.

2. Provide testing equipment and accessories that are free of defects and are certified for use.

3. Provide testing equipment with current calibration labels as per NIST Standards; Equipment shall be calibrated on the manufacturer's recommended intervals with calibration tags affixed to the instrument. In the absence of calibration tags, calibration documentation shall be submitted to the CxA at least thirty days prior to use; this documentation shall include description and serial number of instrument and calibration date and time.

4. Testing equipment shall be maintained in good operating condition for the duration of the project.

5. Testing equipment shall be UL Listed.

B. Instrumentation required to verify readings and test the system and equipment performance shall be provided by the Contractor and made available to CxA. Generally, no testing equipment will be required beyond that required to perform Contractor's work under contract documents.

2.02 TESTING AND AIR BALANCING AND COMMISSIONING

A. Provide a portable operator's terminal or hand-held device to facilitate testing, adjusting, and calibration of controls. This device shall support functions and allow querying and editing of parameters required for proper calibration and start up.

B. Connections shall be provided local to the device being calibrated. For instance, for VAV boxes, connection of the operator's terminal shall be either at the sensor or at the terminal box. Otherwise, a wireless system shall be provided to facilitate this local functionality.

PART 3 – EXECUTION

3.01 COMMISSIONING PROCESS REQUIREMENTS

A. Work prior to commissioning:

1. Complete phases of the work so the system(s) can be started, tested, adjusted, balanced, and otherwise commissioned.

2. If contractual modifications are required to bring the system(s) to acceptance levels, such modifications shall be made at no additional cost to the owner.

3. Normal start-up services required to bring each system into full operational state:

a. Testing, motor rotation check, control sequences of operation, full and part load performance.

b. Commissioning will not start until each system is complete and start-up has been performed.

B. Pre-Commissioning responsibilities:

1. Inspection, calibration and testing of the equipment required to commission the following systems:

a. Environmental Controls and Energy Management Systems.

b. Interface and connections of EMS system with lighting controls, electric utility meter, gas meter, photo voltaic system, or as otherwise indicated in contract documents.

C. Commissioning Process Requirements:

1. Refer to Section 01 9113: General Commissioning Requirements and related Sections for information on meetings, start-up plans, Functional Performance Testing (FPT), operations and maintenance data, training requirements, and other Commissioning activities.

3.02 PREPARATION

A. Provide certified EMS technicians as required, with tools and equipment necessary to perform Cx activities specified.

B. Provide certified testing agency personnel and equipment factory representatives as required in the Cx plan and other related Sections.

C. Verify that work required in this Section and in Section 01 9113 is complete prior to starting of FPT.

D. Verify that complete operational manuals have been reviewed and accepted by the CxA as specified before starting FPT.

3.03 START-UP, TESTING, ADJUSTING, AND CALIBRATION

A. Work or systems installed shall be fully functioning prior to Demonstration and Acceptance Phase. Start, test, adjust, and calibrate work as described below:

1. Inspect the installation of devices. Review the manufacturer's installation instructions and validate that the device is installed in accordance with them.

2. Verify proper electrical voltages and amperages, and verify that circuits are free from faults.

3. Verify integrity/safety of electrical connections.

4. For AHUs that use a throttled outside air damper position when minimum outside air is required, mark the minimum outside air damper position.

5. Coordinate with testing and air balance (TAB) subcontractor to obtain, Cx and fine-tune control settings that are determined from balancing procedures. Record the following control settings as obtained from TAB Contractor, and note any TAB deficiencies in the ECEMS Start-up report:

a. Optimum duct static pressure setpoints for VAV air handling units.

b. Minimum outside air damper settings for air handling units.

c. Optimum differential pressure setpoints for variable speed pumping systems.

d. Calibration parameters for flow control devices such as VAV boxes and flow measuring stations.

6. Test, calibrate, and set digital and analog sensing and actuating devices. Test equipment shall be 50 percent more accurate that the filed device over the same range. Calibrate each instrumentation device by making a comparison between the ECEMS display and the reading at the device. (e.g., if field device is plus or minus 0.5 percent accurate, test equipment shall be plus or minus 0.25 percent accurate over the same range). Record the measured value and displayed value for each device in the ECEMS start-up report.

7. Check and set zero and span adjustments for transducers and transmitters.

8. Dampers and Valves:

   a. Check for adequate installation including free travel throughout range and adequate seal.

   b. Where loops are sequenced, check for proper control with overlap.

9. Actuators:

   a. Check to insure that device seals tightly when the appropriate signal is applied to the operator.

   b. Check for appropriate fail position, and that the stroke and range is as required.

10. Check each digital control point by making a comparison between the control command at the central command unit and the status of the controlled device. Check each digital input point by making a comparison of the state of the sensing device and the ECEMS display. Record the results for each devise in the ECEMS start-up report.

11. For outputs to reset other manufacturer's devices (for example, VSDs) and for feedback from them, calibrate ranges to establish proper parameters. Coordinate with representative of the respective manufacturer and obtain their approval of the installation.

12. Verify proper sequences by using the checklists to record results and submit with ECEMS start-up report. Verify proper sequence and operation of specified functions.

13. Verify that safety devices trip at appropriate conditions. Adjust setpoints accordingly.

14. Tune control loops to obtain the fastest stable response without hunting, offset or overshoot. Record tuning parameters and response test results for each control loop in the ECEMS start-up report. Except from a startup, maximum allowable variance from setpoint for controlled variables under normal load fluctuations shall be as follows. Within 3 minutes of any upset (for which the system has the capability to respond) in the control loop, tolerances shall be maintained (exceptions noted):

a. Duct air temperature: plus or minus 1 degree F.

b. Space temperature: plus or minus 2 degrees F.

c. Hot water temperature: plus or minus 3 degrees F

d. Duct pressure: plus or minus 0.25 inches w.g.

e. Water pressure: plus or minus 1 psid.

f. Air flow control: plus or minus 5 percent of setpoint velocity.

g. Space pressurization: plus or minus 0.05 inches w.g.

15. For interface and DDC control panels:

    a. Ensure devices are properly installed with adequate clearance for maintenance and with clear labels in accordance with the record drawings.

    b. Ensure that terminations are safe, secure and labeled in accordance with the record drawings.

    c. Check power supplies for proper voltage ranges and loading.

    d. Ensure that wiring and tubing are run in a neat and workman-like manner, either bound or enclosed in trough.

    e. Check for adequate signal strength on communication networks.

    f. Check for standalone performance of controllers by disconnecting the controller from the LAN. Verify that the controlling LAN reconfigures as specified in the event of a LAN disconnection.

    g. Ensure that outputs and devices fail to their proper positions/states.

    h. Ensure that buffered or volatile information is held through power outage.

    i. With system and communications operating normally, sample and record update/annunciation times for critical alarms fed from the panel to the Operator Interface.

    j. Check for adequate grounding of DDC panels and devices.

16. Operator Interfaces:

    a. Verify that elements on the graphics are functional and are properly bound to physical devices or virtual points, and that hot links or page jumps are functional and logical.

    b. Output specified ECEMS reports for review and approval.

    c. Verify that the alarm printing and logging is functional and per requirements.

    d. Verify that trends are archiving to disk and provide a sample to the CxA and owner for review.

e. Verify that e-mail alarm annunciation is functional.

f. Verify that functionality of remote operator interfaces.

g. Verify that required third party software applications required with the bid are installed and are functional.

h. Verify proper interface with fire alarm, lighting control system, photo voltaic system, gas and electrical meters.

B. Submit start-up test report: Report shall be completed, submitted, and reviewed prior to Substantial Completion.

3.04 SENSOR CHECKOUT AND CALIBRATION

A. General Checkout: Verify that sensor locations are appropriate and are away from causes of erratic operation. Verify that sensor with shielded cable are grounded only at one end.

B. Calibration: Calibrate sensors using one of the following procedures:

1. Sensors Without Transmitters – Standard Application: Make a reading with a calibrated test instrument within 6 inches of the site sensor at various points across the range. Verify that the sensor reading (via the permanent thermostat, gage, or ECEMS) is within the tolerances specified for the sensor. Where sensors are subject to wide variations in the sensed variable, calibrate sensor within the highest and lowest 20 percent for the expected range.

C. Sensor Tolerance: Sensors shall be within the tolerances specified for the device.

3.05 COIL VALVE LEAK CHECK

A. Verify proper close off of the valves. Ensure that valve seats properly by simulating the maximum anticipated pressure difference across the circuit. Calibrate air temperature sensor on each side of coil to be within 0.5 degrees F of each other. Via the Operator Interface, command the valve to close. Energize fans. After five minutes observe air temperature difference across coil. If a temperature difference is indicated, and the piping surface temperature entering the coil is within 3 degrees F of the water supply temperature, leakage is probably occurring. If it appears that it is occurring, close the isolation valve to the coil to ensure the conditions change. If they do, this validates that the valve is not closing. Remedy the condition by adjusting the stroke and range, increasing the actuator size/torque, replacing the seat, or replacing the valve as applicable.

3.06 VALVE STROKE SETUP AND CHECK

A. For valve and actuator positions check, verify the actual position against the ECEMS display.

B. Set pumps to normal operating mode. Command valve closed, verify that valve is closed, and adjust output zero signal as required. Command valve open, verify position is full open and adjust output signal as required. Command the valve to various few intermediate positions. If actual valve position does not reasonably correspond, replace actuator.

3.07 ECEMS DEMONSTRATION

A. Demonstrate the operation of the ECEMS hardware, software, and related components and systems to the satisfaction of the CxA and Owner. Schedule the demonstration with the Owner's representative two weeks in advance. Demonstration shall not be scheduled until hardware and software submittals and the start-up test report are reviewed. If the work fails to be demonstrated to conform with contract specifications, so as to require scheduling of additional site visits by the CxA and Owner's representative for re-demonstration, reimburse owner for reasonable local costs of subsequent CxA site visits as detailed elsewhere in these specifications.

B. Supply personnel and equipment for the demonstration, including, but not limited to, instruments, ladders, etcetera. Contractor-supplied personnel shall be competent with and knowledgeable of project-specific hardware, software, and the HVAC systems. Training documentation and submittals shall be at the job site.

C. Demonstration shall typically involve small representative samples of systems and equipment randomly selected by the owner and CxA.

D. The system shall be demonstrated following the same procedures used in the start-up test by using the Commissioning checklist. Demonstration shall include, but not necessarily be limed to, the following:

1. Demonstrate that required software is installed on ECEMS workstations. Demonstrate that graphic screens, alarms, trends, and reports are installed as submitted. Demonstrate directory structure and file system matches that submitted.

2. Demonstrate that points specified and shown can be interrogated or commanded (as applicable) from workstations, as specified, in less than the maximum response time.

3. Demonstrate correct calibration of input/output devices using the same methods specified for the start-up tests. A maximum of 10 percent of I/O points shall be selected at random by the CxA or owner for demonstration. Upon failure of any device to meet the specified end-to-end accuracy, an additional 10 percent of I/O points shall be selected at random by CxA for demonstration. This process shall be repeated until 100 percent of randomly selected I/O points have been demonstrated to meet specified end-to-end accuracy.

4. Demonstrate that DDC and other software programs exist at respective field panels. The DDC programming and point database shall be as submitted.

5. Demonstrate that DDC programs accomplish the specified sequences of operation including failure sequences.

6. Demonstrate that the panels automatically recover from power failure, as specified. Demonstrate alarms as specified.

7. Demonstrate that the stand-alone operation of panels meets the requirements of these Specifications. Demonstrate that the panels' response to LAN communication failures meets the requirements of these Specifications.

8. Identify access to equipment selected by CxA or by the owner. Demonstrate that access is sufficient to perform required maintenance.

9. Demonstrate that required trend graphs and trend logs are set up per the requirements. Provide a sample of the data archive. Indicate the file names and locations.

E. ECEMS demonstration shall be completed and prior to Substantial Completion.

F. Tests successfully completed during the demonstration will be recorded as passed for the Functional Performance Testing (FPT) and will not have to be retested.

3.08 RESOLUTION OF DEFICIENCIES

A. Maladjustments, misapplied equipment, or deficient Contractors performance may result in additional work being required for Cx acceptance.

1. Perform work required to correct the installations not meeting contract requirements at no additional cost to the Owner.

B. Corrective work shall be completed in a timely manner to permit completion of the Cx process.

1. Refer to Article 3.07 above, Section 01 9113, and Cx plan for retesting requirements necessary to achieve required system performance.

2. If the system's Cx deadline, as defined in the CxP, goes beyond the scheduled completion of Cx without resolution of the problem, the Owner reserves the right to obtain supplementary services or equipment to resolve the problem.

3.09 ECEMS ACCEPTANCE PERIOD

A. After approval of the ECEMS demonstration and prior to contract close-out acceptance phase shall commence. Acceptance period shall not be scheduled until HVAC systems are in operation and have been accepted, required cleaning and lubrication has been completed (i.e., filters changed, piping flushed, strainers cleaned, and the like), and Testing and Balancing report has been submitted and reviewed. Acceptance Period and its approval will be performed on a system-by-system basis if mutually agreed upon by the Contractor and the owner.

B. Operational Test: At the beginning of the Acceptance Phase, the system shall operate properly for two weeks without malfunction, without alarm caused by control action or device failure, and with smooth and stable control of systems and equipment in conformance with these specifications. At the end of the two weeks, forward the trend logs to the CxA for review and acceptance. CxA shall determine is the system is ready for Functional Performance Testing (FPT) and document any problems requiring Contractor attention.

1. If the systems are not ready for Functional Performance Testing (FPT), correct problems and provide notification to the owner's representative that problems have been corrected. The acceptance period shall be restarted at the mutually scheduled time for an additional one-week period. This process shall be repeated until CxA issues notice that the ECEMS is ready for Functional Performance Testing (FPT).

C. During the acceptance period, maintain a hard copy log of alarms generated by the ECEMS. For each alarm received, diagnose the cause of the alarm, and list on the log for each alarm the diagnosed cause of the alarm, and the corrective action taken.

3.10 TREND LOGS

A. Configure and analyze trends required under Section 23 0923.

3.11 TREND GRAPHS

A. Trend graphs as specified in Section 23 0923 shall generally be used during the acceptance phase to facilitate and document testing. Prepare controller and workstation software to display graphical format trends during the acceptance period. Trend graphs shall demonstrate compliance with contract documents.

B. Each graph shall be clearly labeled wit HVAC subsystem title, date, and times.

3.12 WARRANTY PHASE

A. Trending: Throughout the Warranty phase, trend logs shall be maintained as required for the acceptance period. Forward archive trend logs to the CxA and Owner for review. CxA or Owner will review these and notify Contractor of Warranty work required.

3.13 SOFTWARE OPTIMIZATION ASSISTANCE

A. Provide the services of an ECEMS technician at the project site to be at the disposal of the CxA and Owner. The technician is to make changes, enhancements, and additions to control unit or workstation software that has been identified by the CxA or Owner during the Construction and Commissioning of the project and that are beyond the specified contract requirements. The cost for this service to include a total of 40 hour will be included with the bid. Request for assistance shall be for contiguous or non-contiguous 8 hour days, unless otherwise mutually agreed upon by the Contractor, CxA, and OAR. The Owner Authorized Representative (OAR) shall notify Contractor two days in advance of each day of requested assistance.

B. The ECEMS technician provided shall be trained in the programming and operation of the controller and workstation software. If the ECEMS technician provided cannot perform every software task requested by the CxA or Owner in a timely fashion, provide additional qualified personnel at the project site as requested by the CxA or Owner.

END OF SECTION

SECTION 23 0900

HVAC INSTRUMENTATION AND CONTROLS

PART 1 – GENERAL

1.01 SUMMARY

A. SECTION INCLUDES

Temperature controls for air conditioning, heating, and ventilating systems as indicated. Work includes, but is not be limited to, the following:

1. Automatic control valves and automatically operated dampers.

2. Pneumatic or electric relays (magnetic starters excluded), electric or mechanical linkages, duct sensors, thermostats, dampers and motorized valves, and appurtenances and accessories.

3. Wiring outlet boxes and conduits for control systems, including wiring to connect magnetic starters to control systems.

4. Air compressor and receiver tank for pneumatic control systems, with appurtenances and air piping, including pressure regulator, automatic moisture eliminators, air line filters, relief valves, pressure gages and shut-off valves, drains, pneumatic piping distribution to control equipment, etcetera.

5. Testing and adjusting temperature control system.

6. Furnishing record drawings and operational data of systems as installed and finally adjusted.

7. Formal instruction of Owner personnel in operation of equipment.

B. Following items are specified in other Sections:

1. Magnetic starters, contacts, power relays and variable resistors or controllers for motors, and other electrical devices.

2. Load carrying wiring for above listed devices and wiring for starting switches not interconnected with temperature control system. (Division 26: Electrical).

3. Electrical power to control panels and other equipment. (Division 26: Electrical).

4. Installing automatic valves in pipelines.

5. Installing automatic dampers.

6. Automatic controls and valves not connected with comfort heating, ventilating, and air conditioning systems.

7. Packaged self contained equipment specified complete with temperature controls.

8. DDC control equipment specified in Section 23 0923: Environmental Control and Energy Management Systems.

C. RELATED REQUIREMENTS

1. Division 01: General Requirements.

2. Division 26: Electrical.

3. Section 23 0500: Common Work Results for HVAC.

4. Section 23 0513: Basic HVAC Materials and Methods.

5. Section 23 0800: HVAC Systems Commissioning.

6. Section 23 0923: Environmental Control and Energy Management Systems.

7. Section 23 3000: Air Distribution.

8. Section 23 8000: Heating, Ventilating and Air Conditioning Equipment.

1.02 SUBMITTALS

A. Provide in accordance with Division 01 and Section 23 0500: Common Work Results for HVAC.

1. Complete list of items proposed to be furnished and installed under this Section.

2. Manufacturer's specifications and other data required to demonstrate compliance with specified requirements.

3. Manufacturer's printed installation procedures.

B. Shop Drawings: Provide Shop Drawings, in the same size as the Drawings, prepared, signed and sealed by a mechanical engineer licensed in the State of California. Shop Drawings shall indicate temperature control diagrams, complete with equipment appurtenances required for system. Include sequence of operation description for each system. Submit in accordance with of Division 01.

C. Sequence of Operation: Provide complete, detailed, step-by-step sequence of operation for each item of equipment.

D. Operating Instructions: Comply with provisions of Section 23 0500: Common Work Results for HVAC. Explain and demonstrate operation of system to Owner representatives as required.

E. Guarantee: Refer to Section 23 0500: Common Work Results for HVAC.

1.03 QUALITY ASSURANCE

A. Manufacturer and Installer Qualifications: Comply with provisions stated under Section 23 0500: Common Work Results for HVAC.

1.04 PRODUCT HANDLING

A. Production, Replacement, Delivery and Storage: Refer to Section 23 0500: Common Work Results for HVAC and Section 23 0513: Basic HVAC Materials and Methods.

PART 2 – PRODUCTS

2.01 TEMPERATURE CONTROLS

A. Provide temperature controls of pneumatic, electric, electronic microprocessor - DDC type, or a combination thereof, as indicated on Drawings, to provide required sequences or operational control.

2.02 MANUFACTURERS

A. Equipment in system shall be of same manufacturer or their standard furnished items. Testing, initial start-up, and adjusting of control system shall be under continuous observation of the mechanical engineer responsible for Shop Drawing preparation.

B. Electronic, or direct digital microprocessor based control equipment shall be one of following manufacturers, unless otherwise noted:

1. Honeywell, Inc.

2. Johnson Controls, Inc.

3. Invensys.

4. Equal.

2.03 PNEUMATIC EQUIPMENT AND ACCESSORIES

(Not Used)

2.04 ELECTRIC EQUIPMENT AND ACCESSORIES

A. Electric control equipment and accessories include, but are not limited to, the following:

1. Electric control devices as indicated on Drawings and described herein, including thermostats, temperature controllers, valve and damper operators, switches, relays, and control panels for instruments as required to provide a complete and operable system.

2. Wiring and conduit, unless otherwise noted, or control systems including wiring required, to connect magnetic starters, specified in other sections, to control systems.

B. Room Thermostats:

1. Thermostats for unitary air conditioning units shall be as specified in Section 23 8000: Heating, Ventilating and Air Conditioning Equipment. Thermostats located on outside walls shall be installed on insulated backplates or as specified by unit manufacturer.

2. Provide the following room thermostats for each specific application as follows, where manufacturer's thermostats are not specified in Section 23 8000:

   a. Honeywell, Johnson Controls, Invensys, or equal, for heating only; Honeywell, Johnson Controls, Invensys, or equal, for cooling only.

   b. Honeywell, Johnson Controls, Invensys, or equal, microelectronic commercial thermostat with sub-base for electronic control of 18 to 30 VAC single zone HVAC equipment. Thermostat is either stand alone, or arranged in a temperature averaging network consisting of 2, 3, 4, 5, or 9 sensors for corresponding rooms or zones.

   c. Honeywell, Johnson Controls, Invensys, or equal, proportional thermostat, low-voltage, 3-wire controller for valve, damper motors and balancing relays. Unit manufacturer may specify or recommend optional thermostat.

   d. Provide tamper-proof locking thermostat guards for items specified above. Covers shall be opaque beige plastic in student occupied areas, clear plastic cover in administrative areas. Provide Honeywell, Johnson Controls, Invensys, or equal, universal thermostat guards or as recommended by thermostat manufacturer.

C. Duct-Mounted Thermostats: Duct-mounted thermostats shall be modulating or 2-position as required to accomplish sequence of operation.

D. Valve and Damper Motors: Damper motors shall be furnished with oil-immersed gear trains and ample capacity to handle required loads under normal operating conditions. Where indicated, spring return type motors are to be provided. Valve motors to be 2-position or proportional, spring return or now spring return.

E. Time Clocks:

1. TC-1: Time clock shall be solid-state digital electronic type capable of 28 on/off set points to be distributed through the week, complete with a day repeat feature, time and set points to be adjustable to nearest minute with a minimum on duration of one minute and a maximum of 7 days. UL Listed, enclosed in standard case NEMA Type 1, Intermatic, Tork, Paragon, or equal, with battery operated carry-over.

2. TC-2: Interval timer (bypass), except for window units, shall be manually set and spring operated type, 0 to 6 hours, and without hold feature. Provide Intermatic, M.H. Rhodes, Paragon, or equal.

3. TC-3: Bypass timer for window type air conditioner units shall be DPDT switch configuration, 12 hours, and without hold feature. Provide M.H. Rhodes, Intermatic, Tork, or equal. Provide double gang box as specified in Division 26: Electrical.

F. Wiring: Wiring in connection with control systems regardless of voltage, except power supply circuits, is part of the Work of this Section. Wiring shall comply with Division 26: Electrical.

G. See Section 23 0923 for DDC/Electronic controls.

PART 3 – EXECUTION

3.01 TEMPERATURE CONTROL SYSTEM INSTALLATION

A. Control system shall be installed in accordance with control manufacturer's instructions and reviewed Shop Drawings.

3.02 PNEUMATIC SYSTEM

(Not Used)

3.03 CONTROL PANELS OR CABINETS

A. Switches, clocks, temperature control instruments, and remote bulb thermometers, whose capillary tubes are less than 25 feet in length, shall be mounted in control panels with required wiring, piping, and tubing behind panel. Control panels shall be galvanized steel sheet metal, with light gray hammertone enamel finish, not lighter than 14 gage. Control panels shall be UL Listed. Panels shall be attached to wall at locations indicated, or as required. Adjustable apparatus shall be provided with P-Touch, or equal, labels to indicate function. A clear space of 30 inches in front shall be maintained.

B. Control cabinets shall be provided with door locks. Door locks shall be the flush type, latched, 5/8 inch for metal door, keyed to a Corbin Cat. No. 60 key. Cabinet shall be prime coated and finish painted as specified in Section 09 9000: Painting and Coating. Cabinet shall be flush mounted.

3.04 ROOM THERMOSTAT

A. Room thermostats shall be wall mounted at a height of approximately 4 feet. Room thermostats are not permitted on outside walls, at marker boards, between shelving, in recesses or above heat producing equipment. Units shall be installed as close to edge of tack board as possible. Room thermostats shall be furnished with tamperproof cover. Thermostats shall be furnished with set point windows and integral thermometers. Office thermostats shall be furnished with extended adjustment knobs; others shall have key adjustments. Room thermostats shall be furnished with non-switching sub-bases.

3.05 COORDINATION

A. Coordinate this Work with other aspects of system balancing to obtain a complete operating mechanical system in accordance with design intent, including coordinating with balancing of the system.

B. Coordinate this Work with all aspects of alarm, fire alarm, and smoke detector, specified in Division 26: Electrical.

3.06 SEQUENCE OF OPERATION

A. Each system, pneumatic, electric, electronic, or direct digital control shall operate as graphically and described on Drawings and in accordance with reviewed sequence of operation.

3.07 CONTROL SYSTEM ADJUSTMENTS

A. Perform adjustments under operating conditions to provide sequence of operation for controls indicated. If required operating conditions cannot be obtained before Substantial Completion, due to outdoor seasonal temperatures, return to the Project site when requested by the Owner and readjust control system when outdoor temperatures will permit proper operating conditions. Start readjustment within seven calendar days after notification. Final settings of controls and pressure ranges indicated by gages shall be indicated on project record documents.

3.08 RUNNING TIME METERS

(Not Used)

3.09 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

3.10 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 23 0923

ENVIRONMENTAL CONTROLS AND ENERGY MANAGEMENT SYSTEMS

PART 1 – GENERAL

1.01 SUMMARY

A. SECTION INCLUDES

Environmental controls and energy management systems, including equipment, materials, installation, start-up, testing, documentation and training according to construction documents. The project drawings establish the scope of HVAC controls work in conjunction with the scope of work indicated in Section 23 0900: HVAC Instrumentation and Controls. This Section complements the requirements of Section 23 0900, and construction drawings for controls and system communications.

B. RELATED REQUIREMENTS

1. Division 01: General Requirements.
2. Section 01 4523: Testing and Inspection.
3. Section 01 7900: Maintenance and Operations Staff Demonstration and Training.
4. Section 01 9113: General Commissioning Requirements.
5. Section 23 0500: Common Work Results for HVAC.
6. Section 23 0513: Basic HVAC Materials and Methods.
7. Section 23 0800: HVAC Systems Commissioning.
8. Section 23 0813: Environmental Controls and Energy Management Systems Commissioning.
9. Section 23 3000: Air Distribution.
10. Section 23 8000: Heating, Ventilating and Air Conditioning Equipment.
11. Section 26 0500: Common Work Results for Electrical.
12. Section 26 0513: Basic Electrical Materials and Methods.
13. Section 26 0519: Low-Voltage Wires (600 Volt AC).
14. Section 26 0526: Grounding and Bonding.
15. Section 26 0923: Lighting Control Systems.

16. Project Commissioning Plan (CxP).

1.02 REFERENCES

A. The latest version of applicable codes, standards, and references. Inspections and tests shall be in accordance with the following applicable codes and standards, except as provided otherwise herein.

1. International Electrical Testing Association – NETA.

2. National Electrical Manufacturers Association – NEMA.

3. American Society for Testing and Materials – ASTM.

4. Institute of Electrical and Electronics Engineers – IEEE.

5. American National Standards Institute – ANSI.

6. National Electrical Safety Code – NESC.

7. California Building Code – CBC.

8. California Electrical Code – CEC.

9. California Mechanical Code – CMC.

10. Insulated Cables Engineers Association – ICEA.

11. Occupational Safety and Health Administration – OSHA.

12. National Institute of Standards and Technology – NIST.

13. National Fire Protection Association – NFPA.

14. American Society of Heating, Refrigerating, and Air-Conditioning Engineers – ASHRAE
(The HVAC Commissioning Process, ASHRAE Guideline).

15. International Building Code – IBC.

16. International Mechanical Code – IMC.

17. InterNational Electrical Testing Association (NETA) Acceptance Testing.

1.03 SUBMITTALS

A. Provide in accordance with Division 01 and Section 23 0500: Common Work Results for HVAC.

B. Shop Drawings shall include but not limited to:

1. Cover page with legend, common notes, symbol schedule, and drawing index.

2. Complete point to point environmental controls and energy management network communication diagram(s) for Direct Digital Controls (DDC) of each system:

   a. Identify all components.

   b. Indicate conduit and wire characteristics, sizes and quantities.

   c. Provide bill of materials.

3. Floor plans showing control panels and intercommunication wiring.

   a. Show system(s) interface connections.

4. Valve Schedules where required.

5. Operations and Maintenance Manuals.

6. As-built submittal drawings.

7. Installation Instructions of each control device.

8. PC Workstation.

9. Software flow diagram of each unique system sequence of operation.

10. Software licenses and electronic keys.

11. Supplemental local or factory training schedule for post warranty support.

12. A complete list of recommended spare parts with pricing for the OWNER's use in keeping the environmental control system downtime to a minimum.

13. Composite CD-ROM with AutoCAD drawings in a ".dwg" format.

1.04 QUALITY CONTROL

A. CONTRACTOR shall have adequate experience installing systems of similar size and complexity with the control product line proposed for this project.

1. Qualifications of Installer: Minimum five years experience installing products and systems of similar scope and complexity.

2. Installer shall submit certification from the equipment manufacturer indicating that installer is an authorized representative of the equipment manufacturer and is trained on network applications.

3. Installer shall maintain a fully equipped service organization capable of furnishing repair service to the equipment and shall maintain a spare set of major parts for the system at all times.

4. Installer shall furnish a letter from manufacturer of equipment certifying equipment has been installed according to factory standards and that system is operating properly.

5. CONTRACTOR shall have participated in the commissioning of a minimum of 10 projects of similar magnitude to those needed for this project.

6. System startup and testing shall be performed under the direct observation of the Project Inspector and OAR.

B. Materials and equipment installed shall be new.

C. System installation shall not begin until Shop Drawings are submitted and reviewed by the Architect or Engineer of Record.

D. Components for Direct Digital Control (DDC) shall comply with ASHRAE standards.

E. The installer shall provide the system components required by code and for the life safety of the service personnel.

F. System shall be able to interface with open protocol BACnet systems.

G. Provide all ancillary components for the system to perform the required sequence of operations. Install, test and adjust the system accordingly.

H. System components shall operate per industry standards. The standards shall be as defined by ASHRAE, SMACNA, AABC, NEBB, TABB, and the literature of the manufacturers listed in this Section.

I. Provide field engineering tools including software and hardware needed for programing and/or modifying system controller and devices.

1.05 WARRANTY

A. Components, system hardware and software, and parts and labor shall be guaranteed against defects in materials, fabrication, and execution for three years from date of system acceptance. Provide labor and materials to repair, reprogram, or replace defective components at no charge to the OWNER during the warranty period.

B. Provide a list of applicable warranties for equipment and components, this list shall include warranty information, names, addresses, telephone numbers, and procedures for filing a claim and obtaining warranty services.

C. CONTRACTOR shall respond to OWNER's request for warranty service within four hours of initial call to schedule a mutually agreeable time for service. Submit records of the nature of the call, the work performed, and the parts replaced or service rendered.

1.06 TRAINING

A. Provide a competent instructor who is factory trained and has comprehensive knowledge of system components and operations to provide full instructions to designated personnel in the system operation, maintenance, and programming. Training shall be specifically oriented to installed equipment and systems.

1. Provide four hours of onsite OWNER familiarization and training for the installed system. Training shall include system overview, time schedules, override commands, emergency operation, and programming and report generation. OWNER employees attending this training session shall be provided with the following documentation:

a. As-built drawings of System layouts and point to point connection diagrams.

b. System components cut sheets.

c. Operations and maintenance data.

2. Programmer and maintenance training shall include database entry; trend logs application programs, diagnostic routines, reporting, failure recovery and calibration.

a. Provide 24 hours of training as follows:

1) Training session shall accommodate a minimum of 20 persons and be facilitated at CONTRACTOR's training facility, which should be no more than 50 miles from the Project Site.

a) Training shall be delivered in 6 hours per session increments.

b) Obtain OWNER's approval for training locations exceeding 50 miles. In such cases, the CONTRACTOR shall be responsible for transportation expenses.

c) CONTRACTOR shall provide training computers for all attendees. Computers shall be ready for live training sessions.

2) Training shall cover instruction, theory, and expose the trainees to system's features, components, architecture, operations, programming, report generation, communications, and any other pertinent information required for the operations and maintenance of the system.

3) Each training session shall have an itemized agenda covering all aspects of the training to be covered in the sessions. CONTRACTOR shall obtain agendas approval from OWNER and Commissioning Agent.

3) Instructor(s) shall give the trainees the opportunity to practice on simulated and actual (installed) systems.

4) The training session shall cover, but not be limited to the following instruction modules or sessions:

a) System Architecture:

(1) System layout and components interrelations and hierarchical structure.

(2) Controllers interfacing and functions.

(3) Server functionality and data management, error messages, and alarm conditions.

(4) Connectivity and communication losses.

(5) Replacement procedures for system components.

b) User Operations:

(1) Familiarization and navigation with the EMS operating System.

(2) Window panes, menus, navigation buttons, alarm response windows, system passwords and accessibility features and options, monitoring and managing data points (inputs, outputs, numeric values, time and date, strings).

(3) Views: Provide sufficient information as to train staff on how and where to access programs, functions, adjust or alter diagnostic points and related data, override messages, reports and actions taken.

c) Trending: Setting trend(s) intervals, accessing data trends and history logs for diagnosis points or groups, and reporting. Working with trended data graphical displays, including but not limited to hiding points, setting display types and colors, viewing and setting scales.

d) Graphics: Standard symbols and color codes, graphics customization, how and where to access and manage the system with the graphic displays, including changing points and values, using HOA switches and viewing results, mapping to or with other graphic sources and functions, including groups, navigation, sequence of operations, and displays and reports.

e) Alarms: Reading and interpreting alarms, acknowledging and silencing alarms, routing and setting priorities, viewing and responding e-mailed and paged alarms.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Environmental controls and energy management systems shall be approved products of Alerton, Automated Logic, Schneider Electric, Trane, Carrier, or equal.

2.02 SYSTEM ARCHITECTURE

A. The system shall be capable of providing a peer-to-peer network of distributed stand-alone DDC controllers that meet ANSI/ASHRAE Standard 135 for open protocol communications.

B. A maximum of 32 controllers shall be connected to any one MS/TP bus. Minimum Speed of 38kb and can support 127 devices per COM port. Provide a minimum of 2 ports.

1. Provide a Building Automation System (BAS) that consists of Network Server/Controllers (NSCs), a family of Standalone Digital Control Units (SDCUs), Administration and Programming Workstations (APWs), and Web-based Operator Workstations (WOWs). The BAS shall provide control, alarm detection, scheduling, reporting and information management for the entire facility, WEB enable capabilities, and Wide Area Network (WAN).

2. The Enterprise Level BAS shall consist of an Enterprise Server, which enables multiple NSCs (including all graphics, alarms, schedules, trends, programming, and configuration) to be accessible from a single Workstation simultaneously for operations and engineering tasks. The Enterprise Level BAS shall be able to host up to 250 servers, or NSCs, beneath it.

3. For Enterprise and robust reporting capability outside of the trend chart and listing ability of the Workstation, a Reports Server shall be provided and installed on a Microsoft Windows based computer. The Reports Server can be installed on the same computer as the Enterprise Server.

4. The system shall be a top-level 100/1000bT Ethernet network that utilizes BACnet/IP.

   a. A sub-network of SDCUs using the BACnet MS/TP protocol shall connect the local, and stand-alone controllers with Ethernet-level Network Server Controllers/IP Routers.

5. The system shall match the existing LonWorks IP, and/or Modbus TCP protocol.

   a. Integration to existing Modbus RTU/ASCII (and J-bus), Modbus TCP, LonTalk FTT-10A, and Web Services shall be native to the NSCs. There shall not be a need to provide multiple NSCs or additional software to allow all three protocols to be natively supported.

b. A sub-network of SDCUs using LonTalk FTT-10A, and/or Modbus RTU protocol shall connect the local, stand-alone controllers with Ethernet-level Network Server Controllers/IP Routers.

C. Only systems that use HTML 5 structured language are allowed.

D. The supplied computer software shall employ object-oriented technology (OOT) for representation of data and control devices within the system. For each global, system or unitary controller, provide a PICS document showing the installed device's compliance level. Minimum compliance is Level 3 with the ability to support data read and write functionality.

E. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed three seconds for network connected controllers or user interfaces.

1. For each system point, alarms can be created based on high/low limits or in comparison to other point values.

2. There is no limit to the number of alarms that can be created or stored in system hardware for any point, up to the system capacity.

3. System shall generate configured alarms from single or multiple system conditions.

4. Alarms will be generated from an evaluation of the alarm condition, and presented to the user in a fully configurable order, by priority, time, and category,
   a. Alarm views shall be presented to the user upon logging into the system WorkStation and/or Webstation.

5. Program the alarm management system to create and report alarm events history; the alarm events history data base shall provide the option to select alarm cause and action notes associated with an alarm event. The alarm management system shall also generate checklists for operators' use when utilizing a suggested mode of troubleshooting.

6. Provide alarm event history for a feature use to permit assigning of events for resolution to OWNER staff. The system shall notify the user and assigned resolution personnel.

7. Alarms shall be capable of being routed to any BACnet workstation that conforms to the B-OWS device profile and uses the BACnet/IP protocol.

F. The system shall be able to interface with subsystems that utilize ANSI/CEA-709.1: Control Network Protocol Specification.

2.03 EMS SERVER AND USER INTERFACE WORKSTATION

A. EMS Server: The EMS Server shall include a tower or rack mounted server with an Intel Xeon E5 2600 processor, 8 Gb RAM, RAID 1 configuration with two hot swap 2TB 7200 RPM SATA drive, DVDRW drive, keyboard, mouse, 27 inch LCD color display and the latest version of Microsoft Windows Server operating system software. The workstation shall connect to the network through an internal 1Gbps Ethernet interface card.

1. Software licensing shall be provided for local or remote unlimited simultaneous users of the system, unlimited future point expansion, user graphical display generation and non-vendor controllers. Licenses and electronic keys shall be included with the M&O manuals for project acceptance. Conditional Licenses will not be acceptable.

2. The system shall be programmed to email selected alarms to designated response personnel.

   a. The ability to utilize email paging of alarms shall be a standard feature of the operating system's mail application interface (MAPI). No special software and no email client software must be running in order for the system to distribute emails.

   b. The email notification shall be able to be sent to an individual user or a user group.

   c. The NSC shall support the use of Web Services based on open standards, such as SOAP and REST. Use incoming third-party data (temperature forecast, energy cost) over the Web to determine site modes, scheduling, and programming.

3. Web-based operation shall be supported directly by the NSCs and shall not require additional software.

4. The supplied system shall incorporate the ability to access all data using HTML5 enabled browsers without requiring proprietary operator interface and configuration programs.

5. Programming of SDCUs shall be capable of being done either off-line or on-line from any operator workstation. All information shall be available in graphic or text displays stored at the NSC. Graphic displays shall feature animation effects to enhance the presentation of the data, to alert operators of problems, and to facilitate location of information throughout the DDC system. All operator functions shall be selectable through a mouse.

6. Programming in the NSC shall be either in graphical block format or line-programming format or both.

7. Programming of the NSC shall be available offline from system prior to deployment into the field. All engineering tasks shall be possible, except the viewing of live tasks or values.

8. The programmer's environment shall include access to a superset of the same programming language supported in the SDCUs.

9. Provided NSC devices shall support both script programming language as well as the graphical function block programming language. For both languages, the programmer will be able to configure application software for custom program development, and write global control programs. Both languages will have debugging capabilities in their editors.

10. The system shall be able to save custom programs as libraries for reuse throughout the system. A wizard tool shall be available for loading programs from a library file in the program editor.

11. The system shall be capable providing views of graphical programming in live and real-time from Workstation(s).

12. The system shall be capable of creating 'binding templates' allowing the user to bind multiple points to multiple objects all at once.

13. Automatic detecting zone that may be excessively driving the reset logic and generate an alarm.

14. Readily allow operator removal of zones from reset algorithm.

15. Applications shall be able to be assigned different priorities and cycle times for a prioritized execution of different function.

16. The provided system shall be able to create objects that allow common objects such as power meters, VFD drives, etc. to be integrated into the system with simple import actions without the need of complicated programming or configuration setups.

17. The BAS workstation software shall allow the creation of a custom, browser-style interface linked to the user when logging into any workstation. Additionally, it shall be possible to create customized workspaces that can be assigned to user groups. This interface shall support the creation of "hot-spots" that the user may link to view/edit any object in the system or run any object editor or configuration tool contained in the software. Furthermore, this interface shall be able to be configured to become a user's "PC Desktop" – with all the links that a user needs to run other applications. This, along with the Windows user security capabilities, shall enable a system administrator to setup workstation accounts that not only limit the capabilities of the user within the BAS software, but may also limit what a user can do on the PC and/or LAN/WAN. This might be used to ensure, for example, that the user of an alarm monitoring workstation is unable to shut down the active alarm viewer and/or unable to load software onto the PC.

18. The workstation software shall automatically log and timestamp every operation that a user performs at a workstation, from logging on and off a workstation to changing a point value, modifying a program, enabling/disabling an object, viewing a graphic display, running a report, modifying a schedule, etc.

19. Provide a Web Server to automatically convert system displays on the workstation to an Internet page. Internet page shall be readable from standard PC browsers. Acceptable browsers shall be latest version of internet explorer, Chrome, or Firefox. No additional plug-ins, programs, software, hardware, etc. shall be needed to access the Internet page. The server shall be a separate device to provide security protection for the building system from outside hackers.

    a. Coordinate individual system components IP addresses, switch port assignments, security settings such as but not limited to SNMP alarm delivery, HTTPS/SSL settings, VLAN assignment and authorized IP address ranges with the OWNER's Information Technology Division. Coordination activities with ITD shall be executed through the OAR.

    b. Provide IP address label on the interior of each cabinet door or equipment.

    c. The system shall support the ability to notify school or OWNER designated personnel by SMS or Email messages, utilizing the OWNER's mail server when problems or situations that require immediate attention arise.

20. Operator Workstation shall display data associated with the project as called out on drawings or object type list supplied. Graphic files shall be created using digital, full color photographs of system installation, AutoCAD or Visio drawing files of field installation drawings and wiring diagrams from as-built drawings. Operator's workstation shall display data using three-dimensional graphic representations of mechanical equipment. System shall be capable of displaying graphic files, text, trend data and dynamic object data together on each display screen with animation of equipment operation.

21. Controllers shall be programmed using graphical software tools that allow connection of function blocks for visual sequencing of control logic. Function blocks shall display real time data and be animated to show status of data inputs and outputs when in real time operation. Animation shall also show change of status on logic devices and countdown of timer devices in a graphical format.

22. Operator Tracking Log shall record operator changes to the system for future review. This shall include, but not be limited to setpoint changes, time schedule overrides, alarm limits, etc.

23. The system shall be equipped with a battery back-up source capable of providing 30 minutes of operation (computer and monitor) in the absence of normal power, to allow for an orderly shutdown and data back-up.

B. EMS Workstation: The EMS Workstation shall be an enterprise level tower with an Intel Core™ i7 or better processor, 16GB of RAM, 256 GB solid state drive, DVD drive, keyboard, mouse, 27 inch LCD color display and the latest version of Microsoft Windows professional operating system software. The workstation shall connect to the network through an internal 1Gbps Ethernet interface card.

2.04 GLOBAL CONTROLLER

A. Building controllers shall incorporate the functions of a 3-way BACnet router. Controller shall route BACnet messages between the high-speed LAN (Ethernet 100MHz), master slave token passing (MS/TP) LANs, a point-to-point (PTP/RS-232) connection and telephone modem.

B. Provide global control strategies for the system based on information from any point objects in the system. Programming shall be object-oriented using graphical control function blocks. Global strategies shall include, but not limited to unit scheduling, electrical demand limiting, optimized start-stop of equipment, central plan reset control, etc.

C. Battery shall retain static RAM memory and real-time clock functions for a minimum of 1.5 years (cumulative). Battery shall provide up to five minutes of powerless operation for orderly shutdown and data backup.

D. Each building controller shall support a minimum of 250 BACnet Schedule Objects and 250 BACnet Calendar Objects.

E. Each building controller shall log a minimum 1,000 trend logs. Any point object in the system (real or calculated) may be logged. Sample time interval shall be adjustable at the operator's workstation. Building controller shall periodically upload trended data to networked operator's workstation for long term archiving if desired. Archived data shall be available for use in third-party spreadsheet or database programs.

F. Alarms may be generated within the system for any object change of value or state either real or calculated. This includes events such as analog object value changes, binary object state changes and various controller communication failures. Each alarm may be automatically dialed out to a telephone pager or emailed to any Internet PC computer.

G. Provide a 1.5 KVA UPS with battery back-up capability to provide a minimum of 30 minutes of operation (computer and monitor) for orderly shutdown and data backup. Make connections and test the system for proper operation in the presence of the Project Inspector.

H. The global controller shall be equipped with ADR demand limiting capacity interface.

1. The system shall include 5 DI for interfacing to local utility ADR program. The 5 DI shall be located in a 24 X 24 X 6 NEMA 12 cabinet mounted in the MDF or IDF room. Upon closer of each DI the control system shall raise or lower (depend on system mode) global room temperature set point 1 degree (user adjustable).

2. The system shall also include a demand-limiting program that utilizes data from site utility meter. Features indicated below shall be available via a switchable graphical user interface in all operating stations:

a. Shed/Restore equipment in digital format shall include 5 data input points for interface to future ADR web appliance located in an MDF/IDF room. System server shall accept ADR command from utility service via web interface, and shall include at least 5 priority levels of equipment shedding. Load shedding on a given priority level shall include two methods. In one the loads shall be shed and restored in a "first-off/first-on" mode and in the other; the loads shall be shed/restored in a linear fashion.

b. Adjust operator selected control setpoints in analog format based on energy usage when compared to shed and restore settings.

c. Shedding may be implemented independently on each and every zone or piece of equipment connected to the system.

d. Status of every load shed shall be capable of being displayed on every operator terminal connected to the system. Statuses shall be displayed along with the English description of each load.

2.05 APPLICATION (system and unitary) DDC CONTROLLERS.

A. Application controllers shall include universal inputs with 10-bit resolution that accept 3K and 10K thermistors, 0 to 10VDC, 0 to 5 VDC, 4 to 20 mA and dry contact signals. Any input on a controller may be either analog or digital with a minimum of three inputs that accept pulses. Controller shall include support and modifiable programming for interface to intelligent room sensor with digital display, and set point adjustment and override button. Controller shall include binary and analog outputs on board. Analog outputs shall be switch selectable as either 0–10VDC or 0–20mA. Software shall include scaling features for analog outputs. Application controller shall include a supply voltage to power external sensors.

B. Program sequences shall be stored in EEPROM or flash memory. No batteries shall be needed to retain logic program. Controller shall execute program sequences 10 times per second and be capable of multiple PID loops for control of multiple devices. Calculations shall be completed using floating-point math. Programming of application controller shall be completely modifiable in the field over the installed BACnet LANs or remotely via modem interface.

C. Central Plant Controllers shall interface to chiller gateways. Point objects shall reside in the central plant controller. Hand-Off-Auto switches shall be provided for direct wired output control circuits.

D. Controllers for VAV boxes shall include one onboard airflow sensor microprocessor driven and pre-calibrated at the factory. Pre-calibration shall be at 16 flow points as a minimum. Factory calibration data shall be stored in EEPROM. Calibration data shall be field adjustable to compensate for variations in VAV box type and installation. Calibration parameters shall be adjustable through intelligent room sensor with digital display, and set point adjustment and override button. Operator workstation, portable computers and special hand-held field tools shall not be needed for field calibration. Boxes shall be controlled using pressure independent control algorithms and flow readings shall be in CFM

E. Controllers for Dual Duct boxes shall include two onboard airflow sensors and function similar to the VAV box controller. Multiple VAV box controllers or controllers with remote airflow sensors are not acceptable.

F. CONTRACTOR shall provide a laminated wiring diagram for each control panel. Locate diagrams on interior side of control panel's doors.

2.06 TEMPERATURE SENSORS

A. Temperature sensors shall be 10K ohm thermistor factory-calibrated to within 0.5 degrees F, totally interchangeable with housings appropriate for the application.

B. Wall sensors shall be installed 48 inches above finished floor. Duct sensors to be installed such that the sensing element is in the main air stream. Immersion sensors to be installed in wells filled with thermal compound. Outside air sensors shall be installed away from exhaust or relief vents, not in an outside air intake and in a location that is in the shade most of the day.

C. Intelligent room sensors shall be equipped with digital display, set point adjustment and override button. Smart room temperature sensor/thermostat shall incorporate PIR motion sensor, temperature display, set point adjustment and override button. Acceptable Manufacturers: Schneider Electric SE8600 series, Viconics VT8600 series, Sigler 8600 series or equal.

D. Room thermostat shall be BACnet capable, Acceptable manufacturers: Schneider Electric SE8600 series, Viconics VT8600 series, Sigler VT8600 series or equal.

2.07 CARBON DIOXIDE (CO_2) SENSORS

A. Sensors shall be wall mounted at a height of approximately 4 feet. Locate sensors adjacent to room thermostat.

B. Sensors are not permitted on marker boards, between shelving, in recesses or above heat producing equipment.

C. Sensors shall be furnished with a display window that provides continuous monitoring and sensor status readings, and with tamperproof cover.

D. Sensors shall be gold plated for long-calibration stability, be factory calibrated and certified for a minimum of five years.

E. CO_2 sensors shall be BACnet capable, acceptable manufacturers: Honeywell C7232A, Telaire Ventostat Wall Mount, Johnson Control CD-WRD-00-0, or equal.

2.08 WINDOWS AND DOOR SENSOR

A. Provide windows and door switches at every operable windows and door in controlled spaces. Each switch shall be connected to a DI point on the DDC controller. Each switch shall be wired independently. Wiring multiple switches in series shall not be acceptable. Acceptable Manufacturers: Illumra E3-MDCCP or equal.

2.09 PRESSURE SENSORS

A. Differential and pressure sensors shall have a tensioned stainless steel diaphragm to form a variable capacitor that produces a linear output with an accuracy of 1.0 percent of full scale. The unit shall be able to withstand 10 PSIG over pressurization.

B. Differential pressure switches shall utilize a diaphragm operated snap-acting switch with a setpoint range of 0.05 to 2.0 inches WC.

C. Steam pressure sensors shall be mounted on a pigtail siphon with manual shutoff ball valve.

2.10 CARBON DIOXIDE (CO_2) SENSORS

A. Carbon dioxide concentration levels shall be sensed by non-dispersive infrared technology. A corrosion-free sensing chamber shall be used for accurate, stable CO_2 sensing. An LCD shall display sensed CO_2 concentration.

B. Sensor shall be gold plated and have a range of 0-2000 PPM at +/- 5 percent accuracy for long-term calibration stability. Both analog and binary relay output circuits shall be available on the sensor. An automatic background calibration algorithm shall reduce required maintenance.

C. Acceptable Manufacturers: Telaire, Honeywell, Johnson Controls, or equal.

2.11 ELECTRONIC VALVES

A. Control Valves ½ inch to 2-inch shall be characterized stainless steel ball valves with actuators sized to close off against twice the maximum fluid pressure. Valve body shall be NPT screwed for 2-way or 3-way application. A push button release shall be provided for manual operation.

B. Control Valves 2 ½-inch and larger shall be butterfly type with actuators sized to close off against twice the maximum fluid pressure. Valve body shall be flanged for 2-way or 3-way application. Contacts shall be provided to mechanically indicate the full open and full closed position of the valve.

C. Steam Valves shall be globe valves suitable for 35-PSI inlet steam service. Valve bodies shall be NPT screwed or flanged with spring-return normally closed valve actuators.

D. Valve control shall be accomplish with 2-10 VDC. All valve shall provide feedback signal to EMS/BMS for monitoring on GUI.

E. Acceptable Manufacturers: Belimo, Honeywell, Johnson Controls, Schneider Electric or equal.

2.12 DAMPER ACTUATORS

A. Electric damper actuators (including VAV box actuators) shall be direct shaft mounted and use a V-bolt and toothed V-clamp. The actuator mounting arrangement and spring return feature shall permit normally open or normally closed positions of the damper as required.

B. Actuators shall be sized for 200 percent of the design torque requirements.

C. Damper actuators shall incorporate a release mechanism to manually position the damper for maintenance or emergency override.

D. Damper Actuators located outdoors shall have a clear plastic weather shield specifically designed for the application.

E. Damper motor control shall be with 2-10 VDC

F. Acceptable Manufacturers: Belimo, Honeywell, Johnson Controls, Schneider Electric, or equal.

2.13 CURRENT SWITCH

A. Current sensing switch shall be self-powered with solid-state circuitry and a dry contact output. A multi-turn setpoint adjustment shall set the trip point status. An LED shall indicate the on or off status.

2.14 CONTROL RELAY

A. The relay shall be contained in a plenum rated NEMA 12 enclosure with a ¾" NPT conduit fitting. Coil voltage shall be 24 or 120 VAC with a contact rating of 10A. An LED on the enclosure cover shall indicate the relay is energized.

2.15 POWER SUPPLIES

Power supplies and panel assemblies shall be UL or NRTL listed.

2.16 ENCLOSURES

A. Controllers, power supplies and relays shall be mounted in Hoffman A-LP NEMA 12 enclosures or equal when located in an indoor environment.

B. Enclosures for outdoor applications shall be metal NEMA 4, Hoffman A-ALP, A-BLP or equal, and be mounted on the north exposure of the controlled unit.

C. Enclosures shall have hinged, locking doors with common keying (CAT-60) for control panel on the Project Site.

D. Enclosures shall have permanently affixed to the door an engraved nametag identifying the equipment served. The nametag shall be a minimum 1 inch by 3-inch with ½ inch lettering.

PART 3 – EXECUTION

3.01 CONTROLS INSTALLATION

A. Wiring methods for control system shall be as defined in the Division 26 specifications. Wire types shall conform to manufacturers' recommendations.

B. Mount control panels adjacent to associated equipment on vibration-free walls or freestanding angle iron supports. One cabinet may accommodate more than one system in same equipment room. Control panel assemblies must be UL listed.

C. Provide software and hardware required to provide controls and monitoring of diagnostic points indicated in specification Section 23 8000.

D. Coordinate with Division 26 electrical installer so that "Hand/Off/Auto" selector switches are installed to override automatic interlock controls when switch is in the "Hand" position. Safety shutdown interlock wiring shall disable the equipment regardless of the position of the H-O-A switch.

3.02 ROOM SENSORS INSTALLATION

A. Room sensors shall be wall mounted at a 48-inch height above finished floor. Room sensors are not permitted on outside walls, at chalkboards, between shelving, in recesses or above heat producing equipment. Coordinate with Division 26 for sensor or thermostat mounting adjacent to light switches.

3.03 COORDINATION

A. Coordinate the work with other aspects of mechanical, electrical, fire-life safety and security systems, controls, and photo voltaic systems to obtain a complete and operating system in accordance with the contract documents.

B. Meet with the OAR and school principal and other school staff to determine when each zone or building will be occupied, and to determine programming and scheduling of the heating, ventilating and air conditioning equipment.

C. CONTRACTOR shall contact OAR to coordinate for timely availability of VPN access point(s) form OWNER’s Information Technology Division.

3.04 DDC CONTROL SYSTEM ADJUSTMENTS

A. Make adjustments under operating conditions to provide sequence of operation for each control system per design intent. If required operating conditions cannot be obtained prior to completion date of the contract due to outdoor seasonal temperatures, return to the job site when requested by the OWNER and re-adjust control system when outdoor temperatures will permit proper operating conditions. Start re-adjustment within seven calendar days after notification.

3.05 PERFORMANCE AND ACCEPTANCE:

A. Test and calibrate each device including but not limited to the following for proper operation, connection, signal value or response.

1. Building Controllers.
2. Custom Application Controllers.
3. Application Specific Controllers.
4. Input / Output Devices. (Sensors, actuators and monitoring devices)

5. Operator Interfaces.

B. Verify that systems are standalone and operable upon network failure.

C. Verify that systems return to normal operation automatically upon resumption of network operation or return of power.

D. Test each system for functions of the required control sequence of operation either by normal control operation or forced operation as required. Log and submit results.

E. Test the network for connectivity, data transmission rates, input/output responses, and other appropriate parameters Failure modes, including network failure, individual control system failure, and power outages, shall be simulated and responses logged, with any effects on network operation noted and corrected.

F. Test each preprogrammed time and holiday schedule.

G. Commissioning requirements of Divisions 01, 23, and 26 apply to this Section.

H. Schedule of Responsibilities: Refer to Appendix A. The schedule identifies the responsibilities of the CONTRACTOR for the installation of the environmental controls and energy management system. Deviations and clarifications of this schedule only if allowed by the OAR, provided trade CONTRACTOR coordination and schedule requirements are met. Submit a record copy of the Schedule of Responsibilities to the OAR at the commencement of this Section's Work.

3.06 WIRING AND INFRASTRUCTURE

A. Provide necessary wiring, terminations, connections and conduit infrastructure for the complete system as indicated in the construction documents.

B. Exterior cables whether above or below ground level shall be rated for exterior applications. When entering a building provide a code sized pull box with necessary hardware to transition exterior rated cables to interior applications.

C. Underground EMS cables are permitted to be installed with lighting control wiring in underground applications. Provide innerduct to separate EMS cables from lighting control system cables.

D. Provide both labeling and record documentation for all EMS system cabling. A cable management schedule and diagram shall be provided at each system panel or cabinet, in addition to a complete cabling diagram to be provided at the head end equipment location.

1. The cable management spread file shall include the following:

    a. Cable Schedule.
    b. Cable Test Forms.
    c. Cable Label sequence and nomenclature.
    d. Network chart.

2. Cable numbering shall be based on a defined format which readily identifies cable type, and allows maintenance technicians to determine originating and terminating locations.

3. Present the data in an Excel spreadsheet that will operate on the latest Windows platform. Information shall be presented in paper and electronic formats.

4. A copy of the cable schedule in a transparent plastic sleeve shall be affixed in the interior side of the front door of each network cabinet or cables convergence hub points.

3.07 DATA LOGGING REQUIREMENTS

A. The system must be capable of storing the system's collected and diagnosis data for a minimum of seven days.

B. Program the system for a standard seven day schedule including holydays.

3.08 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off Project Site.

3.09 PROTECTION

A. Protect Work of this Section until Substantial Completion.

END OF SECTION

APPENDIX A
SCHEDULE OF RESPONSIBILITIES

	ITEM	FURNISH BY	INSTALL BY	POWER BY	CONTROL WIRING BY
1	Magnetic Motor Starters:				
	a. Automatic controlled, with or without HOA switches.	E	E	E	DDC
	b. Manually controlled	E	E	E	N/A
	c. Manually controlled furnished as factory wired unit equipment	M	M	E	E
	d. Special duty type (part winding, multi-speed, etc.)	M	See Note 1	E	See Note 1
	e. Adjustable frequency drives with or without manual bypass.	DDC	E	E	DDC See Note 2
	f. Domestic booster pump. Motor Controls	M	M	E	DDC
2	Line voltage contactors.	E	E	E	DDC
3	Control relay transformers (other than starters).	DDC	DDC	E	DDC
4	Control and Instrumentation panels	DDC	NI	E	DDC
5	Automatic control valves, automatic dampers and damper operators, solenoid valves, insertion temperature and pressure sensors including wells	DDC	M	E	DDC
6	Control interlock wiring between chillers, pumps, cooling towers, fans and air handling units and other miscellaneous mechanical equipment.	DDC	DDC	E	DDC
7	Duct Smoke Detectors	E	M	E	E
8	Dampers				
	a. Control Dampers	M	M	N/A	DDC
	b. Smoke Dampers and Combination Fire/Smoke Dampers	M	M	E	E
9	Airflow Stations with transmitter.	M	M	E	DDC
10	Air terminal devices (I.e., VAV and fan powered boxes).	M	M	E	DDC
11	Intelligent Devices and Control Units provided with packaged mechanical equipment such as: Large VAV and constant volume package units Boilers and Chillers.	M	M	E	NI
12	Intelligent Devices and Control Units not provided by equipment manufacturer such as: Air handling units, Heat pumps, AC units (small < 20 tons), Air terminal units (VAV boxes)	DDC	DDC	E	DDC
13	Intelligent Devices and Control Units provided with electrical systems such as: Occupancy / motion sensors, Lighting Control Panels, Switches and dimmers, Switch Multiplexing Control Units, Door Entry Control Units.	E	E	E	DDC
14	Gateways for proprietary non-BACnet equipment	M	M	E	DDC
15	Communications network devices such as Routers, Bridges and Repeaters.	DDC	DDC	DDC	DDC

Abbreviations

DDC	DDC CONTRACTOR (controls CONTRACTOR)
M	Mechanical CONTRACTOR
E	Electrical CONTRACTOR
N/A	Not Applicable

Notes:

1. Magnetic motor starters (special duty type) shall be set in place under electrical division except when part of factory wired equipment, in which case they shall be set in place under mechanical division.
2. Where a remote motor disconnect is required in addition to the one provided integral to a Variable Frequency Drive (VFD), controls CONTRACTOR shall provide the necessary control interlock between the disconnects.

SECTION 23 3000

AIR DISTRIBUTION

PART 1 – GENERAL

1.01 SUMMARY

SECTION INCLUDES

A. Provide ductwork and appurtenances required for a complete air transmission and distribution system for the heating, ventilating, and air conditioning systems indicated on Drawings and as specified.

B. RELATED REQUIREMENTS

1. Division 01: General Requirements.

2. Section 09 9000: Painting and Coating.

3. Section 23 0500: Common Work Results for HVAC.

4. Section 23 0800: HVAC Systems Commissioning.

5. Section 23 0513: Basic HVAC Materials and Methods.

6. Section 23 0548: HVAC Sound, Vibration and Seismic Control.

7. Section 23 0700: HVAC Insulation.

8. Section 23 0900: HVAC Instrumentation and Controls.

9. Section 23 0923: Environmental Control and Energy Management Systems.

10. Section 23 8000: Heating, Ventilating and Air Conditioning Equipment.

1.02 SUBMITTALS

A. Provide in accordance with Division 01 and Section 23 0500: Common Work Results for HVAC.

B. Manufacturer's Data:

1. Complete list of items to be furnished and installed under this Section. Material lists that do not require performance data shall include manufacturer names, types and model numbers.

2. Manufacturer's specifications and other data required to demonstrate compliance with specified requirements.

3. Literature shall include descriptions of equipment, types, models, sizes, capacity tables or curves marked to indicate performance characteristics, electrical requirements, options selected, space requirements, including allowances for servicing, and other data. Data shall include name and address of nearest service and maintenance organization that regularly stocks repair parts. Listings of items that function as parts of an integrated system shall be furnished at one time.

4. Submit complete acoustical test reports showing that proposed products have been tested in accordance with latest editions of relevant ASHRAE and AHRI Standards (ANSI/ASHRAE Standard 70 for air inlets and outlets; ANSI/ASHRAE Standard 130 and AHRI 880 for terminal units) and will be suitable for operation in Project spaces with specified maximum noise criteria (NC) requirements. The results of all testing shall be certified by an independent testing agency and submitted to the Architect for approval. The submittal shall include a complete description of the test conditions, methods and procedures.

5. Submittals shall include a tabulation of proposed products, identification of Project spaces where proposed products are to be installed, maximum allowable NC for all Project spaces, and product NC (at specific design air volume) for all Project spaces.

6. Shop Drawings: Shop Drawings indicating methods of installation of equipment and materials, sizes and gages of ducts, and details of supports. Items to be covered shall include but not be limited to following:

    a. Layout of ductwork and equipment drawn to scale to establish that equipment will fit into allotted spaces with clearance for installation and maintenance. Indicate proposed details for attachment, anchoring to, and hanging from structural framing of building. Indicate vibration isolation units, foundations, supports, and openings for passage of pipes and ducts.

    b. Drawings indicating locations and sizes of sleeves and prepared openings for pipes and ducts.

    c. Typical details of supports for equipment and ductwork.

1.03 QUALITY ASSURANCE

A. Installer's and Manufacturer's Qualifications: Comply with provisions stated under Section 23 0500: Common Work Results for HVAC.

B. Sound power level measurements and Manufacturers' NC value calculations shall be conducted in complete accordance with the latest version of ANSI/ASHRAE Standards 70 and 130 and AHRI 880.

1.04 PRODUCT HANDLING

A. Protection, Replacements, Delivery and Storage: Comply with provisions stated in Section 23 0500: Common Work Results for HVAC.

1.05 COORDINATION

A. Coordinate activities in accordance with provisions of Section 23 0500: Common Work Results for HVAC.

PART 2 – PRODUCTS

2.01 GENERAL

A. Unless otherwise noted, provisions, including amendments thereto, of the HVAC Duct Construction Standards of Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) and the California Mechanical Code (CMC), are hereby made part of this Section.

B. Rectangular, round and flat oval ducts shall be manufactured and installed in accordance with requirements of the HVAC Duct Construction Standards – Metal and Flexible of SMACNA.

C. Sheet metal ducts shall be fabricated from galvanized steel, aluminum or stainless steel.

D. Galvanized steel ducts shall be fabricated of galvanized steel sheet, lock forming grade, conforming to ASTM A653 and A924.

E. Galvanized steel ducts gage thickness and permissible joints and seams of concealed ductwork shall conform to requirements in HVAC Duct Construction Standards – Metal and Flexible of SMACNA and the CMC unless noted otherwise on the drawings. The more stringent requirements shall prevail. Galvanized steel ducts gage thickness and permissible joints and seams of exposed ductwork shall conform to requirements in Tables 2 and 3, Minimum Metal Gages, of this Section. When more stringent requirements are noted on the drawings the most stringent requirement shall prevail.

F. Button punch snap-lock seams, using Lockformer or equal, shall be permitted only in concealed areas using 20 and 22 gage galvanized steel ducts with screws added at the ends. Button punch snap-lock is not permitted for aluminum or duct lighter than 22 gage.

G. Ducts shall be reinforced in accordance with SMACNA standards: Cross-broken Duct: Duct sizes 19 inches wide and larger which have more than 10 square feet of unbraced panel shall be beaded or cross-broken. This requirement is applicable to 20 gage or less thickness and 3 inches w.g. or less pressure. For details, refer to SMACNA manual.

H. Round and Oval Galvanized Steel and Aluminum Ducts:

1. Round Spiral Ducts and Fittings: Fabricated from galvanized sheet steel shall be machine-formed spiral pipe with sealed spiral locking joints. Fittings shall be furnished with continuous corrosion-resistant welds. Provide gages of ducts and fittings recommended by manufacturer.

2. Details of seams and transverse joints for round duct and fittings shall conform to SMACNA standards.

3. Flat oval ducts shall be provided as indicated on the Drawings. Reference standard details in SMACNA manual.

4. Minimum duct wall thickness for concealed flat oval duct construction shall conform to requirements in HVAC Duct Construction Standards – Metal and Flexible of SMACNA and the CMC. The more stringent requirements shall prevail. Gage thickness and permissible joints and seams of exposed ductwork shall conform to requirements in Table 1, of this Section.

5. These provisions apply for ducts furnished for indoor comfort heating, ventilating and air conditioning service only.

I. Flexible Ducts

1. Flexible duct shall be non-metallic, insulated for conditioned air supply and return. The flexible ducts shall be factory fabricated with exterior reinforced laminated vapor barrier, 1 ½-inch thick fiber glass insulation (K = 0.25 at 75 degrees F), encapsulated zinc-coated spring steel wire helix and impervious, smooth, non-perforated interior vinyl liner and factory fabricated steel connection collars. For the composite assembly, including insulation and vapor barrier, comply with NFPA Standard 90A or 90B and tested in accordance with UL Standard, UL 181. Non-insulated metallic ducts shall be provided for exhaust only.

2. Methods of installations, standards for joining and attaching, and supporting flexible duct shall conform to applicable provisions of SMACNA manual.

3. Specifications herein shall not supersede installation requirements by flexible duct manufacturer if those are more stringent.

J. Aluminum Ducts:

1. Material for aluminum duct shall be of 3003-H14 alloy aluminum sheets, with such designation embossed or stenciled on each sheet. Minimum tensile strength shall be 19,000 psi.

2. Aluminum duct gage thickness and permissible joint and seams shall conform to Table 1, Construction Details for Rectangular ducts, in this Section.

3. Aluminum ductwork shall be furnished to transport moisture-laden air from shower rooms, shower drying rooms, dishwashers and discharge ducts from evaporative condenser and cooling towers.

4. Unless otherwise noted, follow construction details for steel construction standards as indicated for unreinforced duct, reinforced duct, or cross-broken duct.

5. Button punch snap-lock seams on aluminum ducts are not permitted.

K. Stainless Steel Duct:

1. Materials for stainless steel duct shall be stainless steel conforming to ASTM A167 and A480.

2. Stainless steel ducts shall be provided as required and indicated on the Drawings.

3. Kitchen exhaust duct system shall be stainless steel Type 304.

4. Stainless steel ducts shall be constructed with welded joints except for connections to equipment which shall be flanged joints with gaskets.

5. Entire stainless steel duct systems shall comply with current CMC requirements for product conveying ducts except where the requirements of this Section are more stringent.

L. Fittings and Other Construction Details: Details of fittings such as elbows, turning vanes, branch take-off and connections, duct access doors, connections for grilles, registers and ceiling diffusers, flexible connector at fan, etcetera, shall conform to applicable provisions of this Section or SMACNA manual.

M. Duct Seam and Joint Sealant: Provide sealant or tape for metal ducts at duct joints which are defined as transverse joints between duct sections including girth joints, branch and sub-branch intersections, duct collar tap-ins, fitting subsections, louver and air terminal connections, access doors and frames, and abutments to building structure. Also provide the same at duct seams which are defined as longitudinal joint between duct sections. Spiral lock seams in factory fabricated round or oval ducts are excluded.

1. Sealant for low-pressure ducts shall be: Design Polymerics DP1010 or DP1020, Childers CP-145A/CP-146 Chil-Flex, Foster's 32-19 Duct-Fas, Miracle-Kingco Glenkote Seal-Flex, Ductmate Industries PROseal or FIBERseal, or equal.

2. Provide sealing material for medium-pressure ducts as described in the SMACNA manual for those pressures.

3. Sealant materials shall comply with the flame spread and smoke developed rating of current CMC when tested in accordance with ASTM E84.

4. Sealant for exposed to weather ducts shall pass the Weather Resistance Test per ASTM G154 at 2000 hours QUV.

N. Restrictions:

1. Zinc-coated steel duct shall not be installed for ductwork transporting moisture-laden air. Flexible duct may only be furnished where specifically indicated on Drawings. Aluminum ducts shall not be installed for internal pressures above 2 inches of water.

2. Fiberglass duct is not permitted as a substitute for sheet metal duct.

2.02 ACOUSTICAL DUCT AND PLENUM LINERS

A. Duct liners shall conform to requirements of Section 23 0700: HVAC Insulation.

2.03 DAMPERS

A. Manually Operated Volume Control Dampers:

1. VD-1, Rectangular: Multi-blade type, opposed blade operation, 16 gage galvanized steel blades; center pivoted on 3/8 inch diameter steel trunnions; interlocking edges; dampers shall be in own angle frame, full duct size as indicated on Drawings; frame of minimum 16 gage steel channel construction. Provide with damper operator and axles positively locked to blade. Ruskin MD35, Pottorff MD-42, Greenheck MBD-15 or equal.

2. VD-2, Round: Frame shall be constructed of not less than 20 gage galvanized steel, blades of not less than 20 gage galvanized steel channel construction with factory neoprene seals, ½ inch diameter axle shafts and locking hand quadrant. Ruskin MDRS25, Greenheck MBDR-50, or equal.

3. VD-3, Oval: Frame shall be constructed of not less than 14 gage galvanized steel channels with factory blade seals of not less than 12 gage galvanized steel with not less than ½ inch diameter axle shafts. Provide Ruskin standard construction for frame, blade and axle size, thickness and material variation. Provide adjustable locking hand quadrant. Ruskin CDO25, or equal.

B. Motorized Volume Control Dampers:

1. MVD-1, Rectangular: Multi-blade type opposed blade operation, 16 gage minimum steel channel frame construction; 16 gage galvanized steel blades center pivoted on ½ inch diameter steel trunnions. Interlocking edges. Dampers shall be in own angle frame. Full duct size as indicated on the Drawings. Provide with matching two position motorized actuator with linkages, 24VAC by Belimo, Honeywell, Invensys, or equal. Ruskin CD35, Pottorff CD-42, Greenheck VCD Series, or equal.

2. MVD-2, Round: Butterfly type constructed with minimum 20 gage galvanized steel frame with steel angle reinforcement on above 20-inch diameter. Blade shall be 14 gage minimum thickness. Neoprene seal to ensure air tightness in closed position. Furnish with matching two position motorized actuator with linkage 24 VAC by Belimo, Honeywell, Invensys, or equal. Ruskin CDRS25, American Warming and Ventilating (AMV) VC-25, Air Balance, Inc. AC530, or equal.

3. Electronic Damper Actuators: Belimo, Honeywell, Invensys, or equal.

a. Sized for torque required for damper seal at load conditions.

b. Coupling: V-bolt dual nut clamp with a V-shaped toothed cradle. Aluminum clamps or set screws are not acceptable.

c. Overload Protection: Microprocessor or an electronic based motor controller providing burnout protection if stalled before full rotation is reached. Actuator shall be electronically cut off at full open to eliminate noise generation with the holding noise level to be inaudible.

d. Power Requirements: As indicated on Drawings.

e. Actuator Timing: Shall meet 15 seconds.

f. Temperature Rating: Actuator shall have a UL 555S listing by damper manufacturer for 350 F.

g. Auxiliary Switches: Provide for signaling, fan control, and position indications.

C. Automatic Fire Dampers:

1. FD, Fire Dampers: Shall conform to requirements of and be listed by State of California Fire Marshal and NFPA 90A. Dampers shall provide airflow resistance not to exceed 0.05 inch water gage static pressure at 900 fpm or 0.25 inch water gage at 2,000 fpm. Dampers shall be installed in required steel sleeve at each penetration of a rated partition.

a. Vertical-mounted fire dampers: Fire damper shall be curtain type with blades removed from the air stream to allow for maximum free area. Dampers will be provided in factory sleeves as tested and listed by manufacturer. Dampers shall be rated for 1 ½ hours for installation in one or 2-hour partitions. Provide UL listed fusible links of adequate size and temperature rating. Dampers will be installed according to the manufacturer's recommended installation instructions provided with units. Provide suitable access for inspection and servicing of each damper. Pottorff VFD-10/VFD-10D Series, Ruskin IBD/DIBD Series, Greenheck FD/DFD Series, or equal.

b. Ceiling fire dampers: Ceiling fire dampers shall be butterfly type with ceramic material to minimize heat radiation. Dampers shall be rated for one hour and shall be furnished as a part of an integral sleeve ceiling box that will accept air distribution, have a UL listed and pre-mounted hanger tabs. Dampers shall be installed according to the manufacturers recommended installation instructions. Pottorff CFD-15 Series, Ruskin CFD Series, Greenheck CRD-1 Series/CRD-2, or equal.

c. Combination fire and smoke dampers: Combination fire and smoke dampers shall be louver bladed type. Units shall be tested and listed under UL 555 and UL 555S. Rating 1 ½ hours for installation in one or 2-hour partitions. The seals shall be non-degradable steel to steel. Leakage shall not exceed 15 cfm/sq. ft. at one inch w.g. and shall be tested at 850 degrees F. Dampers shall be capable of being remotely controlled and reset for pressurization and smoke evacuation. Fire-releasing device shall be UL 33 listed melting fusible links. Dampers shall be provided in sleeves with pre-mounted non-stall motor actuators and dual-position indicators for remote annunciation, if required. The complete assembly shall be factory cycled and tested prior to shipment. Provide suitable access for inspection and servicing of each damper. Pottorff FSD-141 with non-stall motor, Ruskin FSD37 or FSD60 with electric fuse link Model EFL 200, with electric non-stall motor, Greenheck FSD Series, with non-stall motor, or equal.

2. Electronic Damper Actuators: Refer to Sub-paragraph 2.04.B.3.

D. Relief Dampers: Parallel multi-blade, counter balanced type with adjustable counter weights. Constructed of 20 gage galvanized sheet steel or extruded aluminum with solid stops all around. Bearings shall be dust proof, ball bearings. Damper shall open on a positive pressure of 0.01 inch within space and close to a backdraft. Interlocking edges shall prevent dust infiltration when closed. Air Balance, Inc., Pottorff, Ruskin, Metal Form Manufacturing Co. Inc., or equal.

E. Duct Access Panels: Provide factory fabricated access panels in ducts where required for servicing fire or smoke dampers, and at other locations as specified in this Section. Units shall consist of removable panel, gasketed and pressure sealed by controlled spring tension locks. Construct unit, including interior parts, of same material as duct. Units shall be constructed to be suitable for installation in systems of up to 5 inches water gage static pressure.

2.04 AIR DISTRIBUTION DEVICES

A. General:

1. Grilles, registers, diffusers and appurtenances shall conform to requirements specified herein and shall be of type and sizes as specified and indicated on Drawings. Performance shall be in accordance with ANSI/ASHRAE Standard 70 including airflow velocity, pressure, temperature, and sound measurements.

2. Sponge neoprene, rubber, vinyl or felt border gaskets shall be provided for surface-mounted registers, grilles or diffusers.

3. The noise generating characteristics of all specified grilles, registers, and diffusers shall be tested to, and comply with, all requirements of this specification. Representative samples shall be subjected to tests in accordance with applicable standards and procedures in order to demonstrate such compliance. A special test for this project is not required if the manufacturer has previous certified test results that can be made applicable to this project. Maximum Sound Levels of diffusers, grilles and registers shall be as follows:

Administrative office area:	NC 30
Classrooms:	NC 20
Libraries and other noise sensitive areas:	NC 25
Gymnasiums, cafeterias, lockers areas:	NC 30.

4. Provide suitable frame types to match the ceiling types as specified or indicated on the Architectural Drawings.

5. Ceiling diffusers shall be provided with equalizing grids.

6. Ceiling mounted grilles, registers and diffusers shall be provided with a factory applied, baked enamel, dull finish, bone white to match acoustical ceiling tile.

7. Grilles or registers mounted on painted walls or other surfaces shall be furnished with a baked prime coat and finish painted in accordance with Section 09 9000: Painting and Coating.

8. Do not provide opposed blade dampers at diffusers and registers to balance the airflow, as they tend to create noise. Provide a manual volume damper at each branch take-off and also at branch duct to each diffuser and register upstream of the flexible duct connections. Air throw patterns shall be as indicated on the drawings.

9. Diffusers, registers and grilles indicated or scheduled on the drawings to comply with special requirements shall take precedence over the standard items specified.

B. Ceiling Diffusers - Round, Square, Rectangular:

1. CD-1 For non-classroom areas of less than 10 feet ceiling height only. Units shall be square or rectangular modular core type as indicated on the drawings. Anemostat QC Series, Krueger Model 1240, Price SMCD Series, or equal.

2. CD-2 For typical classrooms. Units shall be square plaque type. Anemostat PG Series, Krueger Model PLQ, Price SPD Series, or equal. The horizontal air discharge pattern shall be 360-degree radial type with factory installed blank-offs for three way, two way corner, two way opposite, or one way discharge pattern.

3. CD-3 For non-classroom areas of higher than 10 feet ceiling height. Units shall be square or rectangular louver faced type. Anemostat D Series, Krueger Model SH, Price SMD/AMD Series, or equal.

4. CD-4: Units shall be round, adjustable pattern, and surface-mounted type. Anemostat C-27, Krueger RM Series, Price RCDE Series, or equal.

5. CD-5: Units shall be adjustable linear slot type. Anemostat SLAD Series, Krueger Model 1900, Price AS Series, or equal.

C. Grilles - Return, Exhaust, Ceiling, Square, Rectangular:

1. GR-1 Acoustical Tile on Plaster Ceiling: Return and exhaust grilles shall be single deflection type with horizontal fixed face bars set at straight or 45 degree angle, ½ inch spacing and flush and flanged for surface mounting. Anemostat S3HD Series, Kruger Model S80/S85, Price 500/600 Series, or equal.

2. GR-2 Prefabricated Acoustical Tile Ceiling with Inverted Exposed T-Bars: Return and exhaust grilles shall be with single deflection horizontal fixed face bars, set at straight or 45 degree angle, ½ inch spacing and flush, lay-in panel type with nominal overall dimension of 24-inch by 24-inch. Anemostat Type SAC3L Series, Krueger Model S80/S85, Price 500/600 Series, or equal.

D. Registers, Supply, Return, Wall:

1. WR-1: Sidewall supply register shall be double deflecting type with loose key-operated opposed blade volume control. Anemostat S2 Series, Krueger Model 80/880, Price 500/600 Series, or equal.

2. WR-2: Sidewall return register shall be single deflecting type with horizontal fixed face bars set at 45 degree angle flush and flanged for surface mounting and complete with loose key-operated opposed blade volume control. Anemostat S3 Series, Krueger Model S80/S85, Price 500/600 Series, or equal.

2.05 SOUND ATTENUATING EQUIPMENT - DUCT SILENCERS

A. Provide factory fabricated duct silencers of tubular or rectangular type, for high or low velocity service, with arrangements, sizes and capacities as indicated on Drawings. Construct silencers of galvanized steel with casing seams sealed or welded to be airtight at a pressure differential of 8 inches water gage between inside and outside of unit, and stiffen or brace as required to prevent structural failure or deformation at same condition, or audible vibration during normal operation. Filler material shall comply with the following:

Fire Safety Standards:	NFPA 90A and 90B
Temperature:	ASTM C411
Air velocity:	ASTM C1071, UL 181
Fire Hazard Classification:	ASTM E84, UL 723-Class 1, NFPA 255
Corrosion Resistance:	ASTM C739, C665
Fungi Resistance:	ASTM G21
Water Vapor Sorption:	ASTM C1104, less than 1 percent by weight

Formaldehyde, Phenoloc Resins or other Volatile Organic compounds: 0 percent.

B. Select and provide silencers from acoustical and aerodynamic rating tables based on actual test readings or interpolated values of such readings obtained from tests made by recognized independent laboratories. Tests shall be in accordance with ASTM E477.

C. Select and provide silencers for air pressure drops not exceeding those indicated on Drawings, and of types, sizes and models for which noise reduction values, dynamic insertion loss, in decibels reference 10 to 12 watts, are not less than indicated on Drawings.

2.06 ZONE TEMPERATURE CONTROL DEVICES

(Not Used)

2.07 SMOKE DETECTORS

A. Refer to Section 28 3100: Fire Detection and Alarm.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 DUCTWORK

A. Construct ductwork according to details of fabrication and methods of support, as indicated in the SMACNA manuals and CMC, unless specified or indicated otherwise in this Section or on Drawings. In event of conflict, the most stringent requirement shall be provided.

B. Unless otherwise required, construct ducts to conform accurately to dimensions indicated and to be straight and smooth on inside, with joints neatly finished.

C. Duct dimensions indicated are net inside dimensions. If the indicated duct is to be furnished with an acoustic lining, add twice the thickness of the acoustic liner in both the duct width and height dimensions to provide the gross sheet metal duct dimensions.

D. Where aluminum is welded, provide a minimum thickness of 16 gage, and use gas inert tungsten process of welding.

E. Anchor ducts to building structural slab, framing and roof decking and detail method of anchoring and fastening if not indicated on Drawings. Supports shall be seismically constructed.

F. Construct and install ducts to be completely free from vibration under operating conditions.

G. Indicate on layout drawing, required for suspended ductwork, location of supports, loads imposed on each fastening or anchor, typical details for anchorage, and details for special anchorage for supports attached to metal roof decking.

H. Attach supports only to building structural framing members and concrete slabs.

I. Where supports are required between structural framing members, detail and install suitable intermediate metal framing.

J. Ducts transporting air-conditioned or heated supply air shall be insulated in accordance with requirements of Section 23 0700: HVAC Insulation.

1. Ducts exposed to weather shall be furnished with exterior insulation with weather jacket or interior lining as indicated on Table 2, Section 23 0700: HVAC Insulation.

K. Ferrous angles and structural members and joining collars specified for construction and support of ductwork and plenums shall be primed with one heavy coat of required asphaltic aluminum paint before installation or fabrication. Metal surfaces shall be thoroughly cleaned before installation of paint. Galvanizing may be provided instead of painting. Installed duct hanger rods concealed in furred ceilings and walls are not required to be primed or painted.

L. Broken places in galvanized coating shall be acid washed and then completely soldered over or painted with galvanizing paint.

3.03 DUCT CONSTRUCTION

A. Minimum ductwork gages, joints, reinforcing, and bracing of concealed ductwork shall conform to SMACNA and CMC. Exposed ductwork shall conform to the following tables in addition to SMACNA and CMC. The most stringent standards shall prevail. Hoods,

plenums, and castings shall not be lighter than the duct gage listed in Table 2 for corresponding dimensions. Additional bracing shall be provided to prevent objectionable panel vibration.

B. Provide longitudinal seams of the grooved snap lock and standing, sealed and taped, or sealed spiral or continuously welded. For exhaust duct, taping may be omitted.

TABLE 1 - SHEET METAL THICKNESS FOR CIRCULAR DUCTS AND FLAT-OVAL (FOR STATIC PRESSURES LISTED)

Gage Thickness

2-inch Water Column	Diameter of Duct	Horizontal Girth	
Maximum S.P.	Maximum	Maximum	Joints
Round / Oval	Diameter Support	Distance	
26 / 24	Up to 9 inch	10-foot	2-inch slip
26 / 24	9 to 14-inch	8-foot	4-inch
24 / 22	14 to 23 inch	8-foot	4-inch
22 / 20	23 to 37-inch	8-foot	4-inch
20 / 18	37 to– 51-inch	6-foot	1 ¼-inch by 1 1/8-inch flange

C. Construction Details for Rectangular Sheet Metal Ducts for Low-Pressure Systems - Velocities not Exceeding 2,000 Feet Per Minute:

1. For pressures in excess of 2 inches water column, duct wall thickness shall be 2 gages heavier than set forth in this table.

2. Duct specifications shown below are applicable when ducts larger than 18 inches are cross-broken. Where cross breaking is not provided, duct wall thickness shall be 2 gages heavier on ducts 19 inches to 60 inches wide unless longitudinal standing seams are furnished.

TABLE 2 - MINIMUM METAL GAGES - UNREINFORCED RECTANGULAR DUCT
(2" W.G. OR LESS)

Minimum Gage Thickness Steel / Aluminum	Max. Side, Gross Dimensions	Duct Permissible Girth Joints	Horizontal Support Maximum Distance
26 / 24	Up to 10-inch	Drive-slip, plain S-slip, or 1 inch government lock	10-foot
24 / 22	11 to 12-inch	Drive-slip, plain S-slip, or 1 inch government lock	10-foot
22 / 20	13 to 14-inch	Drive-slip, plain S-slip, or 1 inch government lock	10-foot
20 / 18	15 to 18-inch	Drive-slip, plain S-slip, or 1 inch government lock	10-foot

18 / NA	19 to 20-inch	Drive-slip, plain S-slip, or 1 inch government lock	10-foot
16 / NA	21 to 24-inch	Drive-slip, plain S-slip, or 1 inch government lock	10-foot

TABLE 3 - MINIMUM METAL GAGES - REINFORCED RECTANGULAR DUCT
(2" W.G. OR LESS)

Reinforcement Ratings To Comply with SMACNA Standards			
Minimum Gage Thickness Steel / Aluminum	Max. Side, Gross Dimensions	Duct Permissible Girth Joints	Reinforcement Spacing Max. Distance
26 / 24	Up to 14-inch	Drive-slip, plain S-slip, or 1 inch government lock with B rated reinforcement	6'
24 / 22	13 to 18-inch	Drive-slip, plain S-slip, with C rated reinforcement	8'
	19 to 30-inch	Standing S/D -slip, 1 inch bar slip, or 1 inch government lock with E rated reinforcement	5'
22 / 20	31 to 36-inch	1 inch bar slip, reinforced bar slip, or 1 inch government lock with F rated reinforcement	5'
	37 to 48-inch	1 5/8-inch standing S or 1 inch government lock with G rated reinforcement	4'
20 / 18	49 to 54-inch	1 5/8-inch standing S or 1 inch government lock with H rated reinforcement or G rated tie rods	4'
18 / NA	55 to 84-inch	1 5/8-inch standing S or 1 inch government lock with I rated reinforcement or G rated tie rods	4'
	85 to 108-inch	2 ½-inch standing seam with K rated reinforcement or H rated tie rods	4'

* Button punch snap-lock seams, using Lockformer or equal, shall be permitted only in non-accessible areas using 20 and 22 gage galvanized steel ducts with screws added at the ends. Button punch snap-lock is not permitted for aluminum or duct lighter than 22 gage.

D. Ferrous angles and structural members and joining collars specified for the construction and support of ductwork and plenums shall be primed with one heavy coat of asphalt aluminum paint before installation or fabrication. The metal surface shall be thoroughly cleaned before application of the paint. Galvanizing may be provided instead of painting. Installed duct hanger rods concealed in furred ceilings and walls is not required to be primed or painted.

E. Broken places in galvanized coating shall be acid washed and then completely soldered over or painted with galvanizing paint.

F. S-type or drive-slip type girths or longitudinal seams shall not be furnished for ductwork installed outdoors or mounted on roofs.

G. Broken places in galvanized coating shall be acid washed and then completely soldered over or painted with galvanizing paint.

3.04 DUCTS AND PLENUMS WITH LINERS

A. Ducts and plenums lined with acoustical insulation shall be as indicated on Drawings.

B. Duct dimensions indicated on Drawings are net. Add thickness of acoustic liners to obtain gross sheet metal duct dimensions.

C. For duct liner specifications and installation, refer to Section 23 0700: HVAC Insulation.

3.05 DUCT ELBOWS AND TURNING VANES

A. Duct elbows, including supply, exhaust, and return, shall be provided with a centerline radius of 1.5 times duct width parallel to radius whenever possible; centerline radius shall not be less than width of duct parallel to radius.

B. Where space does not permit above radius, or where square elbows are indicated on Drawings, turning vanes shall be installed whether indicated on Drawings or not.

C. Turning vanes shall be thick double-wall vane type, Ductmate Industries PROrail, or equal. Duro Dyne vane rail system duct turns may be furnished, provided they are of thick double wall type and Shop Drawings are submitted and reviewed by the Architect. Duct turning vanes shall be of same material as ductwork and shall be rigidly fastened in ductwork.

3.06 DUCT JOINTS AND SEAMS

A. Conditioned air supply ducts shall be furnished with joints and seams sealed, taped or welded for air tightness, except spiral seam factory machine formed duct components. Spiral seam is exempted. Joints between slip-fit components may be assembled with all seams and joint connections fastened with screws and taped.

B. Other ducts shall be furnished with joints and seams sealed by using sealant, taping, soldering, or welding. Ducts for grease hood exhaust shall be furnished with grease-tight welding or brazing on external surface for joints and seams. Fiberglass ducts shall be provided with a thermally activated closure system, Johns Manville Fortifiber Therm-Lock with Automatic Bond Indicator dots, or equal.

C. S-slip or drive-slip type girths or longitudinal seams are not permitted on exterior or exposed rooftop mounted ductwork.

D. Caulking, taping, or other joint or seam treatment shall be provided in accordance with recognized standards.

E. Seams around fan, coil housing and plenums shall be sealed with gaskets or sealing compound to provide an airtight assembly.

F. Stainless steel ductwork connected to range hoods and fume hoods shall be provided with grease-tight, gas tight welded seams, and shall be constructed and installed so that grease or

other material cannot become pocketed in any portion thereof, and system shall slope downward toward hood not less than 1/4 inch per lineal foot. Gasketed flanged joints with sealing compound shall be used only at fan and fume hood connections.

G. Alternative duct connectors such as Ductmate Industries, Mez Industries, or equal may be used if the following conditions are met:

1. One of the specifically listed connectors is submitted and approved by the Architect and OAR.

2. The correct size connector, application, and gage of material conform to SMACNA Standards.

3. The connector is installed per manufacturer's specifications.

3.07 DUCT TRANSITION

A. Slopes in sides of transition pieces shall be no greater than 1 to 5. Abrupt changes or offsets in duct system are not permitted, except when reviewed by the Architect.

3.08 DUCT TEST HOLES

A. Holes in ducts and plenums shall be provided for pilot or static tubes for obtaining air measurements to balance or check air systems. Holes shall be covered with neoprene gasketed sheet metal cover or plugged with a fitted neoprene plug chained to duct.

3.09 SOUND ATTENUATING EQUIPMENT

A. Install sound attenuators where required and indicated on Drawings. Refer to manufacturer's instructions for required installation.

3.10 FLEXIBLE CONNECTIONS

A. At points where sheet metal connections are installed to fans or air handling units, or where ducts of dissimilar metals are connected, a flexible connection of commercial grade, Duro Dyne Durolon, Ventfabrics Ventglas, Ductmate Industries Proflex, or equal, non-combustible material shall be installed and securely fastened by zinc-coated steel clinch-type bands or a flange type connection. Inlet and outlet openings shall be axially in-line, maximum deviation of centerline shall be less than 5 percent of diameter or shortest dimension of a rectangular inlet of fan or air handling unit, with system at rest. Duct end of connection shall be seismically restrained if more than 4 feet from last support.

3.11 AIR TERMINAL DEVICES

A. General: Install supply devices after ducts, plenums, and casings have been cleaned and blown free of small particles, as specified. Devices shall be aligned to be parallel to ceiling construction or walls and ceiling surfaces, and shall be pulled tightly to compress gaskets and to fit neatly against surfaces.

B. Diffusers: Support surface mounted ceiling diffusers from angles or channels resting on and fastened to ceiling construction. Do not support from ducts. Install lay-in diffusers on T-bar ceilings with hanger wires from each corner and not supported by ceiling structure. Provide sheet metal adaptor box above each diffuser to allow space for volume controller with round collars for connection to round ducts where indicated on Drawings. Fasten duct-mounted diffusers to duct collars.

C. Registers and Grilles:

1. Install wall supply registers at least 6 inches below ceiling, unless otherwise indicated. Locate return and exhaust registers 6 inches below ceiling unless otherwise indicated.

2. Support ceiling diffuser type inlets, registers, and grilles as required above for ceiling diffusers.

3. Fasten wall mounted and duct mounted registers and grilles to flanges of duct collars.

3.12 DAMPERS

A. Manually operated dampers, gravity dampers, fire dampers, and motor operated dampers shall be furnished and installed as specified and indicated. Upon completion of installation, dampers shall be checked, lubricated, and adjusted so that they operate freely, without binding. Dampers shall be of standard commercial manufacture, complete with damper frame. Where painting is required, they shall be shop finished unless otherwise noted.

1. Provide and install manual volume dampers per SMACNA standards to allow balancing per AABC, NEBB or TABB Procedures and Standards whether indicated on the drawings or not.

2. Balancing dampers shall be installed in main supply ducts from fan discharge plenums, where two or more ducts are connected to each plenum, although such balancing dampers may not be indicated. Each zone shall be provided with a manual volume damper. Sheet metal screws shall be installed through handles and into ducts to lock damper in place after test and balance.

3. Each supply, return, and exhaust branch shall be provided with manual volume dampers.

4. Do not provide opposed blade dampers at air inlets and outlets.

5. Each supply, return, and exhaust inlet or outlet shall be provided with a manual volume damper. This damper shall be a minimum of 5 feet upstream of the air outlet and inlets. An acoustic flexible duct should be provided between the outlet and inlet and the damper for concealed ducts.

6. Dampers installed in accessible locations shall be provided with locking and indicating quadrants. Ventfabrics Ventlok, Duro Dyne, Young Regulator Co., or equal.

7. Dampers installed in ductwork in furred ceiling spaces or in roof spaces with less than 30 inches of clearance below beams, joists, or other construction, and where access panels are not provided shall be furnished with damper rods extended below ceiling and terminated with a concealed damper regulation. Ventfabrics Ventlok, Young Regulator Co., Duro Dyne, or equal.

8. Dampers not identified as splitter, extractor, or butterfly dampers shall be of multi-louver type arranged for opposed blade operation. Damper shall be same dimension as adjoining duct and be tight closing. Blades shall not be greater than 9 inches. Dampers shall be not less than 18 gage steel.

9. Motor operated dampers shall be furnished by temperature control manufacturer as part of temperature control equipment and shall conform to requirements of Section 23 0900: HVAC Instrumentation and Controls.

10. Dampers shall be provided with accessible operating mechanisms. Where operators are exposed in finished portions of building, operators shall be chromium-plated with exposed edges rounded. Splitter dampers are not permitted unless specified and reviewed by the Architect.

11. Dampers shall not be installed in combustion air ducts.

12. Access panels shall be installed for access at each damper's operating mechanism.

3.13 FIRE AND SMOKE DAMPERS

A. Fire dampers or combination fire and smoke dampers shall be installed and accessible at duct penetrations of rated walls and partitions and as required by State Fire Marshal and NFPA 90A, 92A, 92B, and 101.

B. Fire dampers shall be sized, and adjoining duct enlarged, to assure full size air passage of connecting ductwork.

C. Install smoke dampers as indicated on Drawings and as required in ducts penetrating smoke isolation separations.

D. Fire dampers or combination fire and smoke dampers shall be electrically actuated, power open-fail close type, UL 555 and UL 555S classified for 1-1/2 hours.

E. Provide a service disconnect switch for each and every combination smoke and fire damper.

3.14 SMOKE DETECTORS

A. Smoke detectors shall be installed in accordance with requirements of the California Mechanical Code.

B. Smoke detectors shall be installed in systems of over 2000 CFM capacity to detect presence of smoke and automatically shut down air handling units or fans unless it has been verified with the electrical installer that Exception 1 to CMC 608.0: Automatic Shutoffs, regarding automatic shut down of systems with total coverage smoke detection systems is applied.

C. Smoke detectors shall be installed in supply system downstream of filters.

3.15 BACKDRAFT DAMPERS

A. Backdraft dampers shall be installed at locations indicated in accordance with the State of California Building Energy Efficiency Standards, Title 24, CCR.

3.16 DUCT SLEEVES AND PREPARED OPENINGS

A. Furnish duct sleeves for 15-inch diameter ducts or less passing through floors, walls, ceilings, or roof and install during construction of the floor, wall, ceiling, or roof. Install round ducts larger than 15 inches diameter and square and rectangular ducts passing through floors, walls, ceilings or roof through prepared openings. Provide duct sleeves and prepared openings for duct mains and duct branches.

B. Provide one inch clearance between duct and sleeve or between insulation and sleeves for insulated ducts, except at grilles, registers and diffusers.

C. Provide prepared openings for round ducts larger than 15 inches in diameter and for square and rectangular ducts with one inch clearance between duct and openings or between insulation and opening for insulated ducts, except at grilles, registers and diffusers.

D. Provide closure collar of galvanized sheet metal not less than 4 inches wide unless otherwise indicated on Drawings on each side of walls or floors where sleeves or prepared openings are provided except where grilles or diffusers are installed. Install collar tight against surface. Fit sharp edges of collar installed around insulated duct to preclude tearing or puncturing insulation covering vapor barrier. Fabricate collars from round ducts in steel. Provide not less than 4 nails to attach collar where openings are 12 inches in diameter or less and not less than 8 nails where openings are 20 inches in diameter or less.

E. Pack space between sleeve or opening and duct or duct insulation with commercial grade packing yarn.

3.17 FLEXIBLE DUCT RUNOUTS

A. Runouts from branches, risers or mains to air terminal units and outlets may be pre-insulated, factory fabricated flexible ducts complying with NFPA 90A. Flexible ductwork shall not exceed 7 feet in length. When required to suspend flexible ducts, furnish hangers of type recommended by manufacturers of pre-insulated flexible duct and install at intervals recommended. Method of attachment to other components of air distribution system for a vapor-tight joint shall be in accordance with printed instructions of flexible duct manufacturer. Bend radius shall be 1-1/2 times diameter of duct, measured from centerline. Bends greater than 90-degree angle are not permitted. Non-metallic flexible duct shall be permitted only in T-bar suspended ceilings.

3.18 DUCT HANGERS AND SUPPORTS

A. Exposed or easily accessible ductwork: Single horizontal ducts shall be suspended from heavy steel hanger straps securely fastened to overhead structural members. Ducts shall be supported by a hanger strap passing around and fastened to duct with not less than two

Parker No. 10 screws set approximately 2 inches in from each edge, to form a supporting stirrup attached to overhead supports. Rectangular ducts shall be provided with two hanger straps, one located on each side of duct. Round ducts may be installed from a single hanger strap unless conditions require that duct be held tight against ceiling, in which case two hanger straps may be brought down each side of duct, oriented at right angles to axis of duct and securely fastened to duct standing leg seam or angle iron stiffener with a minimum of two bolts, measuring 1/4 inch, for each side of duct. Hanger straps shall be galvanized with a minimum size of 1 1/8-inch by 14 gage. Angles of galvanized steel of 1 1/8-inch by 1 1/8-inch by 16 gage (14 gage for ducts 60 inches or greater) may be furnished instead of straps.

B. Non-accessible ductwork: Non exposed and hidden from sight during regular school operations ductwork, rigid round, rectangular, and flat oval metal ducts, shall be installed with support systems conforming to SMACNA Standards.

C. Where ducts are installed one above the other, they shall be individually supported on a trapeze of steel angles with 3/8 inch supporting steel rods securely fastened to overhead construction. A minimum distance of 3 inches shall be maintained between ducts wherever possible, but in no event shall distance be less than 2 inches. Minimum sizes of steel angles shall be 1 ½-inch by 1 ½-inch by 1/8 inch for duct sizes through 60 inches in greatest dimension, 2-inch by 2-inch by 1/8 inch for duct sizes 61 inches through 84 inches, 2-inch by 2-inch by 3/16 inch for duct sizes 85 inches through 96 inches, and 2-inch by 2-inch by 1/4 inch for duct sizes over 97 inches.

D. Ducts 30 inches square area and greater and ducts 20 feet long and longer shall be seismically restrained. Refer to Section 23 0548: HVAC Sound, Vibration and Seismic Control.

E. Hangers shall not be supported by, or fastened to, non-structural members including blocking. Toggle or Molly type bolts are not permitted.

F. Vertical ducts shall be supported with suitable angles on each side of each duct located at each floor and at intervals not to exceed 8 feet. Angles shall be sized and installed according to SMACNA Standards for required span so that they will be rigid, without bending or sagging.

G. Roof-mounted ductwork shall be installed a minimum 12 inches above roof and shall be supported by galvanized welded pipe, one on each side, fastened to roof structure, flashed and sealed to roof membrane. Install supports at each turn, unit connections, and each penetration, and space at maximum 6 feet off-center in general. Pitch pockets are not allowed.

3.19 ACCESS PLATES AND DOORS

A. Access plates and doors shall be furnished and installed where stops, valves, fire dampers, fusible links, coils, damper operating mechanism, control equipment, lubrication fittings, air filters, air handling equipment and similar items normally requiring adjustment or servicing are installed in concealed spaces.

B. Access plates and doors shall be located to permit convenient access to equipment sized to permit removal of equipment for servicing. Access plates shall be no less than 12-inch by

12-inch in clear opening. Proper servicing of equipment requires adequate access for maintenance personnel. Access doors shall not be less than 24-inches by 24-inch, unless otherwise detailed. Two or more valves shall not be located in same access area unless sufficient clearance is provided for operation, servicing and removal of each valve.

C. Openings in ducts or plenums whose longer dimension does not exceed 12 inches may be covered by a plate of same material as duct, gasketed and fastened to duct or plenum with sheet metal screws.

D. Access plates in floors shall not be less than 8-inch by 8-inch and shall be carborundum surface brass with cast brass frames anchored into concrete. Access plates in tile walls shall be chromium plated brass and polished. Serrated plates furnished as part of a clean-out assembly are permitted in floors instead of a separate plate.

E. Access plates and doors in walls and ceilings of finished rooms and in locations normally accessible to students shall be furnished with continuous piano hinges, unless otherwise specified, and a special flush type spring-loaded latch requiring an Allen wrench to operate. Access devices shall be installed after plastering in plaster ground openings.

F. Access panels or doors penetrating one-hour fire resistive ceilings shall meet code requirements for such openings.

G. Access panels shall be fire-rated; Milcor, or equal. Access doors shall be as required for installation in openings penetrating one-hour fire resistive ceilings. Access doors shall be furnished with a flush, key-operated cylinder lock, furnished with two keys each, instead of Allen headlock for non-rated ceilings.

H. Access panels that are part of an integrated ceiling are specified in Section 09 8433: Cementious Wood Fiber Acoustical Units. Identification markers shall be affixed to adjacent supports, under this portion of Work, to indicate location and type of mechanical device to be serviced.

I. Access panels installed in ducts or plenums located in heater or equipment rooms containing gas-fired equipment shall be furnished with heavy-duty spring closing hinges and refrigerator door type catches unless otherwise required. When these panels are intended for maintenance personnel access, catches shall be operable from both interior and exterior.

J. Other access panels, except those specified above, shall be furnished with suitable hinges and one or more sash fasteners.

K. Panels located in ducts and plenums shall be installed with gaskets made of synthetic rubber, felt, or similar material to provide an airtight installation. Panels shall be constructed and reinforced to prevent vibration.

L. Label the words "FIRE DAMPERS" on panels over fire dampers and words "DO NOT OPEN - HEATER IS OPERATING" on panels located in heater or equipment rooms. Letters shall be approximately 3 inches high, if space is available.

M. Furnish a key to operate latch access plates, one for each access plate, but not to exceed five keys for any one Project.

N. Access plates and panels shall be furnished with manufacturer's name or trade mark and model number cast or stamped thereon, or upon a label permanently affixed thereon.

O. Provide duct through roof flashing as detailed in the SMACNA standards or as indicated on Drawings.

P. Refer to SMACNA for access plate and door construction.

3.20 PRESSURE TESTING

A. Test all supply, return and exhaust ducts, plenums and casings at static pressure indicated for system to insure substantially airtight ducts per current industry standards before covering with insulation or concealing in masonry. Substantially airtight shall be construed to mean that no air leakage is noticeable through senses of feeling or hearing at duct joints. Test ductwork for leaks at 1 ½ times operating pressure but at a minimum of 2 inches of water.

3.21 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose off the Project site.

3.22 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

END OF SECTION

SECTION 23 8000

HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

PART 1 – GENERAL

1.01 SUMMARY

A. SECTION INCLUDES

Air conditioning and air handling equipment including but not limited to:

1. Single Packaged Air Conditioning Units.
2. Split System Air Conditioning Units.
3. Split System Heat Pump Units.
4. Fans.

B. RELATED REQUIREMENTS

1. Division 01: General Requirements.
2. Section 07 6000: Flashing and Sheet Metal.
3. Section 22 1000: Plumbing.
4. Section 23 0500: Common Work Results for HVAC.
5. Section 23 0513: Basic HVAC Materials and Methods.
6. Section 23 0548: HVAC Sound, Vibration and Seismic Control.
7. Section 23 0900: HVAC Instrumentation and Controls.
8. Section 23 0923: Environmental Control and Energy Management System.
9. Section 23 3000: Air Distribution.

1.02 DESIGN REQUIREMENTS

A. Work of this Section is based on HVAC equipment units indicated as Basis of Design in Part 2 of this Section. Products from different HVAC equipment manufacturers listed are never identical, although equivalent in capacity, performance and quality. In the cases where dimensions, weight, configuration and utility requirements differ from the products used as a basis of design, the Contractor, at no additional cost to the Owner, shall coordinate and submit, for Architect review, revisions to the design.

1.03 SUBMITTALS

A. Provide in accordance with Division 01 and Section 23 0500: Common Work Results for HVAC.

B. For products listed that are not the basis of design, submit the following in addition to above requirements:

1. Title 24 Calculations: Replace HVAC unit values in calculation files provided by the Architect and submit for review.

1.04 QUALITY ASSURANCE

A. Provide submittals in accordance with Section 23 0500: Common Work Results for HVAC.

1.05 PROJECT RECORD DOCUMENTS

A. Provide Owner instructions on equipment operation and maintenance procedures, as indicated in Section 23 0500: Common Work Results for HVAC.

1.06 WARRANTY

A. Compressors shall be provided with manufacturer's five year warranty, (replacement only).

B. Manufacturer shall warrant parts, except heat exchangers, for a period of five years.

C. Heat exchangers shall be provided with manufacturer’s ten year warranty, (replacement only).

PART 2 – PRODUCTS

2.01 EQUIPMENT

A. Capacities of air conditioning equipment indicated on Drawings are net capacities actually required. Standard catalog ratings shall be adjusted to actual Project site environmental conditions.

2.02 AIR CONDITIONING UNITS - AC (2 Tons-25 Tons)

A. Manufacturers: Carrier, Trane, York, McQuay, Lennox, American Standard Heating & Air Conditioning, or equal.

1. Basis of Design: [Carrier]

B. Furnish packaged air conditioning unit with gas heating for roof top installation. Unit shall be self-contained, completely factory assembled, with complete internal wiring and controls. Unit shall also be provided with a fully piped refrigerant circuit, fully charged with an environmentally friendly refrigerant that is not scheduled for phase out. Unit

shall be field configurable for down-flow or horizontal discharge. Cooling and heating capacities, electrical characteristics, and operating conditions shall be as indicated on Drawings.

C. Quality Assurance:

1. Units shall be CSA certified for outdoor installation.

2. Cooling capacity shall be rated in accordance with current ANSI/AHRI Standard 210/240.

3. Unit shall be UL listed and designed to conform to ANSI/ASHRAE Standard 15 Safety Code for Mechanical Refrigeration and ANSI Z21.47/UL 1995 Heating and Cooling Equipment.

4. ANSI/NFPA 70: National Electrical Code.

5. Unit cooling efficiency EER/SEER ratings shall comply with CCR, Title 24, Building Energy Efficiency Standards for Residential and Nonresidential Buildings, and shall not be less than ratings indicated on drawings.

6. Unit heating efficiencies AFUE ratings shall comply with current CCR, Title 24, Building Energy Efficiency Standards for Residential and Nonresidential Buildings, and shall not be less than ratings indicated on drawings.

7. Unit shall comply with California Maximum Oxides of Nitrogen (NOX) Emission Regulations and current SCAQMD regulations.

8. The unit roof curbs shall conform to NRCA standards.

9. Insulation and adhesive shall meet NFPA 90A and 90B requirements for flame spread and smoke generation.

10. Unit casing shall be capable of withstanding ASTM B117 500-hour salt spray test.

11. Each unit shall be run tested at factory per ANSI/ASHRAE 37 and provided with a certificate indicating tested pressures, amperages, dates, and inspector.

D. Unit Cabinet:

1. Galvanized steel with baked enamel finish on external surfaces that are exposed to weather.

2. Interior surfaces exposed to conditioned and return air streams shall be insulated with a minimum ½-inch thick, 1 pound density foil-faced cleanable insulation. Insulation shall have an “R” Value of 3.70 and comply with material safety standards and installation requirements for duct lining as specified under Section 23 0700: HVAC Insulation.

3. Cabinet top cover shall be of one piece construction or where seams exist, shall be double hemmed and gasket sealed.

4. Cabinet panels shall be hinged access panels for filter, compressors, evaporator fan, control box and heat section areas. Each panel shall use multiple quarter-turn latches and handles. Each major external hinged access panel shall be permanently attached to rooftop unit. Panels shall also include tiebacks.

5. Return air filters shall be accessible through a hinged access panel and be on a slide-out track using standard size filters.

6. Holes shall be provided in base rails (minimum 16 gage) for rigging shackles and level travel and movement during overhead rigging operations.

7. Unit shall have a factory-installed internally sloped condensate drain pan, providing a minimum ¾-inch-14 NPT connection to prevent standing water from accumulating. Pan shall be fabricated of high impact polycarbonate material, epoxy powder coated steel or stainless steel and shall slide out for cleaning or maintenance. An alternate vertical drain (¾-inch NPT) connection shall also be available. Drain pans shall conform to ASHRAE 62 self-draining provisions.

8. Unit shall have standard thru-the-bottom power and control wiring connection capability.

E. Compressors:

1. Unit shall be furnished with single or multiple fully hermetic scroll compressors with internal vibration isolators.

2. Dual electrically and mechanically independent refrigerant circuits for 7.5 tons and above.

3. Compressors shall be provided with service access valves.

4. Compressor motors shall be cooled by refrigerant passing through motor windings.

5. Compressors shall be provided with line break thermal and current overload protection.

6. Compressors shall be provided with crankcase heaters, internal high-pressure and temperature protection.

F. Refrigerant circuit components:

1. Thermostatic expansion valve (TXV) with removable power element.

2. Refrigerant strainer.

3. Service gage connections on suction, discharge, and liquid lines.

4. Solid core refrigerant filter driers.

G. Evaporator and Condenser Coils: Standard Evaporator and condenser coils shall be furnished with:

1. Condenser coils Type A, B, or C is acceptable

    a. Type A: Copper-tube, aluminum-fin coil, with liquid subcooler. Internally enhanced 3/8 inch OD seamless copper tubing mechanically bonded to aluminum fins.

    b. Type B: Spine Fin condenser coil shall be continuously wrapped, corrosion resistant aluminum with minimum brazed joints. This coil is 3/8 inch OD seamless aluminum tubing glued to a continuous aluminum fin. Coils are lab tested to withstand 2,000 pounds of pressure per square inch. The outdoor coil provides low airflow resistance and efficient heat transfer. The coil is protected on four sides by louvered panels.

    c. Type-C: Coil shall be air-cooled Micro-Channel heat exchanger technology (MCHX) and shall have a series of flat tubes containing a series of multiple, parallel flow microchannels layered between the refrigerant manifolds. Coils shall consist of a two-pass arrangement. Coil construction shall consist of aluminum alloys for fins, tubes, and manifolds in combination with a factory applied corrosion-resistant coating.

2. Evaporator coils

    a. Aluminum plate fins mechanically bonded to enhanced copper tubes with joints brazed.

    b. Tube sheet openings shall be belled to prevent tube wear.

    c. Evaporator coil shall be of full-face active design.

    d. Dual circuit models shall have face-split type evaporator coil.

G. Fans and Motors:

1. Evaporator fan shall be a dynamically balanced, double width, double inlet, forward curved centrifugal type, fabricated of steel with a corrosion resistant finish that was tested and rated in accordance with AMCA requirements.

2. Evaporator fans shall be belt or direct-driven, as indicated on Drawings.

3. Direct drive fans shall be provided with minimum two speeds taps adjustment or ECM motor.

4. Evaporator blower and motor shall have permanently lubricated, factory-sealed ball bearings and automatic-reset thermal overload protection.

5. Belt drive shall include an adjustable-pitch motor pulley. Belt drive fans shall accommodate from 0.6 inch to 1.6-inch external static pressure without changing drives or motors.

6. Condenser fan shall be a dynamically balanced, propeller type, fabricated of aluminum blades riveted to corrosion resistant steel spiders and direct-driven by

a totally enclosed motor. Condenser air shall be discharged vertically. Condenser fan motor shall be high efficiency or ECM type motor and provide cooling operation down to 25 degrees F outdoor temperature with automatic-reset thermal overload protection.

H. Heating Section:

1. Induced draft combustion type with energy saving direct spark ignition system, redundant main gas valve, and 2-stage heat.

2. The heat exchanger shall be of tubular section type fabricated of a minimum of 20 gage steel coated with a nominal 1.2 mil aluminum-silicone alloy or 20 gage type 409 stainless steel, including stainless steel tubes, vestibule plate.

3. Burners shall be of in-shot type fabricated of aluminum coated steel or stainless steel.

4. Gas piping shall enter unit cabinet at a single location.

5. Integrated Controls shall provide following:

   a. Timed control of evaporator fan functioning and burner ignition,

   b. Anti-cycle protection for gas heat operation (after one cycle on high temperature limit switch and one cycle on flame rollout switch).

   c. Diagnostic information.

6. Induced draft motor shall be provided with permanently lubricated, sealed bearings and inherent automatic reset thermal overload protection.

I. Controls, Safeties and Diagnostic Points:

1. Unit Controls: Unit shall be furnished with self-contained, network capable and ready direct digital controls.

   a. Controls shall be factory-installed.

   b. Controls shall operate with zone control systems.

   c. Controls shall furnish built-in diagnostics for thermostat commands for staged heating and cooling, evaporator-fan operation, and economizer operation.

   d. Controls shall be furnished with a 5-minute time delay between modes of operation.

   e. Control circuit shall protected by a fuse on 24-V transformer side.

2. Compressor high temperature, high current, internal overloads, internal thermostat.

a. Compressor reverse rotation protection.

b. Loss-of-charge/low-pressure switch.

c. Freeze-protection thermostat, evaporator coil.

d. High-pressure switch. The lockout protection shall be easily disconnected at control board, if necessary.

e. Internal relief valve.

f. Anti-recycle relay, or time cycle device to prevent rapid cycling of compressor after any off cycle.

3. Heating section shall be provided with following minimum protections:

a. High-temperature limit switches.

b. Induced draft motor speed sensor.

c. Flame rollout switch.

d. Flame proving controls.

e. Redundant main gas valve.

f. Heating controls shall consist of:

1) 2-stage automatic combination gas valve.

2) Pressure regulator.

3) Electric spark intermittent ignition system or hot surface ignition system.

4) Time delay fan control.

4. Operating Characteristics:

a. Unit shall be capable of starting and operating at 125 degrees F ambient outdoor temperature, meeting maximum load criteria of AHRI Standard 210/240 or 360 at plus or minus 10 percent voltage.

b. Compressor with standard controls shall be capable of operation down to 25 degrees F ambient outdoor temperature.

5. EMS Diagnostic Points: Provide diagnostic points for units, including those at projects with no EMS.

a. Supply air temperature.

b. Return air temperature.

c. Space temperature.

d. Outdoor air temperature.

e. Filter status.

f. Fan status.

g. Compressor status.

h. Economizer damper current position.

i. Other diagnostic point required by current Title 24, automated fault detection and diagnostics (FDD).

J. Filter Section:

1. Provide filter section with factory-installed low-velocity, throwaway 2-inch thick high capacity, MERV 8 Class 2, or equal, filters of commercially available sizes unless noted otherwise on the drawings.

2. Filter face velocity shall not exceed 300 fpm at nominal airflows.

3. Filter section shall allow installation of standard size air filter.

4. Return air filters shall be accessible through a hinged access panel and be on a slide-out track using standard size filters.

5. At projects with no EMS, provide clogged filter switch and options board to annunciate at the thermostat.

K. 100 Percent Outdoor Air Economizer:

1. Provide on units larger than 6.25 tons nominal capacity. Provide for smaller capacities where indicated on drawings.

2. Gear-driven integrated economizers.

3. Integrated integral-modulating type capable of simultaneous economizer and compressor operation.

4. Furnish hardware and controls to provide cooling with outdoor air.

5. Low-leakage dampers not to exceed 3 percent leakage, at one inch wg pressure differential (variable sliding economizer).

6. Barometric relief damper. Damper shall close upon unit shutoff.

7. Differential temperature and enthalpy controller unless indicated otherwise on drawings.

8. Provide units 6.25 tons and above with centrifugal power exhaust controlled by a pressure sensor in space or outdoor air measurement and tracking. The controller shall modulate VFD in centrifugal power exhaust to maintain a pressure differential of 0.05 inch of water between indoor and atmospheric pressure. The power exhaust shall be factory furnished with unit and installed in field. Furnish field wiring to power exhaust and install tubing in space. Provide other accessories as required to comply with UL or ETL requirements.

9. Base Rail: Factory installed on both horizontal and down-flow units.

10. Dampers Using Electronic Actuators:

    a. Manufacturer: Belimo, Honeywell, Invensys, Johnson Controls, or equal.

    b. Size for torque required for damper seal at load conditions.

    c. Coupling: V-bolt dual nut clamp with a V-shaped, toothed cradle.

    d. Overload Protection: Electronic overload or digital rotation-sensing circuitry without the use of end switches to prevent damage to the actuator during a stall condition.

    e. Fail-Safe Operation: Mechanical, spring-return mechanism.

    f. Power Requirements: Maximum of 10 VA at 24 VAC or 8 W at 24 VDC.

    g. Proportional Actuators shall be fully programmable. Control input, position feedback and running time shall be factor or field programmable by use of external computer software. Diagnostic feedback shall provide indications of hunting or oscillation, mechanical overload and mechanical travel. Programming shall be through EEPROM without the use of actuator mounted switches.

    h. Actuators shall be listed by ISO 9001, ULC, and CSA C22.2.

L. Furnish programmable digital thermostat with following features for single zone units that are not provided with variable volume and variable temperature type controls:

1. 7-day time clock.

2. Heat, cool, automatic changeover.

3. Occupied/unoccupied modes.

4. Dry contact switch for input from an external device such as a central time clock, occupancy sensor or a telephone activated device.

5. Remote sensors. School Areas that could be subject to vandalism or accidental impact damage such as Gymnasiums, Auditoriums, Multipurpose Rooms, Corridors, and Lobbies shall be provided with thermostats with remote return air

duct or room sensors. Verify remote location of sensors and thermostats with Architect.

6. Robertshaw, Honeywell, Johnson Controls, or equal. Refer to Section 23 0900 for areas with zone damper controls.

7. Provide locking cover.

M. Demand Controlled Ventilation:

1. Units of 6.25 tons and higher nominal capacity shall be provided with Indoor Air Quality (CO_2) Sensor and Accessory Electronic Expansion Boards.

2. The unit shall have ability to provide demand ventilation indoor-air quality (IAQ) control through economizer when provided with an indoor air quality sensor and accessory expansion board.

3. The IAQ sensor shall be wall mounted unless otherwise indicated on Drawings. The set point shall be adjustable.

4. The IAQ sensor shall be powered through unit. If not, required control transformer shall be provided by manufacturer. Coordinate power requirements and location with Division 26.

5. The IAQ sensor shall provide a 4 to 20 mA signal to expansion board.

N. Parts Availability: Submit proof in writing that majority (minimum 80 percent) of the replacements parts are commonly available and not proprietary. Also, submit proof in writing that a local parts sales and service facility exists, where replacement parts will be warehoused in quantity. Guarantee timely availability for parts that are proprietary.

2.03. COOLING ONLY FAN COIL UNITS AND CONDENSING UNITS

A. Manufacturer: Carrier, Trane, York, McQuay, Lennox, American Standard Heating & Air Conditioning, or equal.

1. Basis of Design: [Carrier]

B. FCU and CU: Furnish fan coil unit (FCU) and condensing unit (CU), split type, air-cooled, roof or ground for ducted connections or free blow. Units shall be air-cooled condensing unit/direct expansion fan coil combinations. Condensing unit outdoor section shall be factory assembled with a direct-drive condenser fans with horizontal or vertical air discharge, scroll-type compressor, refrigerant coil, fan motors, pre-wired control panel and a holding charge of a non-ozone depleting refrigerant. Contractor shall provide additional refrigerant for extended lines. Indoor fan coil unit shall be furnished with horizontal discharge and will include evaporator coil, fan and motor, condensate pan with drain, thermal expansion valve, pre-wired control panel and remote thermostat control. Unit shall provide an EER/SEER complying with CCR, Title 24, Building Energy Efficiency Standards for Residential and Nonresidential Buildings. UL listed and rated at AHRI Standard 210/240.

C. Nominal unit cooling, heating capacities, electrical characteristics, and operating conditions shall be as indicated on Drawings.

D. Condenser coils

1. Condenser coils Type A, B, or C are acceptable.

a. Type A: Copper-tube, aluminum-fin coil, with liquid subcooler. Internally enhanced 3/8-inch outside diameter, seamless copper tubing mechanically bonded to aluminum fins.

b. Type B: Spine Fin™ condenser coil shall be continuously wrapped, corrosion resistant aluminum with minimum brazed joints. This coil is 3/8 inch outside diameter seamless aluminum tubing glued to a continuous aluminum fin. Coils are lab tested to withstand 2,000 pounds of pressure per square inch. The outdoor coil provides low airflow resistance and efficient heat transfer. The coil is protected on four sides by louvered panels.

c. Type-C: Coil shall be air-cooled Micro-Channel heat exchanger technology (MCHX) and shall have a series of flat tubes containing a series of multiple, parallel flow microchannels layered between the refrigerant manifolds. Coils shall consist of a two-pass arrangement. Coil construction shall consist of aluminum alloys for fins, tubes, and manifolds in combination with a factory applied corrosion-resistant coating.

D. Condenser Coils at locations within two miles from ocean shall be furnished with copper plate fins mechanically bonded to enhanced copper tubes with copper tube sheets and brazed joints. Coated coils are not acceptable.

E. Evaporator coils:

1. Aluminum plate fins mechanically bonded to enhanced copper tubes with joints brazed.

2. Tube sheet openings shall be belled to prevent tube wear.

3. Evaporator coil shall be of full-face active design.

4. Dual circuit models shall have face-split type evaporator coil.

F. Condenser Fan and Motors: Condenser fan shall be a dynamically balanced, propeller type, fabricated of aluminum blades riveted to corrosion resistant steel spiders and direct-driven by a totally enclosed motor. Condenser air shall be discharged horizontally or vertically. Condenser fan motors shall be high efficiency or ECM type motor.

G. Cabinets: Fabricated of galvanized steel, bonderized and finished with baked enamel.

H. Compressor shall be serviceable hermetic scroll type. Compressor shall be furnished with access valves and shall be installed on rubber isolators to reduce sound vibration. It shall be furnished with high and low-pressure protection. Each horizontal discharge

condensing unit shall be furnished with a factory installed suction accumulator. Field installed accumulators are not permitted. It shall be furnished with high and low-pressure protection, brass external vapor supply line service valves, vapor return line service valves with service gage connection port, service gage port connections on compressor suction and discharge lines with Schrader-type fittings with brass caps, filter drier, pressure relief, liquid line solenoid valves, thermostatic expansion valves, and a holding charge of refrigerant.

I. Controls: Compressor motor assembly shall be protected with high and low-pressure switches, internal overloads, internal thermostat, internal relief valve, and anti-recycle relay, or time cycle device to prevent rapid cycling of compressor after any off cycle. Unit shall incorporate an automatic relay for indoor circulating air blower. Control panel shall be pre-wired in unit casing. The control circuit shall incorporate a manual reset safety circuit to render refrigerant system (compressor and outdoor air motor) inoperative should there be a loss of airflow or refrigerant. Units shall also be furnished with automatic condenser-fan motor protection, high condensing temperature protection, compressor motor current and temperature overload protection, high pressure relief, and condenser fan failure protection.

J. EMS Diagnostic Points:

1. Supply air temperature.

2. Return air temperature.

3. Space temperature.

4. Filter status.

5. Fan status.

6. Compressor status.

7. Other diagnostic point required by current Title 24, automated fault detection and diagnostics (FDD).

K. Low Ambient Operation: Head pressure control shall be provided for operation at outside air temperature below 45 degrees F.

L. Filters: Filters shall be 2-inch standard size high capacity replaceable media type MERV 8, or equal, installed in an external 2-inch rack filter section and complete with an access door.

M. An in-line filter-drier shall be provided with equipment and shall be installed at Project site.

N. Economizer: Provide on 6.25 nominal ton and larger units only. Economizer shall be manufacturer's standard; factory furnished and field installed. Economizer control shall maintain a fixed supply air temperature during free cooling operation by providing full modulation of operable outside and return air dampers.

2.04. HEAT PUMP AND FAN COIL UNITS

A. Manufacturer: Carrier, Trane, York, McQuay, Lennox, American Standard Heating & Air Conditioning, or equal.

1. Basis of Design: [Carrier]

B. HP and matching indoor fan coil unit and condenser unit: Furnish heat pump, split type, air-cooled, roof or ground installation with ducted connections or free blow. Units shall be air-cooled heat pump/direct expansion fan coil combinations. Heat pump outdoor section shall be factory assembled and furnished with direct-drive condenser fans with horizontal or vertical air discharge, scroll type compressor, refrigerant coil, fan motors, pre-wired control panel. Unit shall also be provided with a fully piped refrigerant circuit, fully charged with an environmentally friendly refrigerant that is not scheduled for phase out. Provide additional refrigerant for extended lines. Indoor fan coil unit shall be furnished with horizontal discharge and will include evaporator coil, fan and motor, condensate pan with drain, thermal expansion valve, pre-wired control panel and remote thermostat control. Nominal unit cooling, heating capacities, electrical characteristics, and operating conditions shall be as indicated on Drawings.

C. Quality Assurance:

1. Cooling capacity rated in accordance with current AHRI Standard 210/240 and 270. Units shall be listed in AHRI.

2. Unit construction shall comply with ANSI/ASHRAE 15, latest revision, and with NEC.

3. Units shall be constructed in accordance with UL standards and shall carry UL label of approval. Units shall have CSA approval.

4. Units shall be listed in CEC directory.

5. Unit cabinet shall be capable of withstanding ASTM B117 500 hour salt spray test.

6. Air-cooled condenser coils shall be leak tested at 217 psig and pressure tested at 450 psig with coil submerged water.

7. Unit shall provide an EER/SEER/COP complying with CCR, Title 24, Building Energy Efficiency Standards and per the drawings.

D. Evaporator and condenser coils: Evaporator and condenser coils shall be copper with mechanically bonded, smooth aluminum plate fins. Tube joints shall be brazed with copper or silver alloy. Coils shall be pressure-tested at factory. Protective metal guard for inlet and outlet of outdoor coil.

E. Fans:

1. Condenser Fan and Motors: Condenser fan shall be high efficiency or ECM type motor direct driven, propeller type arranged for horizontal or vertical discharge.

Condenser fan motors shall be furnished with inherent protection, and shall be permanently lubricated type, resiliently mounted for quiet operation. Each fan shall be furnished with a safety guard.

2. Evaporator fan section shall be furnished with high efficiency or ECM type motor centrifugal, forward curved, double width, double inlet fan or fans installed on a solid shaft. Fan shall be statically and dynamically balanced and shall rotate on permanently lubricated bearings.

F. Unit Cabinets:

1. Cabinets shall be fabricated of galvanized steel, bonderized and finished with baked enamel.

2. Cabinet interior shall be insulated with minimum one inch thick neoprene covered fiberglass.

3. Outdoor unit compartment shall be isolated and have an acoustic lining to assure quiet operation.

G. Compressor: Compressor shall be hermetic scroll type.

1. Compressor shall be furnished with access valves and it shall be installed on rubber isolators to reduce sound vibration.

2. Furnish with high and low-pressure protection.

3. Each heat pump shall be furnished with factory installed suction accumulator. Field installed accumulators are not permitted.

4. It shall be furnished with high and low-pressure protection, brass external vapor supply line service valves, vapor return line service valves with service gage connection port, service gage port connections on compressor suction and discharge lines with Schrader-type fittings with brass caps, filter drier, pressure relief, liquid line solenoid valves, thermostatic expansion valves, and a holding charge of refrigerant.

H. Refrigeration Components: Refrigerant circuit components shall include brass external liquid line service valve with service gage port connections, suction line service valve with service gage connection port, service gage port connections on compressor suction and discharge lines with Schrader type fittings with brass caps, accumulator, bi-flow filter drier, pressure relief, reversing valve, heating mode metering device, and a holding charge of refrigerant.

I. Controls and Safeties:

1. Compressor motor assembly shall be protected with high and low-pressure switches, internal overloads, internal thermostat, internal relief valve, and anti-recycle relay, or time cycle device to prevent rapid cycling of compressor after any off cycle.

2. Control panel shall be pre-wired in unit casing.

3. The control circuit shall incorporate a safety circuit to render refrigerant system (compressor and outdoor air motor) inoperative should there be a loss of airflow or refrigerant.

4. Units shall also be furnished with automatic condenser-fan motor protection, high condensing temperature protection, compressor motor current and temperature overload protection, high pressure relief and condenser fan failure protection.

J. EMS Diagnostic Points:

1. Supply air temperature.

2. Return air temperature.

3. Space temperature.

4. Filter status.

5. Fan status.

6. Compressor status.

7. Other diagnostic point required by current Title 24, automated fault detection and diagnostics (FDD).

K. Low Ambient Operation: Head pressure control shall be provided for operation at outside air temperature below 45 degrees F.

L. Safeties:

1. High condensing temperature protection.

2. Compressor motor current and temperature overload protection.

3. High pressure relief.

4. Outdoor fan failure protection.

M. Filters:

1. Filters shall be 2-inch standard size high capacity replaceable media type, MERV 8, or equal, installed in an external 2-inch rack filter section and complete with an access door.

2. An-line filter-drier shall be furnished with equipment and installed at Project site.

N. Start-up: Factory test each unit before shipment to Project site. Performance test shall include full refrigeration start-up, fan and controls start-up. Each unit shall be provided with its own report with its own serial number. Non-tested units are not permitted to be delivered to Project site. Provide full start-up of units to include full refrigeration and provide a written report.

O. Parts Availability: Submit proof in writing that majority (minimum 80 percent) of replacements parts are commonly available and not proprietary. Also, submit proof in writing that a local parts sales and service facility exists, where replacement parts will be warehoused in quantity. Guarantee timely availability for parts that are proprietary.

2.05 ROOF MOUNTED POWER EXHAUST VENTILATORS

A. RMEV-1 (Not Used)

B. RMEV-2:(Not Used)

C. RMEV-3:

1. Manufacturer: Fan shall be model ACRUB as manufactured by Loren Cook Company, Greenheck CUBE Series, Carnes VUBK, or equal.

2. Spun aluminum, roof mounted, belt driven, upblast centrifugal exhaust ventilator, with components as indicated and specified. Sizes, performances, and accessories shall be as indicated on equipment schedules on Drawings. Also, provide accessories for proper operation and balancing of fans in accordance with design intent and sequence of operation.

3. Certification: Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories Inc. (UL 705) and ETL listed for Canada. Fan shall bear AMCA Certified Ratings Seals for Fan Sound and Air Performance.

4. Housing: The fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum structural components shall be constructed of minimum 16 gage marine alloy aluminum, bolted to a rigid aluminum support structure. The aluminum base shall have a one piece inlet spinning and continuously welded curb cap corners for maximum leak protection. The windband shall have a rolled bead for added strength. A two piece top cap shall have stainless steel quick release latches to provide access into motor compartment without use of tools. An integral conduit chase shall be provided into motor compartment to facilitate wiring connections. The motor, bearings and drives shall be mounted on a minimum 14 gage steel power assembly, isolated from unit structure with rubber vibration isolators. These components shall be enclosed in a weather-tight compartment, separated from exhaust airstream. Lifting lugs shall be provided to help prevent damage from improper lifting. Unit shall bear an engraved aluminum nameplate and shall be shipped in ISTA Transit Tested Certified packaging.

5. Wheel: Wheel shall be centrifugal backward inclined, constructed of 100 percent aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in

accordance with AMCA Standard 204, Balance Quality and Vibration Levels for Fans.

6. Motor: Motor shall be heavy-duty type with permanently lubricated sealed ball bearings and furnished at specified voltage, phase, and enclosure.

7. Bearing: Bearings shall be designed and individually tested specifically for use in air handling applications. Construction shall be heavy-duty regreasable ball type in a cast iron pillow block housing selected for a minimum L50 life in excess of 200,000 hours at maximum cataloged operating speed.

8. Belts and Drives: Belts shall be oil and heat resistant, non-static type. Drives shall be precision machined cast iron type, keyed and securely attached to wheel and motor shafts. Drives shall be sized for 150 percent of installed motor horsepower. The variable pitch motor drive must be factory set to specified fan RPM.

D. RMEV-4:

1. Manufacturer: Fan shall be model ACRUD as manufactured by Loren Cook Company, Greenheck CUE Series, Carnes VUDK, or equal.

2. Spun aluminum, roof mounted, direct driven, upblast centrifugal exhaust ventilator, with components as indicated and specified. Sizes, performances, and accessories shall be as indicated on equipment schedules on Drawings. Also, provide accessories for proper operation and balancing of fans in accordance with design intent and sequence of operation.

3. Certification: Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories Inc. (UL 705) and ETL listed for Canada. Fan shall bear AMCA Certified Ratings Seals for Fan Sound and Air Performance.

4. Housing: Fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum structural components shall be constructed of minimum 16 gage marine alloy aluminum, bolted to a rigid aluminum support structure. The aluminum base shall have a one piece inlet spinning and continuously welded curb cap corners for maximum leak protection. The windband shall have a rolled bead for added strength. An integral conduit chase shall be provided into motor compartment to facilitate wiring connections. The motor shall be enclosed in a weather-tight compartment, separated from exhaust airstream. Unit shall bear an engraved aluminum nameplate and shall be shipped in ISTA Transit Tested Certified packaging.

5. Wheel: Wheel shall be centrifugal backward inclined, constructed of 100 percent aluminum, including a precision machined cast aluminum hub. An aerodynamic aluminum inlet cone shall be provided for maximum

performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204, Balance Quality and Vibration Levels for Fans.

6. Motor: Motor shall be heavy-duty type with permanently lubricated sealed bearings and furnished at specified voltage, phase, and enclosure.

2.06 GARAGE EXHAUST FANS

A. GEF-1:

1. Manufacturer: Fan shall be model QEI or QEID as manufactured by The Greenheck Company or equivalent by The Loren Cook Company.

2. Provide inline mixed flow type fans of sizes, capacities and configurations indicated on drawings, complete with all accessories required for installation of fans, as configured on drawings. Also, provide all required accessories for proper operation and balancing of fans in accordance with design intent and sequence of operation.

3. Certification: Fan shall be listed by Underwriters Laboratories (UL 705). Fan shall bear AMCA certified ratings seal for sound and air performance.

4. Housing: The fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The housing shall be of minimum 12 gauge steel. Bearing supports shall be minimum 10 gauge welded steel. Lifting eyes shall be provided for ease of installation. Unit shall bear an engraved aluminum nameplate and shall be shipped in ISTA certified transit tested packaging.

5. Finish: All steel fan components shall be coated with an electrostatically applied, baked polyester powder coating to exceed 1,000 hour salt spray test under ASTM B117 test method.

6. Wheel: Wheel shall be of mixed flow type with a wheel cone, spherical back plate and single thickness cambered blades continuously welded to back plate. Hub shall be keyed and securely attached to fan shaft. Wheel shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-05, Balance Quality and Vibration Levels for Fans.

7. Motor: Motor shall be of type, voltage and phase, as indicated on drawings. Provide permanently lubricated sealed ball bearings. Option: Energy efficient motor meets EPACT and NEMA 1210.

8. Shaft: Blower shaft shall be AISI C-1045 hot rolled and accurately turned, ground and polished. Shafting shall be sized for a critical speed of at least 125% of maximum RPM.

9. Bearings: Bearings shall be designed and tested specifically for use in air handling applications. Construction shall be heavy-duty regreasable ball or roller type in a cast iron pillow block housing and selected for a minimum L50 life in excess of 200,000 hours at maximum cataloged operating speed.

10. Drive: Fans shall be direct drive or belt driven as indicated on drawings.

11. Belts and Drives: Belts shall be oil and heat resistant, non-static type. Drives shall be precision machined cast iron type, keyed and securely attached to wheel and motor shafts. Drives shall be sized for 150% of installed motor horsepower. The variable pitch motor drive must be factory set to specified fan RPM.

2.07 CEILING CABINET FANS

A. CCF-1: (Not Used)

B. CCF-2: (Not Used)

C. CCF-3: (Not Used)

2.08 SIDEWALL PROPELLER FANS

A. SWPF-1: (Not Used)

2.09 GRAVITY EXHAUST/INTAKE VENTILATORS

A. GEIV-1:

1. Manufacturer: Unit shall be model PR or TR as manufactured by Loren Cook Company, Greenheck GRS Series, Carnes GSAA Series, or equal.

2. Spun aluminum, roof mounted gravity ventilators of sizes, capacities and configurations indicated on drawings, complete with accessories for installation of ventilators. Also, provide accessories for proper operation of ventilators per code and in accordance with design intent and sequence of operation.

3. Certification: Fan shall be manufactured at an ISO 9001 certified facility.

4. Housing: The unit shall be of bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum structural components shall be constructed of minimum 16 gage marine alloy aluminum, bolted to a rigid aluminum support structure. The aluminum base shall have continuously welded curb cap corners for maximum leak protection. The spun aluminum baffle shall have a rolled bead for added strength. Birdscreen constructed of 1/2" mesh shall be mounted across air opening. Unit shall bear an engraved aluminum nameplate and shall be shipped in ISTA Transit Tested Certified packaging.

5. Provide gravity type back-draft or relief dampers at relief or exhaust ventilators (with counterweights if required). Gravity relief dampers shall fully open at 0.01" static pressure.

6. Intake ventilators shall be provided with normally closed, motorized dampers that are interlocked with fan to open upon fan activation unless fan is provided with such a damper.

B. GEIV-2: (Not Used)

C. GEIV-3: (Not Used)

2.10 FUME HOOD EXHAUST

A. FHE-1: (Not Used)

B. FHE-2: (Not Used)

2.11 FILTERS

A. Air filters shall be of pleated, high capacity, disposable type of efficiencies indicated on drawings. Each filter shall consist of a non-woven cotton fabric media, media support grid, and enclosing frame. Filter shall be UL 900 listed, Class 2.

B. Filter media shall provide an average efficiency as specified on drawings per ASHRAE Standard 52.2.

C. Initial resistance of air filters shall not exceed following limits for each efficiency level at face velocities indicated. Lower resistance requirements, if indicated on drawings shall have precedence.

30 percent (MERV 8) 0.27 inch water gage at 500 feet per minute
75 percent (MERV 11) 0.28 inch water gage at 500 feet per minute
85 percent (MERV 13) 0.30 inch water gage at 500 feet per minute
95 percent (MERV 14) 0.38 inch water gage at 500 feet per minute

D. Media support shall be a welded wire grid or a rigid frame with an effective open area of not less than 96 percent.

1. Media support shall be bonded to filter media to eliminate possibility of media oscillation and media pull-away.

2. Media support grid shall be formed in such a manner that it effectively forms a radial pleat design, providing total use of filter media.

E. Enclosing frame shall be bonded to air entering and air exit side of each pleat, to ensure pleat stability. Inside periphery of enclosing frame shall be bonded to filter pack, thus eliminating possibility of air bypass.

F. Holding frames shall be factory fabricated of 16 gage galvanized steel, or equivalent and shall be furnished with gaskets and spring type positive sealing fasteners. Fasteners shall be capable of being attached or removed without use of tools.

G. Manufacturers: Camfil Farr, Koch, or AAF.

2.12 LOUVERS, AIR CONDITIONING (use in conjunction with relief damper)

A. Standard steel louvers shall be furnished complete with frames, blades, finish and construction details per Drawings and manufacturer's recommendations.

B. Louvers shall be furnished with horizontal blades, 2 inches deep for air through wall installation in conjunction with gravity relief damper for backdraft protection that will open at 0.01 inch wc room static pressure as indicated on Drawings. Blades shall be 16-gage steel, spaced at 1 7/8-inch at 30 degrees angle, and with baked epoxy coating. Panel size shall be as indicated but not less than 24 inches width by 18 inches in height.

PART 3 – EXECUTION

3.01 GENERAL

A. Examine areas under which Work of this Section will be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 EQUIPMENT FOUNDATIONS

A. Provide foundations (housekeeping pads, level platforms or curbs) for mechanical equipment whether indicated on drawings or not. Equipment foundations shall be of sufficient size and weight, and of proper design to preclude shifting of equipment under operating conditions, or under abnormal conditions imposed upon equipment.

B. Provide foundations (housekeeping pads, level platforms or curbs) for mechanical equipment whether indicated on drawings or not. Foundations shall meet requirements of equipment manufacturer and, when required by Architect, obtain from equipment manufacturer, approval of foundation design and construction, for equipment to be installed. Equipment vibration shall be maintained within design limits, and shall be dampened and isolated. Isolators shall be bolted to a structural member so as to be readily removable.

3.03 EQUIPMENT DESIGN AND INSTALLATION

A. Uniformity: Unless otherwise specified, equipment of same type or classification shall be product of same manufacturer.

B. Application: Only provide equipment as reviewed by Architect.

C. Equipment Installation: Equipment installation shall be in strict accordance with these Specifications, and installation instructions of manufacturers. Equipment installed on concrete foundations shall be grouted before piping is installed. Piping shall be installed in such a manner as not to place a strain on equipment. Flanged joints shall be adequately extended before installation. Piping shall be graded, anchored, guided and supported, without low pockets.

1. Install equipment in a neat and skillful manner, properly aligned, leveled, and adjusted for satisfactory operation.

2. Install so connecting and disconnecting of piping and accessories can be readily accomplished, parts are readily accessible for inspection, service and repair. Space shall be provided to readily remove filters, coils, compressors and fan wheels. Access doors shall be hinged with cam lock door handles.

3. Provide flexible connections for duct, pipe and conduit connections at moving equipment.

3.04 ROOF-TOP EQUIPMENT MOUNTING

A. Downflow Packaged Units: Install unit on a prefabricated mounting frame or curb secured directly to roof. Follow manufacturers recommended installation manuals. Submit Shop Drawings for review by Architect.

B. Horizontal Flow Packaged Units: Install unit on platform or prefabricated mounting frame or curb secured directly to roof designed to suit roof conditions and requirements of provided unit. Submit Shop Drawings for review by Architect.

3.05 NOISE AND VIBRATION

A. Operation of Equipment: Mechanical equipment and piping systems shall operate without exceeding specified noise and/or vibration levels.

B. Corrective Measures: If specified noise and/or vibration levels are exceeded, provide necessary changes to reduce noise and/or vibration levels to within specified levels.

3.06 FIELD TESTS AND INSPECTION

A. General: Perform field inspections, field tests, and trial operations as specified in Section 23 0500: Common Work Results for HVAC. Provide labor, equipment and incidentals required for testing. The Project Inspector will witness field tests and trial operations as specified in Section 23 0500: Common Work Results for HVAC.

B. Equipment and Material: Equipment and material certified as being successfully tested by manufacturer, in accordance with referenced Specifications and standards, will not require re-testing before installation. Equipment and materials not tested at place of manufacture will be tested before or after installation, as applicable or necessary, to determine compliance with reference Specifications and standards.

C. Start-Up and Operational Test: System shall be started up and initially operated with components operating. During this test, various strainers or filters shall be periodically cleaned until no further accumulation of foreign material occurs. Adjust safety and automatic control instruments as required to provide proper operation and control sequence. Refer to Section 23 0500: Common Work Results for HVAC.

D. Extent of Field Tests: After installation and before completion, Work of this Section shall be subjected to required field tests, including those specified here and in Section 23 0500: Common Work Results for HVAC.

E. Operation and Maintenance Data: Provide required operation and maintenance data as specified in Section 23 0500: Common Work Results for HVAC.

3.07 REFRIGERANT PIPING

A. Unless otherwise indicated, main liquid and suction lines from condensing unit to evaporator coil shall be of sizes specified by manufacturer.

B. Refrigeration piping shall be refrigeration grade copper tubing, type L hard-drawn. In instances where refrigeration lines are installed in an inaccessible location and must be snaked through conduit or a trench, that portion of tubing required to complete connections through conduit or trench may be soft drawn. Maintain entire system clean and dry during installation. Pipe shall be sealed until installed.

C. Refrigeration piping, both hard and soft-drawn, shall be straight and free from kinks, restrictions and horizontal runs shall be sloped towards compressor one inch to 10 feet wherever possible. Vapor line oil traps shall be installed on bottom of vertical risers and inverted oil trap shall be installed on top of vertical risers.

D. Joints shall be installed with Sil-Fos 15, Silvaloy 15, or equal, high melting point solder.

E. Flare nuts required on suction lines shall be of short forged or frost-proof type. Other fittings shall be standard sweat-soldered type. Ells and return bends shall be long radius type. Install leak lock material.

F. Refrigeration Piping: Joints shall be silver brazed and leak tested. Field fabricated lines shall be thoroughly flushed and cleaned before connection. Bleed nitrogen through lines during silver brazing, and cap and seal lines when not completed and connected to equipment.

G. Sleeve penetrations of floors, walls and ceiling to allow for free motion of piping. Provide 24 gage galvanized iron pipe and chrome-plated escutcheon plates. Pack annular space between pipe and sleeve with incombustible material such as fiberglass and seal each end with mastic to provide a waterproof seal.

H. Install insulated couplings at points of connection between dissimilar metals for cathodic protection. Insulate copper tubing from ferrous materials and hangers with 2-inch thickness of 3-inch wide strip, 10 mil polyvinyl tape wrapped around pipe.

I. Support piping by iron hangers and supports. Hydra-Zorb cushion clamps, LSP Products Group Acousto Clamp, or equal, on non-insulated piping, and Klo-Shure coupling clamp on insulated piping, or equal.

J. Provide saddles to protect pipe insulation.

K. Provide connections of copper and brass pipe and tubing with Harris Products Group Safety-Silv 56, Lucas-Milhoupt, Inc., or equal, complying with ANSI/AWS A5.8 and NSF 51.

L. Insulate refrigerant suction lines.

M. On split heat pump systems, insulate both vapor and liquid lines. For insulation materials, refer to Section 23 0700: HVAC Insulation.

3.08 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off Project site.

3.09 PROTECTION

A. Protect Work of this Section until Substantial Completion.

END OF SECTION

SECTION 26 0100

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Addenda, Alternates, Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specifications collectively apply to work of this Section.

1.2 WORK INCLUDED

A. The specifications and drawings are intended to cover a complete installation of systems. The omission of expressed reference to any item of labor or material for the proper execution of the work in accordance with present practice of the trade shall not relieve the Contractor from providing such additional labor and materials.

B. All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of electrical system, complete, as shown on the drawings and/or specified herein. Work includes but is not necessarily limited to the following:

1. Conduits for all wiring systems, unless otherwise specifically noted.
2. All electrical wiring and connections to equipment furnished under other sections of Specifications.
3. All electrical wiring and connections to Owner furnished equipment.
4. All wiring and conduit for Air Conditioning and Heating and Ventilating systems, and electrical equipment in Plumbing Section of work.
5. Time clocks and contactors for control of lighting and air conditioning.
6. Pull wires in conduit runs indicated as conduit only (CO).
7. Lighting panelboards.
8. Building electrical wiring, conduits, outlet boxes, junction boxes, convenience outlets, switches, plates and all miscellaneous items of electrical equipment, apparatus and material specified and/or shown on Drawings.
9. Disconnect switches, magnetic motor starters and manual motor starters.
10. All required grounds.
11. All anchors, chases, sleeves and supports for electrical equipment.
12. Excavation necessary for execution and completion of electrical work.
13. Required backing, supports and blocking for lighting fixtures.
14. Complete Fire Alarm and Detection System.
15. Tests of entire system.
16. Lighting fixtures complete with lamps and required accessories.
17. Guarantees.
18. Temporary power for building construction.
19. Temporary lighting during construction.
20. Complete connections to all motors, apparatus, electrically operated devices, etc., as shown on Drawings.
21. Circuits, switches, starters and connections for all exhaust fans, blowers and heaters.
22. Flashing of conduits through roof.
23. Shop Drawings.

24. Include an allowance of $250.00 for the material cost of any lighting fixture where an outlet is shown on drawings without a fixture type designation.
25. In these specifications, Fire Alarm, Clock and Class Change Signal, PA/Intercom, Television, Intrusion Alarm, etc. are referred to as Auxiliary Systems or Signal Systems.

1.3 GUARANTEE

A. In addition to guarantee required in Division 01 or specifically specified elsewhere, all materials and equipment provided and installed under this Division of Specifications shall be guaranteed by Contractor in writing for a period of one year from date of acceptance of work by Owner. Should any trouble develop during this period due to defective materials or faulty workmanship, the Contractor shall furnish all necessary labor and materials to correct the trouble without costs to Owner.

B. Guarantee complete and perfect operation of entire system and that all apparatus will perform in accordance with detailed drawings and Specifications.

C. Guarantee that all equipment will be supported in such a way as to be free from objectionable vibration and noise.

D. Guarantee that all licenses and royalties for use of any patented feature of system will be paid before acceptance of system.

1.4 GENERAL REQUIREMENTS

A. Codes: Construct project in accordance with following codes and regulations.

1. 2016 California Electrical Code, Title 24 C.C.R.
2. 2016 California Mechanical Code, Title 24 C.C.R.
3. 2016 California Plumbing Code, Title 24 C.C.R.
4. 2016 California Energy Code, Title 24 C.C.R.
5. 2016 California Historical Building Code, Title 24 C.C.R.
6. 2016 California Fire Code, Title 24 C.C.R.
7. 2016 California Existing Building Code, Title 24 C.C.R.
8. 2016 California Green Building Standards Code (CALGreen Code), Title 24 C.C.R.
9. 2016 California Referenced Standards Code, Title 24 C.C.R.
10. Local codes and ordinances.
11. Division of State Architect.

Keep a copy of applicable code available at Site while performing work of this Section. Nothing in these Drawings and Specifications to be construed as authority to violate codes and ordinances. Conflict with applicable regulations to be resolved at Contractor's expense before installation.

B. Permits, Fees and Inspections: Obtain and pay for all necessary permits and fees required by any constituted authority having jurisdiction including utilities. Arrange and pay for all required inspections or examinations and deliver certificates of inspection to Architect.

C. Record Drawings:

1. Provide record drawings for work of this Section.
2. Keep up-to-date a complete "As-Built" record set of blueline prints corrected daily and showing every change from original Drawings and Specifications and exact "As-Built" locations, sizes, and kinds of equipment.
3. Prints for this purpose may be obtained from Architect at cost of printing. Keep this set of Drawings on job and use only as a record set.

4. Drawings to serve as work progress sheets. Make neat and legible notations in red ink thereon daily as work proceeds, showing work as actually installed. Drawings to be available at all times for inspection, and kept at a location designated by Architect.
5. On completion of work, obtain one set of prints from Architect at cost of printing, and note neatly in scale all changes on record set. Deliver complete set of prints together with one set of blueline prints to Architect together with Contractor's name, address and phone number. Incorrect, non-legible or non-reproducible drawings will not be accepted.

D. Selection and Ordering of Equipment and Materials: Within two weeks after award of Contract, arrange for purchase and delivery of all light fixtures, equipment and materials required in ample quantities and at proper time. Inform Architect immediately of any inability to obtain suitable delivery of any equipment or material. Send copy of letter verifying date of purchases to Architect.

E. Shop Drawings and Material Lists:

1. Submit material lists and shop drawings as called for in Division 01, and as supplemented by this Division, and with sufficient promptness to ensure that overall work of project will not be delayed.
2. Submit six copies of a list of materials and equipment manufacturers that Contractor intends to use.
3. Provide shop drawings for following:

    a. Distribution Sections.
    b. Panelboards.
    c. Lighting fixtures, lamps and necessary accessories.
    d. Time switches.
    e. Contactors.
    f. Magnetic Motor Starters.
    g. Fuses.
    h. Disconnect switches.

4. Do not fabricate work until reviewed shop drawings for work have been received from Architect. Work fabricated or erected in advance of reviewed shop drawings will be at risk of Contractor.
5. Architect's or Engineer's review of shop drawings does not relieve Contractor of responsibility for errors including details, dimensions, or materials, as well as conformance with requirements of Drawings and Specifications.
6. Shop drawings will be checked by Architect and Engineer for conformance to design as a convenience to Contractor. Dimensions will not be checked. Should interferences become evident, notify Architect immediately so that matter may be resolved prior to proceeding with fabrication.
7. No reimbursement based on a claim that work was placed in accordance with dimensions shown on a reviewed shop drawing will be allowed for removing or replacing work already in place.
8. Make available a copy of every reviewed shop drawing at Project Site.
9. Submit shop drawings in coherent groups; e.g., all lighting fixtures at one time.
10. Submit actual samples of specified equipment or material to Architect for review when requested.

F. Substitution and Approval of Material:

1. Base all bids and proposals only upon materials, construction and equipment named or described in specification and/or shown on drawing. Should a Contractor wish to

use other equipment than that specified, he shall submit proposed substitution by fully describing equipment he prefers to use and by listing credit or additional cost to his bid as a separate item should substitution be acceptable.

2. All equipment and materials proposed for substitution shall be similar in design and equal in quality and function to those specified herein or on drawings. Contractor (not sales vendor) shall demonstrate his proposed substitution and shall specifically note all differences between item specified and proposed substitution. Actual samples and test data, certified by an independent testing laboratory, shall be submitted when requested.
3. Each substitution will be given consideration, but without any obligation expressed or implied on part of Architect to change named requirements of specification. Only one substitution for each item of equipment will be permitted. Contractor assumes sole responsibility for performance and space requirements for substitute equipment. Decision of Architect shall be final as to whether or not substitution is acceptable.

G. Terminology:

1. Term "provide" used on Drawings and elsewhere in the Specifications shall be considered to mean "furnish and install".
2. Term "UL" means Underwriters Laboratories Inc.

H. Workmanship: See supplementary Conditions, Architect is sole judge of whether execution is in a workmanlike manner.

I. Safety Conditions: Be responsible in preventing energized switches, circuit breakers or circuits from being turned to "On" position during construction period. Be responsible for damages to personnel and/or property resulting from contact with energized circuits, switches, circuit breakers, busses or other electrical apparatus. Construct all electrical work with electrical system de-energized in area. At no time permit work on equipment or apparatus with energized circuits.

J. Verification of Dimensions: All scaled and figured dimensions are approximate and are given for estimating purposes only. Before proceeding with work carefully check and verify all dimensions and sizes and assume all responsibility for fitting of materials and equipment to other parts of equipment and to structure. Where apparatus and equipment have been indicated on drawings, dimensions have been taken from typical equipment of class indicated. Carefully check drawings and see that equipment will fit into spaces provided.

K. Locations:

1. Locations of conduits, outlets, apparatus and equipment indicated on drawings are approximate only and shall be changed to meet architectural and structural conditions as required.
2. Install conduit and equipment in a manner and in locations avoiding all obstructions, preserving headroom, keeping openings and passageways clear and readily accessible for maintenance and repairs. Make changes in locations of conduit or equipment which may be necessary to accomplish this. Drawings are essentially diagrammatic to extent that many offsets, bends, special fittings and exact locations are not indicated. Examine all drawings prepared by manufacturers, suppliers and installers of all equipment including air conditioning and plumbing fixture shelving, for requirements and locations of equipment and outlets.
3. Should any structural interferences prevent installation of outlets, setting of cabinets for lighting panelboards, running of conduits, or installation of other electrical equipment at locations shown on Drawings, necessary minor deviations therefore as determined by Engineer may be permitted. In event changes in indicated locations or arrangements are necessary due to developed conditions in building's construction

or rearrangement of furnishings or equipment, Owner shall be permitted to move any junction box or utility outlet a distance of 10' and such changes shall be made without extra cost providing change is ordered before work is installed. Submit an estimate of cost or credit for other changes and proceed only upon written authority of Architect.

4. Be cautioned that diagrams showing electrical connections are diagrammatic only and must not be used for obtaining lineal runs of wiring or conduit. Wiring diagrams do not necessarily show exact physical arrangement of equipment.
5. Locations of outlets, lighting fixtures, cabinets, panelboards, apparatus, motors, mechanical equipment, etc., shown on Electrical Drawings is only approximate. Do not scale them from Electrical Drawings.
6. Verify locations of outlets, lighting fixtures, equipment etc., with Architectural Drawings of interior and exterior details and finish, and coordinate location of electrical work with mechanical and other equipment.
7. Locate lighting fixtures as per reflected ceiling plans prepared by Architect.

L. These Specifications and attendant Drawings are intended to cover a complete and operable electrical system. Follow Drawings and Specifications and execute all work according to true intent and meaning. Should any error or omission exist in either or both of these Drawings and Specifications, or conflict one with another, have same explained and adjusted by Engineer before submitting bid price for electrical work; otherwise at own expense, supply proper materials and labor to completely install same, make good any damage to or defect in work of results obtained therefore caused by such error, omission or conflict. Most restrictive, greater quantity or size, better quality or other superior condition of all representations shall prevail. It is intended that outlets be located symmetrical with Architectural elements notwithstanding fact that locations indicated on Drawings may be distorted for clarity.

M. Omission of expressed reference in Drawings or Specifications to any item of labor or material necessary for proper execution of work in accordance with present good practice of trade will not relieve Contractor from providing such additional labor and materials.

N. Job Visits by Engineer: Periodic visits to job by Engineer is for express purpose of verifying compliance by Contractor with contract documents. Such visits by Engineer shall not be construed as construction supervision. Neither shall such visits be construed to make Engineer responsible for providing a safe place for performance of work by Contractor or Contractor's employees or safety of supplies of Contractor or his subcontractors.

O. Cooperation with Others: Organize work that will harmonize with work of all trades so that all work may proceed as expeditiously as possible. Be responsible for correct placement of work and connection of work to all related trades.

P. Protection of Finish: Provide adequate means for protecting all finished parts of materials and equipment against damage from any cause during progress of work and until acceptance by Architect. Cover all material and equipment in storage and during construction in such a manner that no finished surfaces will be damaged, marred or splattered with paint. Keep moving parts perfectly clean and dry. No paint spraying will be permitted in building. Replace or refinish damaged material or equipment including face plates or panels without additional costs to Owner.

Q. Cleaning Equipment and Premises: Thoroughly clean all parts of materials, equipment and exposed parts such as receptacles and panelboards, of cement, plaster and other materials. Remove all oil and grease spots with a non-inflammable cleaning solvent. Brush exposed metal work with steel brushes to remove rust and other spots and leave smooth and clean. During progress of work, carefully clean up and leave premises and all portions of building

free from debris. At completion of work, remove all waste materials and debris resulting, leaving everything in a complete and satisfactory condition.

R. Cutting and Patching: Include all cutting and patching in bid. Do not cut any structural members without first having received written permission from Architect. Cutting of round openings which can be done by use of a rotary drill shall be done by Contractor requiring same. Cutting and patching finish work shall be performed by workmen of the respective trade.

S. Conditions at Site: Visit Job Site and become familiar with all existing conditions within scope of work and include in Bid Proposal allowance for these conditions. Verify exact locations of services prior to construction. Notify all other Contractors of these utility locations.

T. Documents: Read all relevant documents, become familiar with job, scope of work, type of general construction, Architectural, Structural, Mechanical and Electrical Drawings and Specifications. Also become familiar with purpose for which these Drawings have been prepared and become cognizant of all details involved.

U. Acceptance: Before work will be accepted, demonstrate to Owner and Architect that entire installation is complete and in proper operating condition and Contract has been fully and properly executed. Following items shall be prepared and submitted to Architect:

1. Two copies of all test results required under this Division.
2. Two copies of local and/or state code enforcing authorities final inspection certificates.
3. Copies of as-built record drawings as required.
4. Notify Architect in writing when installation is complete and that a final inspection of this work can be performed. In event defects or deficiencies are found during this final inspection they shall be corrected to satisfaction of Architect before final acceptance can be issued.
5. Two Maintenance and Operating Manuals as required.

V. Field Inspections: Provide proper facilities for access of Owner or Owner's representative to conveniently examine and inspect all portions of work covered in this Contract at any and all reasonable hours.

W. Completing Work: At completion of work, remove all waste materials and debris resulting from work, leaving everything in a complete and satisfactory condition.

X. Electrical Superintendent: Include services of a qualified electrical foreman capable of interpreting intent of Drawings and Specifications, to study Plans, Specifications and references, and coordinate all requirements with other trades, authorized to make decisions and issue instructions; be constantly in charge of work and available at job site at all times and at final inspection. Instruct Owner's representative for proper operation and recommend maintenance of all systems.

Y. Maintenance and Operating Manuals:

1. Before completion and acceptance of work, furnish Owner with two complete sets of operating and maintenance instruction manuals. Bind each set in durable hardboard binder and index.
2. Compile data for manuals upon approval of material list and sketches so as not to delay final approval of work installed. Operating manuals to contain all pertinent data relating to electrical installation such as fixture cuts, manufacturer's approval, shop drawings, sketches, wiring diagrams and equipment operating instructions.
3. Instruct Owner's operating personnel with electrical operating procedures before work is considered complete.

Z. Extra Work or Costs to This Contractor Due to Other Contractors or Trades: Adjusted between this Contractor and offending Contractor at no extra cost to Owner. Notify Architect before such extra work is done.

AA. Tests:

1. Upon completion of work and adjustment of all equipment, all systems shall be tested under direction of Owner's representative to demonstrate that all equipment furnished and installed and/or connected under provision of these Specifications shall function electrically in manner required. All tests shall be completed prior to final inspection of project.
2. All systems shall test free from short circuits and grounds and shall be free from mechanical and electrical defects. All circuits shall be tested for proper neutral connection.
3. All instrumentation and personnel required for testing shall be furnished by Contractor.

BB. Noise Control:

1. Perform electrical work to a manner in minimize transmission of noise and preserve acoustical properties of building structure.
2. Where equipment is mounted on vibration isolators, use flexible connections to reduce transmission of noise.
3. Where conduits pass through sleeves in interior walls, floors, or ceilings, completely fill space between each conduit and its sleeve to provide an airtight seal.
4. Use glass fiber material, "Duxseal" compound, for acoustic seals.

CC. Seismic Bracing Standards: All pipes, cable trays, conduits, etc. shall be supported and braced in accordance with SMACNA “Seismic Restraint Manual, Guidelines for Mechanical Systems”, including Appendix B, “Additional Requirements for OSHPD” and “Addendum no. 1, September 2000”. Comply with CBC, where requirements are more stringent than SMACNA, including, but not limited to the following:

1. Pipes and conduit shall be braced to resist the forces prescribed in California Building Code.
2. Where possible, pipes, conduit and their connections shall be constructed of ductile materials (copper, ductile iron, steel or aluminum and brazed, welded, or screwed connections.) Pipes, conduits and their connections, constructed of nonductile materials (e.g., cast iron, no-hub pipe and plastic), shall have the brace spacing reduced to one-half of the spacing allowed for ductile material in accordance with California Building Code or SMACNA Seismic Restraint Manual.
3. Seismic restraints may be omitted for the following conditions:
    a. All piping suspended by individual hangers 12 inches or less in length from the top of the pipe to the bottom of the structural support for the hanger.
    b. All electrical conduit less than 2.5 inches trade size.
4. For rigidly supported, electrical conduit, or cable trays, the product of $C_a l_p$ need not to exceed 1.2 for any value of l_p.
5. All Trapeze assemblies supporting, cable trays and conduit shall be braced to resist the forces and relative displacements per ASCE 7 Chapter 13, considering the total weight of the elements on the trapeze.
6. Conduit supported by a trapeze where none of these elements would individually be braced need not be braced if connection to the pipe/conduit of directional changes do not restrict movement of the trapeze. If this flexibility is not provided, bracing will be required when the aggregate weight of the pipes and conduit exceed 10

pounds/foot. The weight shall be determined assuming all pipes and conduits are filled with water.

DD. Bracing Standards Application: Comply with bracing standards by evaluating the complete installation of all utilities and equipment, and providing a comprehensive solution based on Contractor's layout, coordination withal other trades, and with the structural design and all other provisions for incorporating systems into the buildings. Show bracing products and layout in shop drawing submittals. The following criteria apply to the bracing of all systems:

1. The design parameters for determining the Total Design Lateral Force shall be as designated on the structural drawing.
2. Seismic Hazard Levels (SHL) shall be as designated on structural drawings.
3. Contractor shall submit documentation for each condition, which is not specifically covered in the SMACNA manual, including piping configurations and conditions, structural systems, structural connection methods, and other issues regarding the application of the standards.
4. Provide expansion anchors, sized per SMACNA guidelines, for use in concrete.
5. For connections to structural steel, wood framing, etc. provide bolted or welded connections, sized per SMACNA guidelines.
6. Seismic bracing components consisting of structural shapes.
7. Seismic bracing cable shall be galvanized steel, conforming to ASTM A603, zinc-coated with minimum 0.4 ounces/sf, pre-stretched, 7 x 19 strand, sized per SMACNA guidelines.

EE. In hard ceiling space where access to j-boxes, detectors, etc is required, provide ceiling access panel, fire-rated typical.

END OF SECTION

SECTION 26 0160

ELECTRICAL DEMOLITION FOR REMODELING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Addenda, Alternates, Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specifications collectively apply to work of this Section.

1.2 DESCRIPTION

A. Work includes but is not limited to the following:

1. Electrical demolition.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that abandoned wiring and equipment serve only abandoned facilities.

B. Drawings are based on field observation and existing record documents. Report discrepancies to Architect/Engineer before disturbing existing installation.

C. Beginning of demolition means installer accepts existing conditions.

3.2 DEMOLITION

A. Provide all necessary electrical demolition. See Architectural drawings for extent of wall removal and other demolition. Remove existing electrical devices in walls to be demolished. Re-route and reconnect as required, any active circuits feeding through these walls in order to keep upstream and downstream circuits active. Remove exposed conduit, wiring, devices, etc. as required.

B. Where new lighting is shown in an area with existing lighting, demolish existing lights, associated conduits, wires, devices, etc. Dispose of existing ballasts with PCB in accordance with all regulations of all governing agencies having jurisdiction.

C Where mechanical equipment is to be demolished as shown on mechanical drawings, demolish disconnect switches, conduits, wires and associated electrical equipment.

D. Dispose of all demolished equipment and devices. Equipment with salvage value shall be disposed of per District's instructions.

E. When underground conduits are indicated to be removed or intercepted, assume that all existing underground conduits are concrete encased and provide all work to remove encasement as necessary.

END OF SECTION

SECTION 26 0519

WIRE AND CABLE-RATED 600 VOLT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Addenda, Alternates, Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specifications collectively apply to work of this Section.

1.2 DESCRIPTION

A. Work includes but is not limited to the following:

1. Building wire.
2. Ground Conductors.
3. Wiring connections and terminations.
4. Conductor Identification.

B. Related Work:

1. Section 260100 - Basic Materials and Methods.
2. Section 260526 - Grounding.
3. Section 260533 - Conduit.
4. Section 260553 - Electrical Identification.

PART 2 - PRODUCTS

2.1 BUILDING WIRE

A. Wires shall be single conductor type THHN or THWN insulated with polyvinyl chloride and covered with a protective sheath of nylon, rated at 600 volts. Wires may be operated at 90 degrees C. maximum continuous conductor temperature in dry locations, and 75 degrees C. in wet locations and shall be listed by UL Standard 83 for thermoplastic insulated wires, listed by Underwriter's Laboratories (UL) for installation in accordance with Article 310 of the California Electrical Code (CEC). Conductors shall be solid copper for 12 AWG and smaller conductors, and stranded copper for 10 AWG and larger conductors. Conductors shall be insulated with PVC and sheathed with nylon. Wires shall be identified by surface markings indicating manufacturer's identification, conductor size and metal, voltage rating, UL symbol, type designations and optional rating. Indentations for lettering are not permitted. Wires shall be tested in accordance with the requirements of UL standard for types THWN, or THHN.

B. Conductors shall be solid Class B or stranded Class C, annealed uncoated copper in accordance with UL standards, or another Nationally Recognized Testing Laboratory (NRTL).

C. Control Circuits: Copper, stranded conductor 600 volt insulation, THWN/THHN.

D. Minimum branch circuit wiring: No. 12 AWG copper, 600 volt insulation.

E. Minimum wire size except for control wiring: No. 14 AWG copper, 600 volt insulation.

F. Wiring for fluorescent lighting fixtures mounted end-to-End: Type “THHN”.

2.2 GROUND CONDUCTORS

A. Equipment ground: Insulated conductor green in color.

B. Isolated circuit ground: Insulated conductor green in color.

C. Ground Wires: Bare copper or with green colored insulation.

2.3 CONDUCTOR ARRANGEMENT AND IDENTIFICATION

A. Ties: T & B "Ty-rap" or 3M Company.

B. Lacing: Nylon twine.

C. Markers: Adhesive type, Brady.

2.4 CONDUCTORS

A. All Wire: New and delivered to job site in unbroken packages.

B. Each package shall bear Underwriter's and Manufacturer's labels and seals indicating date of manufacture and maximum allowable voltage.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wires shall not be installed until debris and moisture is removed from conduits, boxes, and cabinets. Wires stored at site shall be protected from physical damage until they are installed and walls are completed.

B. Wire-pulling compounds furnished as lubricants for installation of conductors in raceways shall be compounds approved and listed by UL, NRTL, or equal. Oil, grease, graphite, or similar substances are not permitted. Pulling of 2 AWG or larger conductors shall be performed with a cable pull machine. Any runs shorter than 50 feet are exempt. When pulling conductors, do not exceed manufacturer’s recommended values

C. At outlets for light, power, and signal equipment, pigtail splices with 8-inch circuit conductor leads for connection to fixtures, equipment, and devices.

D. Pressure cable connectors, pre-insulated 3M Scotchlok, Hubbell Power, O-Z/Gedney or equal, Y, R or B spring-loaded twist-on type, may be furnished in splicing number 8 AWG or smaller wires for wiring systems; except public address and telephone systems.

E. Joints, splices, taps, and connections to switchboard neutral, bonding or grounding conductors, conductors to ground busses, and transformer connections for wires 6 gage and larger shall be performed with high-pressure cable connectors approved for installation with copper conductors. Connectors shall be insulated with heavy wall heat shrink WCSM, or cold-applied roll-on sleeve RVS. Insulation level shall be a minimum of 600V and joints, splices, and taps shall be qualified to ANSI C 119.1, UL, NRTL, or equal listed mechanical pressure connections.

F. Connections to any bussing and high-press cable connectors shall be securely bolted together with corrosion-resistant plated carbon steel, minimum grade five machine screws secured with constant pressure-type locking devices.

G. Connection of any bonding or grounding conductors shall be securely bolted together with corrosion-resistant plated carbon steel, minimum grade five machine screws secured with constant pressure-type locking devices.

H. Wire switchboards, panel cabinets, pull boxes, and other cabinets except public address, shall be neatly grouped and tied in bundles with nylon ties at 10-inch intervals. In switchboards, panels and terminal blocks, wires shall be fanned out to terminals. If bundles are longer than 24 inches, a maximum of nine current carrying conductors may be bundled together.

I. Install conductor lengths with a minimum length within the wiring space. Conductors must be long enough to reach the terminal location in a manner that avoids strain on the connecting lug.

J. Maintain the conductor required bending radius.

K. Neutral conductors larger than 6 gage, which are not color identified throughout their entire length, shall be taped, painted white or natural gray, or taped white where they appear in switchboards, cabinet, gutters or pull boxes. Neutral conductors 6 gage and smaller shall be white color identified throughout their entire length.

L. Fire alarm and clock wiring shall be continuous from terminal cabinets or from equipment to each device. Splices are not permitted between devices and/or terminal cabinets at junction and pull boxes. Wiring shall be terminated at terminal blocks or devices only.

M. Wiring systems shall be free from short circuits and grounds, other than required grounds. The contractor shall be responsible for the testing of feeder and branch circuit conductor's insulation resistance. The insulation of the conductors shall be tested prior to connections to any panelboards, switchboards, variable frequency drives, lighting control systems, ballasts, and wiring devices such as but not limited to GFI receptacles, TVSS receptacles, or equipment. Insulation testing of panelboards and switchboards shall be independently performed from the insulation testing of any conductors as specified in other sections of this specification.

1. Utilize the services of an approved independent testing laboratory to perform megger time-resistance insulation testing of feeder conductors. Tests must be conducted with wires disconnected at both ends.

    a. Provide calibration program records to assure the testing instrument to be within rated accuracy. The test equipment accuracy shall be in accord with the requirements stated by the National Institute of Standards and Technology (NIST).

    b. Test equipment shall be provided with a label stating the date of last calibration. As a minimum the equipment shall have been calibrated within the past 12 months.

    c. Test reports shall include the following:

        1) Identification of the testing organization.
        2) Equipment identification.
        3) Ambient conditions.
        4) Identification of the testing technician.
        5) Summary of project.
        6) Description of equipment being tested.
        7) Description of tests.
        8) Test results.
        9) Analysis, interpretation and recommendations.

3.2 COLOR CODES

A. General Wiring:

1. Color code conductor insulation as follows:

SYSTEM VOLTAGE		
Conductor	208Y/120	480Y/277
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Natural Gray

Neutrals shall be colored-distinguished if circuits of two voltage systems are used in the same raceway.

2. For phase and neutral conductors 6 gage or larger, permanent plastic-colored tape may be furnished to mark conductor end instead of coded insulation. Tape shall cover not less than 2 inches of conductor insulation within enclosure.

B. Signal Systems: Wires for signal systems shall be color-coded. Except where otherwise specified, color-coding shall be as follows:

SYSTEM	COLOR CODE
Clocks	Pink, Gray and Orange
Fire Alarm Horns	Pink (+) and Gray (-)
Fire Alarm Strobes	Orange (+) and Blue (-)
Un-Interruptible 24 Volt Power (Annunciator, Water Flow, and Audible Device)	Yellow (+) and White (-) Note: A single white wire may be common to both
Interruptible 24 Volt Power (4 wire smoke detectors, duct detectors)	Brown (+) and White (-) Note: A single white wire may be common to both
Switch-Leg Sprinkler Bell (Between water flow and audible device)	Violet (+) and White (-)
Door Holding Magnets (Non Power Limited)	Black (+) and White (-)

3.3 FEEDER IDENTIFICATION

A. Feeder wires and cables shall be identified at each point the conduit run is broken by a cabinet, box, gutter, etc. Where terminal ends are available, identification shall be by means of heat shrink wire markers, which provide terminal strain relief. Markers shall be by Tyco Electronics, Panduit, Brady Perma-Sleeve, or equal. Identification in other areas shall be by means of wrap-around tape markers from Tyco Electronics, Panduit, Brady Perma-Code or equal. Markers shall include feeder designation, size, and description.

3.4 TAPE AND SPLICE KITS

A. Splices, joints, and connectors joining conductors in dry and wet locations shall be covered with insulation equivalent to that provided on conductors. Free ends of conductors connected to energized sources shall be taped. Voids in irregular connectors shall be filled with insulating compound before taping. Thermoplastic insulating tape approved by UL, NRTL, or equal for installation as sole insulation of splices shall be furnished and shall be installed according to manufacturer's printed specifications.

3.5 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.6 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 26 0526

GROUNDING

PART 1 - GENERAL

1.1 Provide required grounding.

1.2 SYSTEM DESCRIPTION

A. All metallic objects on the premises that enclose electrical conductors or that are likely to be energized by electrical currents shall be effectively grounded.

B. All metal equipment parts such as enclosures, raceways, and equipment grounding conductors and all earth grounding electrodes shall be solidly joined together into a continuous electrically conductive system.

C. All metallic systems shall be solidly interconnected to the electrical system as provided by the service entrance and for each grounded separately derived system that is installed.

D. A separately derived A.C. source shall be grounded to the equipment grounding conductor and to a separate made electrode.

E. Electrical continuity to ground metal raceways and enclosures, isolated from equipment ground by use of non-metallic conduit or fittings, shall be provided by a green insulated grounding conductor of approved size within each raceway connected to isolated metallic raceways, or enclosures at each end. Each flexible conduit shall be provided with a green insulated grounding conductor of approved size. In addition to using metallic conduits as ground, provide a ground wire sized per code in every conduit.

F. Cold water or other utility piping systems shall not be used as the only source of grounding electrodes. Grounding electrodes shall be "made electrodes" specified as follows:

1. Grounding electrodes as specified in Part 2 of this Specification.
2. Concrete enclosed electrode, which is made up of at least 20'-0" of #4 AWG, minimum size, copper conductor, encased by at least 2" of concrete, located within or near bottom of a concrete foundation, or footing, which is in direct contact with earth. Footing rebar must be connected to copper wire using approved connections. An external electrode as specified in Article 2.01, Paragraph B of this Specification Section must be installed and connected to foundation or footing rebar.

G. Non-current-carrying metal parts of high voltage equipment enclosure, signal and power conduits, switchboard and panelboard enclosures, motor frames, equipment cabinets, and metal frames of buildings shall be permanently and effectively grounded.

H. Metallic or semi-conducting shields, and lead sheaths of cables operating at high voltage, shall be permanently and effectively grounded at each splice and termination.

I. Neutral of service conductors shall be grounded as follows:

1. Neutral shall be grounded at only one point within school site for that particular service. Preferable location of grounding point shall be at service switchboard, or main switch.
2. Equipment and conduit grounding conductors shall be bonded to that grounding point.

3. If other buildings on campus are served from a switchboard or panelboard in another building, power supply is classified as a feeder and not as a service.
4. Equipment grounding conductor is carried from switchboard to each individual building. At building, grounding conductor is bonded with power equipment enclosures, metal frames of building, etc., to "made electrode" for that building.
5. Neutral of feeder shall not be grounded.

J. If there is a distribution transformer at a building, secondary neutral conductor shall be grounded to "made electrode" serving building.

K. Within every building, main switchboard or panel, shall be bonded to a 1" or larger cold water line with a 1" conduit with one #6 wire. Metallic piping systems (gas, fire sprinkler, etc.) shall be bonded to cold water line with 3/4" conduit with one #8 wire.

PART 2 - PRODUCTS

2.1 YARD BOXES

A. Yard boxes shall be precast concrete and shall be approximately 14" wide, 19" long, and 12" deep (outside dimensions), or larger, if necessary, to obtain required clearances. Boxes shall be equipped with bolt-down, checkered, cast iron covers and a cast iron frame cast into box. Yard boxes shall be Brooks 36 or approved equal.

2.2 ELECTRODES

A. "Made" electrodes shall be approved copper-clad steel ground rods, minimum 3/4" diameter, 10'-0" long.

2.3 GROUND ENHANCEMENT MATERIAL

A. Ground enhancement material as manufactured by Erico Electrical Products shall be used packed inside a 3" diameter hole around ground rod. Manufacturer's installation instructions must be followed for each ground rod installation.

PART 3 - EXECUTION

3.1 ELECTRICAL DEVICES

A. Grounding electrodes shall be located in nearest usable planting area, where not otherwise indicated on Drawings, and each electrode shall terminate within a concrete yard box installed flush with finish grade. In planting areas, concrete yard box shall be 2" above planting surfaces.

B. If concrete enclosed electrode is used, grounding wire shall terminate to a suitable copper plate with grounding lugs.

C. Grounding rods shall be driven to a depth of not less than 8'-0". A permanent ground enhancement material as manufactured by Erico Electrical Products shall be used at each ground rod to improve grounding effectiveness. The manufacture's guidelines shall be used for each installation.

D. Grounding electrodes shall have a resistance to ground of not more than 5 ohms.

E. When using grounding rods, if resistance to ground exceeds 5 ohms, 2 or more rods connected in parallel shall be provided to meet grounding resistance requirement.

F. Ground rods shall be separated from one another by not less than 10'-0"

G. Parallel grounding rods shall be connected together with approved fittings and approved grounding conductors in galvanized rigid steel conduit, buried not less than 12" below finish grade.

H. Electrical Contractor shall include in his bid, cost of services of an approved independent testing laboratory, to test grounding resistance of all made electrodes, ground rods, and bonding of building steel, water pipes, gas pipes and other utility piping. Tests to be performed are as follows:

1. Visually and mechanically examine ground system connections for completeness and adequacy.
2. Perform "fall of potential" tests on each ground rod or ground electrode where suitable locations are available per IEEE Standard No. 81, Section 8.2.1.2. Where suitable locations are not available, measurements will be referenced to a known dead earth or reference ground.
3. Perform the two point method test per IEEE No. 81, Section 8.2.1.1 to determine ground resistance between ground rod and building steel, and utility piping - such as water, gas and panelboard grounds. Metal railings at building entrances and at handicapped ramps shall also be tested.
4. Test shall be conducted in presence of the District Electrical Inspector.

I. Three copies of test results shall be submitted to the District Electrical Inspector. Test results shall be submitted on an official form from the independent testing laboratory showing project location, test engineer, test conditions, test equipment data, ground system layout or diagram, and final test results.

END OF SECTION

SECTION 26 0533

CONDUIT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Addenda, Alternates, Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specifications collectively apply to work of this Section.

1.2 DESCRIPTION

A. Work includes but is not limited to the following:

1. Rigid metal conduit and fittings.
2. Intermediate metal conduit and fittings.
3. Electrical metallic tubing and fittings.
4. Flexible metal conduit and fittings.
5. Liquidtight flexible metal conduit and fittings.
6. Non-metallic conduit and fittings.

PART 2 - PRODUCTS

2.1 RIGID STEEL CONDUIT AND FITTINGS

A. Rigid Steel Conduit: Hot dipped galvanized inside and out, galvanized threads, mild steel, zinc coated, inside and outside protective coating. Standard lengths: 10'-0".

B. Bushings: Threaded insulated metallic type except sizes 1" and smaller may be non-metallic type. Setscrew bushings are not acceptable.

C. Couplings, elbows, bends and other fittings: Same material and finish as rigid steel conduit. All shall be threaded type.

2.2 RIGID ALUMINUM CONDUIT AND FITTINGS

A. Conduit: Extruded from 6063-T24 alloy of maximum 1/10% copper content and containing lubricating inside liners; rigid threaded type.

B. Bushings: Insulated metallic except that sizes 1" and smaller may be non-metallic.

2.3 INTERMEDIATE METAL CONDUIT (IMC) AND FITTINGS

A. Conduit: Galvanized steel, zinc coated, protective coating inside and out.

B. Fittings and Conduit Bodies: Use fittings and conduit bodies specified above for rigid steel conduit.

C. Conduit: May be used in lieu of rigid steel conduit where permitted by code, except in concrete, underground, runs longer than 100 feet for all power feeders with conduit greater than 2 inches.

2.4 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

A. Conduit: Hot dipped galvanized or sherardized inside and out, zinc coated with protective enamel coating inside. Provide bushings at ends of conduits.

B. Connectors: Steel, insulated, bused tap-on or wrench tightened compression type. (Couplings similar) Indentor or screw type not acceptable.

C. Conduit: May be used in lieu of rigid steel conduit where permitted by code, except exposed, in concrete and for runs more than 100' for all power feeders with conduit greater than 2 inches.

2.5 FLEXIBLE METAL CONDUIT AND FITTINGS

A. Conduit: Steel single strip, hot dipped galvanized on all 4 sides prior to fabrication. Flexible aluminum conduit will not be allowed.

B. Connectors: Die cast with ridges that thread into conduit. (Binding screw type connectors are not acceptable.)

C. Conduit: May be used in lieu of rigid steel conduit where specifically indicated; at connections to vibrating equipment; at drops to light fixtures from J-boxes; at locations judged by Architect impractical to use rigid conduit. Maximum length for any application shall be 6 feet.

2.6 LIQUIDTIGHT FLEXIBLE CONDUIT AND FITTINGS

A. Conduit: Steel, single strip, hot dipped galvanized on 4 sides prior to fabrication.

B. Connectors: Insulated, special Appleton "STN" Series.

C. Jacket: Liquidtight, polyvinyl chloride plastic.

D. Conduit: Use for final connection to motor terminal boxes and transformers. Use at exterior locations, damp locations, wet locations and for flex connections in kitchen, restrooms and similar areas.

2.7 PLASTIC CONDUIT AND FITTINGS

A. Conduit: Extruded, virgin polyvinyl chloride compound, Schedule 40, heavy wall, in 10'-0" lengths with couplings.

B. Fittings: Non-threaded type couplings.

C. Conduit: May be used underground only. Vertical elbows and risers of all sizes shall be rigid steel with 20 mil bonded PVC coating.

2.8 CONDUIT SUPPORTS

A. Conduit Clamps, Straps, and Supports: Steel or malleable iron. Clamps: Unistrut Nos. P111 thru P1124, Kindorf No. C105. Straps: One or two hole as required.

B. Conduit hangers, racks and trapezes: Steel, threaded rods, channel iron "U" shaped racks equal to "Unistrut".

C. Individual conduit hangers: Steel, threaded rods with malleable iron split rings.

D. Hanger rods: 3/8" minimum diameter for 2" and smaller conduit, factory made. 1/2" minimum for 2-1/2" and larger conduit.

E. Wire supports: 12 gauge zinc coated iron tie wire, or 16 gauge galvanized double annealed steel tie wire.

2.9 CONDUIT ROOF JACKS AND FLASHING

A. Roof Jacks:

1. For Single Conduits Through Roof: Stonemen Stormtite Series #1100-4; seamless 4 pound lead flashing assembly, 8" skirt, steel reinforced varipitch boot; caulk type cast iron counterflashing sleeve, with vandalproof set screws, and Perma-seal waterproofing compound.
2. Sleeves for Conduits: Sleeves shall be adjustable type, of 26 gage galvanized iron, Adjust-to Crete Co. Adjust-to-Crete, or Jet Line Products Inc. Jet-Line, or equal.
3. Where conduit enters a building through a concrete foundation below grade, or ground water level, or where it is necessary to seal around a conduit where it passes through a concrete floor or wall, provide O-Z/Gedney Type FSK Thru Wall and Floor Seal, or equal.

2.10 CONDUIT PULLING CORDS

A. Pull Wire: No. 12 galvanized iron or nylon pull wire rated 250 pounds tensile strength.

2.11 CONDUIT FITTINGS, ELLS AND BUSHINGS

A. Special conduit fittings: Crouse-Hinds "Condulets" or Appleton "Unilets".

B. Ells: Same quality, same finish and same make as conduit.

C. Bushings: Thomas & Betts or approved equal.

D. Seismic separations and expansion joints: OZ type "AX" complete with bonding strap and clamps. At exterior locations use OZ type "EX".

2.12 CONDUIT SEALS AND SEALING COMPOUND

A. Vertical seals: Crouse Hinds type "EYD" or Appleton type "SF".

B. Horizontal Seals: Crouse Hinds type "EYS" or Appleton type "ESU".

C. Sealing compound: Crouse Hinds "CHICO" or Appleton "APELCO".

D. Fireproofing Compound: Dow Corning No. 3-6548 RTV or equal by 3M Company or Nelson.

2.13 UNDERGROUND SPACERS FOR PVC CONDUIT

A. Spacers: PVC, interlocking type, intermediate and base styles.

B. Sizes: For 2" to 4" conduit.

C. Manufacturer: Carlon or approved equal.

2.14 SPECIAL UNDERGROUND COUPLINGS FOR PVC CONDUIT

A. Expansion couplings: PVC type to expand up to 4".

B. Couplings: Socket type for joining PVC conduit.

C. Adapters: Socket type at one end for PVC conduit and threaded female type at other end for metallic connection.

2.15 PLASTIC CONDUIT CEMENT

A. Solvent weld cement: Fast drying, brush-on type.

2.16 MC CABLE

A. Metal Clad (MC) cable system is not allowed.

PART 3 - EXECUTION

3.1 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

A. Arrange conduit to maintain headroom and present a neat appearance.

B. Unless indicated otherwise, conceal conduit within or behind finished walls and ceiling.

C. Route exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping.

D. Maintain minimum 6 inch clearance between conduit and piping. Maintain 12 inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.

E. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.

F. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.

G. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.

H. Do not support conduit from any equipment subject to vibration. Support from structural members only.

I. Structural Considerations for Conduit Routing:

1. Where conduits are to pass through or will interfere with any Structural member, or where notching, boring or cutting of the structure is necessary, or where special openings are required through walls, floors, footings, or other buildings elements, to accommodate the electrical work, such work shall conform to State Building Code.
2. Where conduits are terminated in groups at panelboards, switchboards and signal cabinets, etc., provide templates or spacers to hold conduits in proper position and to preserve alignment. Conduits terminating at signal cabinets shall enter cabinets in following approved locations only: Conduits entering top, side, and bottom of cabinets shall be aligned in a single row, centered 2" from rear of cabinet; conduits entering back of cabinet shall be aligned in a single row centered 2" from top of cabinet. Conduits shall not be spaced closer than 3" on centers.
3. 1" and smaller conduits above metal lath ceilings shall be tied to ceiling channels. 1-1/4" conduits above metal lath ceilings shall be rigidly suspended with pipe hangers or pipe racks or shall be secured to superstructure with factory made pipe straps. Conduits in metal lath or steel stud partitions, shall be tied to furring

channels or studs. In ceiling spaces and in partitions, tie wires shall be spaced not more than 5'-0" apart, shall hold conduit tight against channels and studs at point of tie and shall not bear any of weight of conduit. Tie wire shall be #16 gage galvanized double annealed steel tie wire.

4. Where auxiliary supports, saddles, brackets,, etc., are required to meet special conditions they shall be made rigid and secure before conduit is attached thereto.
5. Conduit in ceiling spaces, in stud walls and under floors shall be supported with factory made pipe straps or shall be suspended with pipe hangers or pipe racks. Pipe straps shall be attached to and shall hold conduit tight at point of support against ceiling and floor joists, rafters, and wall studs, or 2" x 4" headers fitted between joists or wall studs.
6. Conduits installed on exposed steel trusses and rafters shall be fastened with factory made conduit straps or clamps which shall hold conduit tight against supporting member at point of support.
7. Conduits under buildings shall be strapped with factory made conduit straps to underside of concrete floor or joists, or wood floor joists, or shall be suspended with pipe hangers or pipe racks. Conduits under building shall not rest on ground but shall be suspended from building or shall be buried below surface of ground. 1" and larger conduits under buildings shall be suspended with conduit hangers or racks.
8. Pipe hangers for individual conduits shall be factory made, consisting of a pipe ring and threaded suspension rod. Pipe ring shall be malleable iron, split and hinged, and shall securely hold conduit, or shall be springable wrought steel. Rings shall be bolted to or interlocked with suspension rod socket. Rods shall be 3/8" for 2" conduit hangers and smaller and shall be 1/2" for 2-1/2" conduit hangers and larger.
9. Pipe racks for groups of parallel conduits and for supporting total weights not exceeding 500 pounds shall be trapezed type and shall consist of a cross channel, Steel City Kindorf #B-900, Unistrut #P-1000 suspended with a 3/8" minimum diameter steel rod at each end. Each rod shall be fastened with nuts, top and bottom to cross channel and with a square washer on top of channel. Each conduit shall be clamped to top for cross channel with conduit clamps, Steel City Kindorf #C-105 or Unistrut Nos. P-1111 through P-1124. Conduits shall not be stacked one on top of another, but a maximum of 2 tiers maybe on same rack providing an additional cross channel is installed. Where a pipe rack is to be longer than 18", or if weight it is to support exceeds 500 pounds, submit details of installation to the Architect for approval.
10. Factory-made pipe straps shall be one or 2-hole formed galvanized clamps, heavy duty type, except where otherwise specified.
11. Hangers straps, rods, or pipe supports under concrete shall be attached to inserts set at time concrete is poured. Under wood use bolts, lag bolts, or lag screws; under steel joists or trusses use beam clamps.

3.2 CONDUIT INSTALLATION

A. Cut conduit square using a saw or pipe cutter; de-burr cut ends.

B. Bring conduit to the shoulder of fittings and couplings and fasten securely.

C. Use conduit hubs or sealing locknuts for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations.

D. Install no more than equivalent of two 90- degree bends between boxes for conduits 2" diameter and larger, three for conduit under 2" diameter. Locate pull boxes as required.

E. Use conduit bodies to make sharp changes in direction, as around beams.

F. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2 inch size.

G. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.

H. Support rigid, intermediate and thin wall conduit at 8'-0" maximum on centers and 3'-0" from junction boxes.

I. Support flexible and liquidtight flexible conduit at 4'-0" maximum on centers and 12" from junction boxes.

J. PVC conduit: Use underground only. Encase in 3" concrete (2000 psi) envelope except under building.

K. Provide No. 12 AWG insulated conductor or suitable pull string in empty conduit, except sleeves and nipples.

L. Install expansion-deflection joints where conduit crosses building expansion or seismic joints.

M. Where conduit penetrates fire-rated walls and floors, seal opening around conduit with UL listed fire barrier, "3M" calk or equal.

N. Route conduit to roof mounted devices and equipment through roof jacks. Provide flashing/roof jacks for all new and existing conduits which penetrate roof to appropriate Roofing Section(s) for installation.

O. Run conduit to equipment on roof concealed in attic space. Penetrate roof at equipment locations only.

P. For conduits to roof mounted HVAC equipment, penetrate roof with roof jacks outside footprint of HVAC units. Do not penetrate roof inside HVAC units.

Q. Do not use aluminum conduit below grade, cast in concrete or in masonry in contact with earth.

R. Conduit underground may be rigid conduit and in these conditions shall be given two heavy coatings of a suitable primer and a single half lapped layer of protective plastic tape. Primer and tape shall be "Scotchrap" No. 50 tape. Primer and tape shall be "Scotchrap" Primer or Trantex V-10 tape and Dutch Brand Primer. Primer and tape shall be in strict accordance with manufacturer's instructions. As an alternate, conduit and fittings shall have a PVC bonded coating (40 mil thickness minimum) by Occidental Coating Company.

S. Where conduit is installed underground, under slabs on grade, exposed to weather or in wet locations, make joints liquidtight and gastight.

T. For underground or underslab conduit, apply a heavy coat of Pabco P & B No. 2 paint to all surfaces within 6" each side of fittings and to areas where wrenches or other tools have been applied. On exposed conduit, repair scratches and other defects with galvanizing repair stick, Enterprise Galvanizing "Galvabar".

U. Cut threads on rigid conduit to standard taper and to a length such that all bare metal exposed by threading operation will be completely covered by couplings or fittings used. In addition, cut lengths of thread such that all joints will become secure and wrench tight just preceding point where conduit ends would butt together in couplings and where conduit ends would butt into ends or shoulders of other fittings. Securely tighten all threaded connections.

V. Make joints in rigid conduit installed in concrete or masonry liquid-and-gas-tight, with red lead and oil, or other approved joint compound and engage not less than five threads.

W. Keep bends and offsets in conduit runs to an absolute minimum. Replace all deformed, flattened or kinked conduit. Provide large radius factory made bends or power bend rigid metal conduit of 1-1/4" trade size or larger.

X. Place sleeves for electrical conduit passing through walls, beams or slabs before concrete is poured (exception-floor slabs on earth). Where conduit passes through suspended floor slabs, outside of chases, sleeves shall be standard weight black steel pipe extending 1-1/2" above the finished floor level. Sleeves at other locations shall be either lightweight galvanized steel tube, or galvanized sheet steel, with a minimum thickness of 24 USSG. Clearance between conduit and sleeves shall be not less than 1/2". Sleeves through outside walls below grade shall be caulked tight. Caulk with oakum and mastic to obtain watertight joint.

Y. Penetration Membrane: Where penetration cannot be avoided, cut and re-seal membrane at point of penetration.

Z. Provide minimum 3/4" conduit size underground.

AA. Run exposed conduit parallel with or at right angles to building line, beams, or ceilings. Place symmetrical bends or metal boxes at changes in direction or taps.

BB. Stub from each panel which is flush mounted in a wall, from top of panel a minimum of 3-3/4" conduits to nearest ceiling space or other accessible locations and cap for future use. Tag to indicate panel origination.

CC. Independently support conduit rising from floor for motor connections if over 24" above floor. Support shall not be a motor or duct work which may transmit vibrations.

DD. Provide pull wire in all conduit runs indicated as conduit only (C.O.).

EE. Do not run conduit closer than 12" to any hot water pipe, steam pipe, heater flue or vent.

FF. Terminate conduit stub-ups through floor for connection to equipment of junction boxes in couplings flush with top of concrete slab floor.

GG. Within building, bury underground conduit a minimum of 6" below bottom of slab.

HH. Use rigid metal conduit where legally required, where exposed to weather, where located in unheated areas, or where subject to mechanical injury, here defined as exposed conduit less than 7'-6" above floor in areas accessible to anyone other than authorized operating or maintenance personnel.

II. Where a conduit from one structure crosses to another structure, e.g., from a building to an arcade or from one arcade to another arcade, use a section of liquid-tight flex conduit at the crossing with sufficient slack to allow the two structures to move during an earthquake without breaking the conduit. For stub up to relocatable buildings, provide liquid-tite flex from stub up to first box on back of building.

JJ. Provide PVC deflection - expansion joint fittings where underground run passes through expansion joint or is necessary for seismic conditions.

KK. Provide a green insulated ground wire in all flexible conduit runs regardless of length.

LL. Wipe plastic conduit (PVC) clean before joining. Apply even coat of cement to entire area to be inserted into fitting. Let joint cure for 20 minutes minimum. Use approved solvent-weld cement specifically manufactured for purpose. Threading of PVC conduit is prohibited.

MM. Install an equipment ground (green) insulated conductor in each non-metallic conduit.

NN. Do not install PVC conduit above grade for any reason. Seal both ends of all PVC conduit runs at each junction box or conduit interruption with sealant. Seal steel conduit risers to panelboards, switchboards, or pullboxes from underground PVC conduit runs.

OO. Flash and counterflash all conduit runs passing through roof.

PP. Use electrical metallic tubing above grade in dry locations only and where not subject to mechanical injury or otherwise prohibited. Concrete and masonry in contact with earth are not considered dry locations.

QQ. Use liquid tight flexible conduit for final connections to motors and vibrating equipment. Use flexible conduit where required for equipment servicing for connections to recessed lighting fixtures from nearby accessible junction boxes, and for concealed runs in dry locations where structural conditions prevent use of other types of conduit.

RR. For conduits for computer cables and coax cables, use large radius bends. Do not use j-box or pull box to change direction. Install boxes at straight conduit sections only and sweep conduit to make turns. Do not use condulet fittings to change directions.

SS. Minimum radius for conduits designated for computer LAN wiring, coax cable wiring, data wiring, fibre-optics wiring, and TV cable wiring shall be as follows:

3/4"C	-	12"
1"C	-	12"
1-1/4"C	-	18"
2"C	-	24"
2-1/2"C	-	24"
3"C	-	30"
3-1/2"C	-	30"
4"C	-	30"
5"C	-	36"
6"C	-	42"

TT. Size all conduits as legally required or larger where indicated or preferred. Where portions of a conduit run are increased in size, for whatever reason, make all remaining portions in that run same size.

UU. Mark all underground conduit stub-outs with a 6 inch square by 2 foot deep concrete block with an embedded brass nameplate indicating the origin of conduit.

VV. Do not cut concrete, masonry or structural members except where approved by Architect.

WW. Underground Requirements:

1. Except for branch circuit conduits and auxiliary system branch circuits within a building, all conduits installed underground shall be entirely encased in concrete (2000 psi), 3" thick on all sides with multiple conduits spaced not less than 3" apart, except where otherwise specified. Provide approved conduit spacers as required to prevent any deflection of conduits when concrete is placed and to preserve position and alignment of conduits in concrete. Conduits shall be tied to spacers. Anchors shall be installed to prevent floating of conduits during pouring of concrete. Red concrete shall be used to encase conduits of systems operating above 600 volts. To protect conduits from underground to surface wall mounted panels, terminal cabinets, etc., encase conduits in 3" high concrete curb.
2. Assemble sections of conduit with approved fittings and stagger all joints. Cut ends of conduit shall be reamed to remove all rough edges. Joints in all conduits shall be

made liquid-tight. All bends at risers shall be completely below surface where possible.

3. Two or more conduit runs in a common trench shall be separated by at least 3" of concrete. Conduit runs installed in a common trench with other utility lines and water, gas, sew lines, shall be separated from such lines by at least 12" horizontally. Power conduits shall be separated from low voltage signal conduits by 6" of concrete.
4. Slope underground conduits between two pull boxes towards one of the boxes to avoid water and moisture trap. For underground conduits coming out of a building, slope conduits towards the first pull boxes. Take care to install underground conduits such that water cannot travel through underground pull boxes and conduits back into a building. Prevention method shall include but not limited to installing pull boxes with draining provision where conduits enter building, sealing both ends of each conduit water tight, etc.
5. Provide electronic markers to identify conduit stub locations at property lines, as required by electric service utility company.

3.3 EXCAVATION AND BACKFILL

A. Include all excavation and backfilling required for work under this Section.

1. Bury underground conduit at least 27 inches below finished grade to top of conduit encasement.
2. Underground branch circuit conduit, within building limits, 6" below bottom of slab unless specifically indicated otherwise in these specifications.
3. After installation of work has been inspected and approved, backfill trenches with clean earth, moistened and layer tamped to same compaction density as specified for both building and site locations under "Earthwork".

B. Locate existing underground pipes by use of electronic locating devices and exercise utmost care in excavation work. Contractor is responsible for satisfactory repair of any underground utility line damaged as result of his excavation.

C. Trenches or any other excavation required for installation of electrical work, which are outside of barricaded working area, shall be barricaded at all times with continuous portable barricades. At completion of work, remove barricades from site. Backfill trenches and excavations outside of barricaded working area immediately after approval of conduit work by Inspector.

D. Where asphalt concrete has been cut, backfill up to existing grade.

E. Do not start excavations until approval is obtained from Inspector.

END OF SECTION

SECTION 26 0534

BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Addenda, Alternates, Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specifications collectively apply to work of this Section.

1.2 DESCRIPTION

A. Work includes but is not limited to the following:

1. Wall and ceiling outlet boxes.
2. Pull and junction boxes.
3. Sealant.

B. Related Work:

1. Section 260100 - Basic Materials and Methods.
2. Section 260533 - Conduit
3. Section 262726 - Wiring Devices.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS-OUTLET BOXES

A. Raco

B. Steel City

C. Bowers

2.2 OUTLET BOXES

A. Sheet Metal Outlet Boxes: One piece galvanized, pressed steel, knockout type, 4-11/16" sq. by 2-1/8" deep in all locations unless otherwise indicated or required.

B. Cast Boxes: Aluminum, or Cast feralloy, deep type, gasketed cover, threaded hubs.

C. Where Wiremold type box have to be used, e.g., on existing concrete wall, provide proper box such that the total depth of a box including the device mounted on the box, will not exceed 4 inches.

2.3 ACCEPTABLE MANUFACTURERS-FLOOR BOXES

A. Hubbell

B. Walker Parkersburg

C. Steel City

2.4 PULL AND JUNCTION BOXES

A. Interior and non-weatherproof boxes shall be constructed of blue or galvanized steel with ample laps, spot welded, and shall be rigid under torsional and deflecting forces. Boxes shall have auxiliary angle iron framing where necessary to ensure rigidity. Covers shall be fastened to box with a sufficient number of brass machine screws to ensure continuous contact all around. Flush type boxes shall be drilled and tapped for cover screws at Site if boxes are not installed plumb. All surfaces of pull and junction boxes and covers shall be given one coat of metal primer, and one coat of aluminum paint.

B. Weatherproof pull and junction boxes shall conform to foregoing for interior boxes with following modifications: Cover of flush mounting boxes shall have a weather-tight gasket cemented to and trimmed even with cover all around. Surface or semi-flush mounting pull and junction boxes shall be UL approved as rain-tight and shall be complete with threaded conduit hubs. All exposed portions of boxes shall be galvanized and finished with a prime coat and coat of baked-on gray enamel.

C. All junction and pull-boxes shall be rigidly fastened to the structure and shall not depend on conduits for support.

D. Cast Metal Boxes for Outdoor and Wet Location Installations: Type 4 and Type 6, flat-flanged, surface-mounted junction box, UL listed as rain-tight. Galvanized cast iron OR Cast aluminum box and cover with ground flange, neoprene gasket, and stainless steel cover screws.

2.5 ACCEPTABLE MANUFACTURERS-SEALANT

A. Crouse Hinds "CHICO"

B. Permacel

C. Ductseal

2.6 ACCEPTABLE MANUFACTURERS - FIRE PROOFING SEALANT

A. Dow Corning

B. 3M Company

C. Nelson

PART 3 - EXECUTION

3.1 COORDINATION OF BOX LOCATIONS

A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.

B. Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify exact location of floor boxes and outlets in offices and work areas with Owner's representative prior to rough-in.

C. Locate and install boxes to allow access.

D. Locate and install to maintain headroom and to present a neat appearance.

3.2 OUTLET BOX INSTALLATION

A. Unless otherwise noted on plan or specifically allowed by the Engineer, conceal all boxes flush in wall or in ceiling space above drop ceiling. In finished areas and where it is not possible to conceal conduits and boxes, for example, on existing concrete wall, provide Wiremold type metallic surface raceways and boxes.

B. Do not install boxes back-to-back in walls. Provide minimum 6 inch separation, except provide minimum 24 inch separation in acoustic-rated walls.

C. Provide knockout closures for unused openings.

D. Support boxes independently of conduit except for cast box that is connected to two rigid metal conduits, both supported within 12 inches of box.

E. Use multiple-gang boxes where more than one device are mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.

F. Install boxes in walls without damaging wall insulation.

G. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

H. Position outlets to locate lighting fixtures as shown on reflected ceiling plans.

I. In inaccessible ceiling areas, position outlets and junction boxes within 6 inches of recessed lighting fixture, to be accessible through lighting fixture ceiling opening.

J. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs. Accurately position to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes. Install plaster rings to interface with equipment to be mounted thereon.

K. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.

L. Provide cast outlet boxes in exterior locations and wet locations. Provide cast bell-boxes at interior locations where box is exposed to view. (do not use regular 4/s or handy box with exposed knockouts and unfinished appearances for these interior exposed applications).

M. Where boxes are installed in fire rated ceiling or walls, be responsible for preserving integrity of fire rating as required.

N. In fire-rated wall, use 4" square deep boxes. Do not aggregate more than 100 square inches of boxes for any 100 square feet of wall or partitions. Separate outlet boxes on opposite sides of walls or partition by a minimum horizontal distance of 24 inches. Where the separation cannot be achieved due to site condition, provide 2-hour rated fire-proof material behind boxes to maintain fire rating of walls.

3.3 PULL AND JUNCTION BOX INSTALLATION

A. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.

B. Support pull and junction boxes independent of conduit.

END OF SECTION

SECTION 26 0553

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Addenda, Alternates, Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specifications collectively apply to work of this Section.

1.2 DESCRIPTION

A. Work includes but is not limited to the following:

1. Nameplates.
2. Wire and cable markers.

B. Related Work:

1. Section 260100 - Basic Materials and Methods.
2. Section 260519 - Wire and Cable -Rated 600 Volt.
3. Section 260526 - Grounding.
4. Section 260533 - Conduit.
5. Section 260534 - Boxes.
6. Section 262416 - Panelboards.
7. Section 262816 - Disconnect Switches.
8. Auxiliary System Sections.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Nameplates: Engraved three-layer laminated plastic, white letters on a black background.

B. Wire Markers: Cloth markers, split sleeve or tubing type.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Degrease and clean surfaces to receive nameplates.

B. Install nameplates parallel to equipment lines.

C. Secure nameplates to equipment fronts using screws or rivets. Secure nameplate to outside face of panelboard doors.

D. Embossed tape will not be permitted for any application.

3.2 WIRE IDENTIFICATION

A. Provide wire markers on each conductor in panelboard gutters, pull boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on schematic and interconnection diagrams or equipment manufacturer's shop drawings for control wiring.

3.3 NAMEPLATE ENGRAVING SCHEDULE

A. Provide nameplates of minimum letter height as scheduled below.

B. Panelboards, Switchboards, and Distribution Sections: 1/4 inch identifying equipment designation; 1/8 inch identifying voltage rating and source. Provide nameplates on load centers furnished with relocatable buildings. Nameplates for relocatable buildings shall match description on circuit breakers or switches at switchboards or panelboards feeding the buildings.

C. Individual Circuit Breakers, Switches, Motor Starters in Panelboards, and Distribution Sections: 1/8 inch identifying circuit and load served, including location.

D. Individual Circuit Breakers, fused and non-fused disconnect Switches, and Motor Starters: 1/8 inch identifying load served.

E. Transformers: 1/4 inch identifying equipment designation; 1/8 inch identifying primary and secondary voltages, primary source, and secondary load and location.

F. Emergency Power Units: 1/4 inch identifying equipment designation; 1/8 inch identifying incoming and outgoing voltages.

G. Exterior metal pull boxes: 1/4 inch identifying systems in boxes.

H. Terminal Cabinets: 1/4 inch identifying systems.

3.4 MARK CONDUCTOR RUNS

A. Apply markers after conductors installed in conduits.

B. Apply in panelboards and in junction boxes.

C. Mark feeders in panelboards, switchboards and distribution sections.

3.5 MARK JUNCTION BOXES

A. Mark covers of junction boxes with non-erasable marker to indicate circuit numbers or systems contained within boxes.

B. Mark fire alarm boxes with red marker and identifying as "FA".

C. Paint fire alarm conduits red at intervals such that conduits can be clearly identified for fire alarm system.

3.6 RELOCATABLE BUILDINGS

A. Provide nameplate on each load center that is supplied with each relocatable building. Refer to single line diagram for inscription.

B. Provide a typewritten circuit directory inside the cover of each load center supplied with each relocatable building.

END OF SECTION

SECTION 26 0921

ELECTRICAL-HVAC-PLUMBING COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Addenda, Alternates, Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specifications collectively apply to work of this Section.

1.2 DESCRIPTION

A. Work includes but is not limited to the following:

1. Coordination with HVAC and Plumbing Sections of work.
2. Electrical components, wiring and connections to electrical HVAC and Plumbing equipment.

B. Related Work:

1. Section 260100 - Basic Materials and Methods.
2. Section 260533 - Conduit.
3. Section 260519 - Wire and Cable.
4. Section 260534 - Boxes.
5. Section 262813 - Fuses.
6. Section 260553 - Electrical Identification.
7. Section 262816 - Disconnect Switches.

1.3 QUALITY ASSURANCE

A. Size fuses in accordance with manufacturer's published data and equipment nameplate information.

B. Confirm with Mechanical Contractor correct sizes of all starter heater sizes.

1.4 PROJECT RECORD DOCUMENTS

A. Submit record documents under provisions of Section 017839 and Section 016000.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Air Conditioning and Heating & Ventilating equipment will be furnished and installed by HVAC Contractor. Plumbing equipment will be furnished and installed by Plumbing Contractor.

B. Electrical components for these systems will be a part of work of this section.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Furnish, install and connect all required electrical components for air conditioning and heating systems and for plumbing system.

B. Secure a control wiring diagram from Air Conditioning Equipment Supplier at time of receipt of Contract and determine all control and protective apparatus and devices necessary for correct and proper operation of air conditioning equipment and furnish such apparatus and devices. Be responsible for proper wiring and connecting of air conditioning equipment and plumbing equipment.

C. Refer to mechanical plans, check all locations of mechanical equipment that may or may not show on electrical plans and include in bid sum sufficient to cover total cost of mechanical installation. Coordinate with Air Conditioning Equipment Supplier to ensure that all equipment is covered in Contract.

D. Unless specifically noted on drawings, run conduit in attic or ceiling space to equipment on roof so that no conduit runs or lays on roof. Penetrate roof at equipment location only.

END OF SECTION

SECTION 26 2416

PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Addenda, Alternates, Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specifications collectively apply to work of this Section.

1.2 DESCRIPTION

A. Work includes but is not limited to the following:

1. Lighting branch circuit panelboards.

B. Related Work:

1. Section 260100 - Basic Materials and Methods.
2. Section 260519 - Wire and Cable.
3. Section 260526 - Grounding.
4. Section 260533 - Conduit.
5. Section 260553 - Electrical Identification.

1.3 SUBMITTALS

A. Submit shop drawings for equipment and component devices.

B. Include outline and support point dimensions, voltage, main bus ampacity, circuit breaker arrangement and sizes.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER - PANELBOARDS

A. Square D.

B. General Electric.

C. Cutler Hammer

D. ITE.

2.2 BRANCH CIRCUIT PANELBOARDS

A. Lighting panelboards: Safety type with 277/480 volt and 120/208 volt, three phase, four wire. Circuit breakers: Molded case thermal magnetic type quick-make, quick-break approved by designated use and voltage, bolt-on, 20 ampere single pole branch circuit unless otherwise indicated on schedules. Toggle type mechanism shall have trip indicator. Circuit breakers where used to switch light fixtures: Type "SWD". Breakers for HVAC equipment shall be HACR rated. Minimum interrupting capacity rating for 120/208 volt units: 10,000 amperes and for 277/480 volt system units: 14,000 amperes. 120/208 volt panelboards shall have 200% rated neutral bus. Provide a handle tie on the single pole breakers on each multi-

wire branch circuit (circuits sharing a common neutral) such that the circuits of each multi-wire branch circuit can be disconnected simultaneously.

B. Panelboard cabinets for lighting panels: Single door, with Underwriters' label.

C. Cabinets: Constructed in accordance with N.E.C. Standards, of not less than No.12 gauge galvanized sheet steel and painted inside with rust resistant paint. Minimum width: 20 inches; depth: 5-3/4".

D. Panelboard cabinets shall be sufficient height and width to allow a minimum of 4 inch wiring gutters around all sides, except feeder entrance side, which shall be 6 inches wide.

E. Fronts of all cabinets shall be constructed of one (1) piece of code gauge galvanized sheet but not less than 12 gauge steel, fastened with screws and countersunk washers.

F. Doors: Fastened to trims with substantial continuous flush hinges, flush spring catch latch and cylinder lock with two (2) keys for each floor. All locks: Master keyed.

G. Directory frames: 1/32", Lucite.

H. Interiors: Factory assembled rigid frame, supporting bus, mains and neutral bar. Bussing: Copper and arrange for sequence phasing throughout with a current density in copper not to exceed 1000 amperes per square inch. Neutral bar: Located at opposite end of structure from mains.

I. Circuit number labels shall be engraved laminated plastic, white letters on a black background. Stick on decal paper label is not acceptable.

J. Equipment supplier shall provide “Flash Hazard” warning signs as required by the NEC.

K. Panelboards shall be by "Original Equipment Manufacturer" that also manufactures circuit breakers. Load center type panelboards are not acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards plumb.

B. Height: 6 ft maximum to top of panelboard.

C. Provide filler plates for unused spaces in panelboards.

D. Provide typed circuit directory for each panelboard. Do not revise branch circuit numbers for any reason.

E. Stub three empty 3/4 inch conduits to accessible location above ceiling out of each recessed panelboard and cap.

F. Provide padlocking device for each and every circuit breaker in "Off" position in each and every panelboard.

G. Use common internal trip element for two and three pole circuit breakers.

H. Finish panels gray.

I. Rigidly support cabinets to building construction in an approved manner.

J. Provide approved lock-in devices on all circuit breakers serving fire alarm panels and devices, motors, heaters, clocks, signal circuits, night lights, drinking fountains, or equipment remotely located. (Lock-in devices are not padlocking devices.)

K. Provide identifying screwed on bakelite nameplate to face of each panelboard.

L. Coordinate with other trades and ensure that no pipes or ducts are installed in the space within 6 feet above top of panelboards. Be responsible also that all doors from electrical rooms swing out from room.

M. Provide handle tie bars on circuit breakers serving each multi-wire branch circuits sharing a common neutral wire.

3.2 FIELD QUALITY CONTROL

A. Measure steady state load currents at each panelboard feeder. Should difference at any panelboard between phases exceed 20 percent, notify Electrical Engineer immediately. Take care to maintain proper phasing for multi-wire branch circuits.

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers.

END OF SECTION

SECTION 26 2726

WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Addenda, Alternates, Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specifications collectively apply to work of this Section.

1.2 DESCRIPTION

A. Work includes but is not limited to the following:

1. Wall Switches
2. Receptacles.
3. Device plates and box covers.

B. Related Work:

1. Section 260100 - Basic Materials and Methods.
2. Section 260526 - Grounding.
3. Section 260534 - Boxes.
4. Section 260553 - Electrical Identification.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS – WALL SWITCHES

A. Harvey Hubbell Company.

B. Pass and Seymour.

C. Leviton.

2.2 WALL SWITCHES

A. Wall switches for Lighting Circuit AC general use snap switch with toggle handle, rated 20 amperes and 120/277 volts AC. Handle: White or color as selected by Architect, plastic. Decorator spec grade.

2.3 ACCEPTABLE MANUFACTURERS - RECEPTACLES

A. Harvey Hubbell Company.

B. Pass and Seymour.

C. Leviton.

2.4 RECEPTACLES

A. Convenience and Straight-blade Receptacles: NEMA Configuration 5-15R: Decorator Spec Grade, White.

B. Convenience and Straight-Blade Receptacles: NEMA configuration 5-20R: Decorator Spec Grade, White.

C. Convenience receptacle, isolated ground type, orange in color: Decorator Spec Grade.

D. GFI Receptacles: Duplex convenience receptacle with integral ground fault current interrupter, NEMA 5-20R, Decorator Spec Grade, White. Unit shall comply with UL 2003 GFCI requirements including lockout action.

E. Receptacles: Highest specification grade.

F. Provide tamper-resistant receptacles with thermoplastic dual mechanism shutter system to help prevent insertion of foreign objects. Receptacles shall have extra heavy-duty brass, one-piece mounting strap with integral ground. Receptacles shall be white color, impact resistant nylon face and back body. For tamper-resistant receptacles rated 20 amps/125 volts, provide NEMA 5-20R, white in color. For tamper-resistant receptacles rated 15 amps/125 volts, provide NEMA 5-15R, white in color. Provide Decorator Spec Grade receptacles.

G. Split wired half controlled receptacle: NEMA 5-20R, 20 amp, Pass & Seymour 26352CH-W or equal.

2.5 ACCEPTABLE MANUFACTURERS - WALL PLATES (Match manufacturer of Device)

A. Harvey Hubbell Company.

B. Pass and Seymour.

C. Leviton.

D. TayMac.

E. Match manufacturer of switches and receptacles.

2.6 WALL PLATES

A. Interior Device Plates: Sierra Electric .040 stainless steel to suit device; multi-gang where required; blank plates at junction boxes and capped outlets.

B. Weatherproof Cover Plates: Receptacles in wet locations shall be installed with an outlet enclosure clearly marked “Suitable for Wet Locations While In Use”. There must be a gasket between the enclosure and the mounting surface, and between the cover and base to assure a proper seal. The enclosure must employ stainless steel mounting hardware and enclosure shall be recessed where possible and by TayMac Corporation or equal.

C. Highest specification grade.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wall switches/receptacles 48" max measured from top of device and 15" min. measured from bottom of the device to finished floor. Verify mounting height with Architect prior to installation.

B. Install convenience receptacles 18 inches above floor, or as noted on drawings, grounding pole on bottom.

C. Install specific-use receptacles at heights shown on Contract Drawings.

D. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets in non-public places.

E. Install devices and wall plates flush and level.

F. Provide etched plates with 3/16" high black letters for:

1. Outlets where voltage is other than 120 volt.
2. When switch controls device other than lighting fixture.
3. When switch is located out of sight of unit being controlled.
4. Lock switches.
5. Where more than one switch occurs under a common plate.
6. Air Distribution System control switches.

G. Install plates with all four edges in continuous contact with finished wall surfaces without use of mats or similar devices.

H. Provide blank cover plates for all boxes as required.

I. In Kitchen, all 15A and 20A 115V receptacles shall be GFI type.

J. In bedrooms, receptacles shall be Arc Fault Circuit Interrupter type.

K. Receptacles in Pre-school and Kindergarten shall be tamper resistant (safety) type.

END OF SECTION

SECTION 26 2813

FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Addenda, Alternates, Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specifications collectively apply to work of this Section.

1.2 DESCRIPTION

A. Work includes but is not limited to the following:

1. Fuses.

B. Related Work:

1. Section 260100 - Basic Materials and Methods.
2. Section 262816 - Disconnect Switches.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - FUSES

A. Bussmann

B. Gould-Chase Shawmut

2.2 FUSES

A. Fuses, 600 amperes or less: Dual-element with a minimum time delay of 10 seconds at 500% rating; current limiting; interrupting capacity of 200,000 amperes RMS symmetrical.

B. Fuses: Of same manufacturer, of sizes shown on Drawings, of required size for proper operation of equipment protected.

C. Fuses, 250 volt: LPN-RK, Class "RK".

D. Fuses, 600 volt: LPS-RK, class "RK".

2.3 SPARE FUSES

A. Furnish 3 spare fuses of each type and each size.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fuses in switches and other equipment requiring fuses.

B. Do not ship equipment from factory with fuses installed.

C. Verify that correct size fuses are installed in switch. Verify that all three fuses in a three-pole switch and two fuses in a two-pole switch are exactly of same amperage and voltage ratings.

3.2 TESTS

A. Operate system with fuses in place after approval by inspecting authority.

B. Replace immediately any defective fuse and/or correct any and all deficiencies discovered through blown fuses.

END OF SECTION

SECTION 26 2816

DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Addenda, Alternates, Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specifications collectively apply to work of this Section.

1.2 DESCRIPTION

A. Work includes but is not limited to the following:

1. Disconnect switches.
2. Enclosures.

B. Related Work

1. Section 260100 - Basic Materials and Methods.
2. Section 260553 - Electrical Identification.
3. Section 262813 - Fuses.

1.3 SUBMITTALS

A. Include outline drawings with dimensions, and equipment ratings for voltage, capacity and horsepower.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - DISCONNECT SWITCHES

A. General Electric.

B. Cutler Hammer.

C. Square "D" Company.

2.2 DISCONNECT SWITCHES

A. Fusible Switch Assemblies: Heavy duty, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in "ON" position. Handle lockable in "OFF" position. Fuse Clips: Designed to accommodate Class R fuses, current limiting, 200,000 A.I.C.

B. Nonfusible Switch Assemblies: Heavy duty quick-make, quick-break, load interrupter enclosed knife switch with externally operable hand interlocked to prevent opening front cover with switch in “ON” position. Handle lockable in “OFF” position.

C. Enclosures: NEMA Type 1 or NEMA Type 3R as indicated on Drawings.

D. Fusible and Nonfusible Switch Enclosures: Assembled with defeatable door interlocks that prevent door from opening when operating handle is in "ON" position.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install disconnect switches where indicated on Drawings.

B. Install fuses in fusible disconnect switches.

C. Install "Caution" sticker on inside of switch door indicating exact type of fuses to be installed therein.

D. Verify that size, type and rating of fuses installed in each switch is correct and that all fuses in any one individual switch are the exactly same.

3.2 IDENTIFICATION

A. Provide screwed-on bakelite nameplate.

B. See Section 260553 for nameplate data.

END OF SECTION

SECTION 28 3100

FIRE ALARM SYSTEMS

The requirements of the General Conditions and Supplementary General Conditions apply to this section.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Addenda, Alternates, Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specifications collectively apply to work of this Section.

1.2 WORK INCLUDED

A. Section Includes:

1. The work under this section includes all labor, material, equipment, supplies, labor, testing, and accessories required to furnish and install a complete Fire Alarm System as indicated on the drawings and as specified herein.
2. It is the intent of the Drawings and Specifications for the Contractor to provide and install a complete, fully operational, and tested system.
3. All miscellaneous system components including, but not limited to control panels, digital communicator, alarm detection devices, alarm initiation devices, alarm indicating devices, remote power supplies, terminal cabinets, terminal blocks, conduits, wires, programming, testing, etc, as well as any other related items, shall be furnished and installed complete under this section, such that the system shall perform all functions listed herein in compliance with all of the specified requirements.
4. The complete installation shall conform to the following codes:

   2016 Building Standards Administrative Code
   2016 California Building Code (CBC)
   2016 California Electrical Code (CEC)
   2016 California Mechanical Code (CMC)
   2016 California Plumbing (CPC)
   2016 California Fire Code (CFC)
   2016 NFPA-72

B. Related Sections:

1. Section 260100: Basic Materials and Methods.
2. Section 260533: Conduit
3. Section 260519: Wire and Cable

1.3 SYSTEM REQUIREMENTS

A. Fire detection system shall continually supervise and monitor the following initiating, signaling, and monitoring circuits:

1. Manual fire-pull stations.

2. Smoke and heat detectors, monitor modules, relay modules, etc.
3. Alarm signaling circuits including alarm, horns and visual alarm units.
4. Annunciators.
5. Power supplies and batteries.
6. Voice communications panels.

B. System controls shall be UL listed for power limited applications in accordance with California Electrical Code.

C. The fire alarm devices and equipment shall be listed for installation for the fire alarm control panel to which they are being connected.

D. System labels and devices programming addresses shall be based on actual signage and building labeling as currently exist.

E. The fire alarm system shall comply with requirements of NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.

F. The facility shall have an emergency voice alarm communication system. Digitally stored message sequences shall notify the building occupants that a fire or life safety condition has been reported. Message generator(s) shall be capable of automatically distributing up to eight (8) simultaneous, unique messages to appropriate audio zones within the facility based on the type and location of the initiating event. The Fire Command Center (FCC) shall also support Emergency manual voice announcement capability for both system wide or selected audio zones, and shall include provisions for the system operator to override automatic messages system wide or in selected zones.

G. The system shall be support additional, alternate Fire Command Centers, which shall be capable of simultaneous monitoring of all system events. Alternate Fire Command Centers shall also support an approved method of transferring the control functions to an alternate Fire Command Center when necessary. All Fire Command Centers shall be individually capable of assuming Audio Command functions such as Emergency Paging, audio zone control functions, and Firefighter's Telephone communication functions.

H. Each designated zone shall transmit separate and different alarm, supervisory and trouble signals to the Fire Command Center (FCC) and designated personnel in other buildings at the site via a multiplex communication network.

I. The fire alarm system shall be manufactured by an ISO 9001:2008 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.

J. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installion shall be in compliance with the UL listing.

K. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final checkout and to ensure the systems integrity.

L. Basic Performance:

1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 (Class B) Signaling Line Circuits (SLC).
2. Device Circuits (IDC) shall be wired Class A (NFPA Style D) as part of an addressable device connected by the SLC Circuit.

3. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.
4. Speaker circuits may be controlled by NAC outputs built into the amplifiers, which shall function as addressable points on the Digital Audio Loop.
5. NAC speaker circuits shall be arranged such that there is a minimum of one speaker circuit per floor of the building or smoke zone whichever is greater.
6. Audio amplifiers and tone generating equipment shall be electrically supervised for normal and abnormal conditions.
7. NAC speaker circuits and control equipment shall be arranged such that loss of any one (1) speaker circuit will not cause the loss of any other speaker circuit in the system. Two-way emergency telephone communication circuits shall be supervised for open and short circuit conditions. Speaker circuits shall be electrically supervised for open and short circuit conditions. If a short circuit exists on a speaker circuit, it shall not be possible to activate that circuit.
8. Audio amplifiers and tone generating equipment shall be electrically supervised for abnormal conditions. Digital amplifiers shall provide built-in speaker circuits, field configurable as four Class B (Style Y), or two Class A (Style Z) circuits.
9. Digital amplifiers shall be capable of storing up to two minutes of digitally recorded audio messages and tones. The digital amplifiers shall also be capable of supervising the connection to the associated digital message generator, and upon loss of that connection shall be capable of one of the following system responses:
    a. The digital amplifier shall automatically broadcast the stored audio message.
    b. The digital amplifier shall switch to a mode where a local bus input on the digital amplifier will accept an input to initiate a broadcast of the stored message. This bus input shall be connected to a NAC on a local FACP for the purpose of providing an alternate means of initiating an emergency message during a communication fault condition.
    c. Speaker circuits shall be either 25 VRMS or 70VRMS. Speaker circuits shall have 20% space capacity for future expansion or increased power output requirements.
    d. Two-way emergency telephone (Fire Fighter Telephone) communication shall be supported between the Audio Command Center and up to seven (7) remote Fire Fighter's Telephone locations simultaneously on a telephone riser.
    e. Means shall be provided to connect FFT voice communications to the speaker circuits in order to allow voice paging over the speaker circuit from a telephone handset.
    f. The digital audio message generator shall be of reliable, non-moving parts, and support the digital storage of up to 32 minutes of tones and emergency messages, shall support programming options to string audio segments together to create up to 1000 messages, or to loop messages and parts of messages to repeat for pre-determined cycles or indefinitely.

1.4 CERTIFICATION

A. Certification: Installation of fire alarm system shall not begin until Shop Drawings, including State Fire Marshal listing numbers of fire alarm components, are submitted and reviewed by the Architect. Written certification by fire alarm equipment distributor or

manufacturer shall be submitted to the Architect stating that system and its component parts are as approved and listed by the State Fire Marshal, and that the design conforms to requirements set forth in CBC.

1.5 PERFORMANCE

A. System shall be fully programmable, configurable, and expandable in the field without special tools or PROM programmers and shall not require replacement of memory ICs. Installer shall provide a CD of all system installed software, site specific system programming and all information and tools required to re-program or modify the system.

1.6 SYSTEM FUNCTIONAL OPERATION

A. When a fire alarm condition is detected by one of the system alarm initiating devices, the following functions shall occur:

1. System alarm LED shall flash.
2. Local sounding device in panel shall be activated.
3. The LCD display shall indicate type of device, custom label location label and point status alarm condition.
4. Appropriate change of status message shall be transmitted to remote annunciator(s).
5. Automatic programs assigned to alarm point shall be executed and associated indicating devices and relays activated.
6. UDACT (Universal Digital Alarm Communicator Transmitter) shall activate.

B. Trouble and Supervisory Conditions.

1. When any trouble condition is detected the following functions shall occur:

a. System trouble LED shall flash.
b. Local sounding device in panel shall be activated.
c. The LCD display shall indicate the type of trouble and custom label location associated with the trouble condition and its location. Unacknowledged alarm messages shall have priority over trouble messages. If such an alarm is displayed, then trouble messages shall not be displayed.
d. Appropriate message shall be transmitted to remote annunciators.
e. UDACT shall activate.

2. When any supervisory condition occurs such as a sprinkler valve tamper, the following function shall occur:

a. System supervisory LED shall flash.
b. Local sounding device in panel shall be activated.
c. Appropriate message shall be transmitted to remote annunciators.
d. UDACT shall activate.

C. Activation of control panel ACKNOWLEDGE switch in response to a single new alarm, trouble or supervisory condition shall silence panel sounding device and change system alarm, trouble, or supervisory LED from flashing to steady-ON. If additional new alarm, trouble, or supervisory conditions exist in the system; activation of this switch shall advance display to next alarm, trouble, or supervisory condition that exists, and shall not silence local audible device or change LED to steady until new conditions have been so acknowledged. New alarm conditions shall always be displayed before new trouble

conditions. Occurrence of a new alarm, trouble, or supervisory condition shall cause panel to resound, and sequences as described above, shall repeat.

D. Activation of the signal silence switch shall cause appropriate notification (indicating) appliances and relays to return to normal condition. Selection of notification appliance circuits and relays silenced by this switch shall be fully programmable.

E. Activation of system reset switch shall cause electronically latched initiating devices or zones, as well as associated output devices and circuits, to return to normal condition after sixty seconds of alarm. If alarm conditions exist in system after system reset switch activation, system shall then re-sound alarm conditions as indicated hereafter.

F. Activation of lamp test switch shall turn on LED indicators, LCD display, and local sounding device in panel, and then return to previous condition.

G. Fire alarm indicating appliances may be silenced, after one minute, by operating signal silence switch at the FACP or by use of key supervised alarm silence switch at remote annunciators. A subsequent zone alarm shall reactivate signals. Fire alarm audible indicating appliances shall be automatically silenced after 4 minutes of operation; visual indicating appliances shall not extinguish at system reset or automatically after 4 minutes of operation. Fire sprinkler flow alarm bells shall not silence until the contacts in the fire sprinkler flow switch return to the normal non-alarm state. Appropriate signage must be installed on or next to the sprinkler alarm bell.

H. Initiation and indicating circuits shall be monitored for open/short circuit and ground fault conditions, these conditions shall be indicated on the Fire Alarm Control Panel and Annunciator displays while remaining circuits continue to operate normally.

I. All notification appliance circuits shall be silenceable for testing purposes by authorized persons. Protected pass-codes, keys, or another secure method that does not require entering into the system programming shall be used.

1.7 POWER REQUIREMENTS

A. The fire alarm control panel and remote power supply shall receive 120 VAC power, 60 Hz, through a dedicated 20 amps circuit. Circuit breaker protection for the dedicated fire alarm power circuits shall be equipped with a handle lock-on device, the breaker handle shall be colored red and labeled “FIRE ALARM”. Clearly label the Electrical panel name, location and circuit number on the inside of the fire alarm control panel and all remote power supplies using a p-touch style labeling system. Transient voltage surge suppression shall be provided at the 120VAC input terminal.

B. System shall be provided with sufficient battery capacity to operate entire system upon loss of normal 120 VAC power, in a normal quiescent mode, for a period of 24 hours with 5 minutes of alarm indication at end of this period for horns and 15 minutes for voice communication system speakers. System shall automatically transfer to standby batteries upon power failure. Battery charging and recharging operations shall be automatic. Batteries, once discharged, shall recharge at a rate to provide a minimum of 70 percent capacity in 12 hours.

C. Circuits requiring system operating power shall be 24 VDC and shall be individually protected at control panel.

1.8 SUBMITTALS

A. Component Plan Submittal: Availability and listing for its application shall be verified for all system components before presentation of the submittal. Include the following information and details as applicable:

1. Installer name, address, telephone number.
2. List of system components, equipment and devices, including manufacturer model numbers, quantity and California State Fire Marshal listing numbers, mounting heights, and symbols.
3. Current copies of manufacturer specification sheets for equipment and devices indicated. Highlight or identify the specific components on Catalog cut sheets.
4. Voltage Drop Calculations: Include the following information for the worst case:

    a. Point-to-point or Ohms law calculations.
    b. Zone used in calculations.
    c. Voltage drop percent. Voltage drop shall not exceed manufacturer's requirements. If voltage drop exceeds 10 percent, indicate manufacturer listed operating voltage ranges for equipment and devices.
    d. Speakers and amplifier calculations.

5. Battery types, amp hours, and load calculations including the following:

    a. Normal operation: 100 percent of applicable devices for 24 hours to equal control panel amps plus list of amps per device that draw power form the panel during standby power condition including, but not limited to, zone modules, detectors and devices as identified.
    b. Alarm condition: 100 percent of voice communication speakers for 15 minutes and 100 percent of horns and bells for 5 minutes to equal control panel amps plus list of amps per device that draw power from panel during alarm condition including, but not limited to, the following:

        (1) Zone modules.
        (2) Signal modules.
        (3) Detectors.
        (4) Signal devices.
        (5) Annunciator.
        (6) Other devices as identified.

    c. Normal operation plus alarm operation load calculation shall include total amp hours required and total amp hours provided.

6. Provide one copy of testing procedures.

B. Shop Drawings: Provide Shop Drawings, in the same size as the design Drawings, Shop Drawings shall include the following:

1. Provide drawing scale, elevations of all system enclosures, and actual layout of the Fire Alarm Control Panel, power supply, annunciator, and all main system components.
2. Site Plan indicating devices and equipment to be monitored or supervised; and main equipment such as control panels, power supplies, annunciators, and components such as outdoor wall-mounted horns, pull boxes, underground pull boxes, wiring routes on buildings exterior and underground locations. In each conduit or raceway run indicate conduit sizes, and quantities and type of wires.
3. Complete battery calculations, and voltage drop calculation shall be included; these calculations shall be based on the devices maximum UL current rating.

4. One line drawing for the entire system network indicating all system components and wiring. The one line diagram shall show but not be limited to panel to panel interconnections, conductors gauge and quantity, conduit size and type (designation) and specific function.
5. System panel one-line drawings indicating the quantity and type (designation) of conductors entering and exiting the fire alarm terminal cabinet in each building (enclosure) for initiating, notification, or other command control functions required for complete system operation:
    a. Individual floor/building plan view drawings indicating all device locations including end of line resistors "EOLR" in accordance with the legend provided.
    b. Individual point addresses for all initiation and notification devices.
    c. Device "typical" wiring diagrams. These drawings shall indicate specific termination details for all peripheral equipment and/or interface devices.
6. Provide interfacing with equipment furnished by others including voltages, and other required coordination items.
7. Each of the pictorial diagrams included shall appear identical to the products they are intended to depict, in order to speed installation of the system, and to enhance the accuracy of the installation Work. Typical wiring diagrams or catalog sheets are not permitted.
8. Background Drawings with device locations of DSA approved drawings are available in electronic format and may be obtained from the Architect. Contractor is solely responsible for the accuracy and completeness of shop drawings. Buildings that are not part of the contract shall be clearly identified "NOT IN CONTRACT". Shop Drawings shall be prepared in the latest version of AutoCAD.
9. Other installation and coordination drawings specifically related to this section shall be included as follows:
    a. Size A (8-1/2 inch x 11 inches) and size B (11 inch x 17 inch) shall be bound into the manual.
    b. Larger drawings shall be folded and inserted into transparent envelopes and bound into the manual.
10. Installation and coordination drawings for items in other sections shall be included with submittal of Shop Drawings. Submit blue line copies and one reproducible copy of installation and coordination drawings.

C. In addition to the above requirements, provide submittals to meet any additional requirements of DSA.

1.9 QUALITY ASSURANCE

A. Installer shall have successfully completed at least 5 projects of equal scope in the past 5 years, and have been in business of furnishing and installing fire alarm systems of this type for at least 5 years. Installer shall use apprentices with certified Life Safety Blue Card Holders.

B. Installer shall be a factory authorized distributor and service provider for the brand of equipment offered and shall provide documentation to the Architect upon request.

C. Installer shall maintain a fully equipped service organization capable of furnishing repair service to the equipment and shall maintain a spare set of major parts for the system at all times.

D. Installer shall furnish a letter from manufacturer of equipment certifying equipment has been installed according to factory standards and that system is operating properly.

E. Certifications: Installer shall submit certification from the equipment manufacturer indicating that installer is an authorized representative of the equipment manufacturer and is trained on network applications.

F. All materials and equipment installed shall be new except as specifically shown on the drawings.

G. All of the fire alarm equipment, devices and wiring in this specification including control panel, remote power supplies, detectors, modules, horns, strobes, fire alarm wires, etc., shall be furnished and installed by the Authorized Factory Distributor of the equipment. Furnish a letter from the manufacturer of all major equipment, which certifies that the installer is an authorized distributor and that the equipment has been installed according to factory intended practices. Furnish a written guarantee from the manufacturer that they will have a service representative assigned to this area for the life of the equipment. All rough-ins including conduits, boxes, 120-volt power wiring may be installed by an electrician.

H. Contractor/Installer's electricians and fire/life safety technicians shall be certified in accordance with Labor Code sections 3099, and 3099.2, and section 209.0 of the California Code of Regulations.

I. System startup and testing shall be performed under the direct observation of the IOR and OAR. The Contractor at this time shall provide a legible half size reproduction of the original completed fire alarm red-line drawings (this copy will be retained by the Owner), an accurate copy of the fire alarm system points list, and a copy of the construction drawings on CD in AutoCad format,

J. Provide and install the most current software package available at the time of installation. At the time of Owner Acceptance of the installation, all equipment, including any and all updated software which is to include the appropriate operating system, pass-codes, electronic keys and program disks, manuals and cables employed in the installation of the system, shall be delivered to the OAR who will, in turn, forward the items to the District. In addition, when the programming software is available in disk format, a backup copy of the most up to date revision, in disk format, shall be delivered to the OAR at the completion of the project. A software license agreement shall be made available for the responsible Owner representative to sign at the time of training.

1.10 WARRANTY

A. The Fire Alarm Equipment Manufacturer shall provide a 3 year material warranty. Installer shall provide a 3 year labor warranty.

B. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer for a period of 5 years after expiration of the warranty.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Fire alarm equipment shall be standard products of the Notifier Co. ONIX Series. Catalog and model numbers listed are intended to establish type and quality of equipment and system design as well as operating features required. Deviations from intended functions of specified system are not permitted. Equipment shall not be ordered or installed until such equipment has been reviewed and approved by the Architect.

2.2 FIRE ALARM CONTROL PANEL (FACP) OR NETWORK NODES

A. Main FACP or network node shall be a NOTIFIER Model NFS2-3030 and shall contain a microprocessor based Central Processing Unit (CPU) and power supply. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, and other system controlled devices.

B. In conjunction with intelligent Loop Control Modules and Loop Expander Modules, the main FACP shall perform the following functions:

1. Supervise and monitor all intelligent addressable detectors and monitor modules connected to the system for normal, trouble and alarm conditions.
2. Supervise all initiating signaling and notification circuits throughout the facility by way of connection to addressable monitor and control modules.
3. Detect the activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed. In the event of CPU failure, all SLC loop modules shall fallback to degrade mode. Such degrade mode shall treat the corresponding SLC loop control modules and associated detection devices as conventional two-wire operation. Any activation of a detector in this mode shall automatically activate associated Notification Appliance Circuits.

2.3 SYSTEM CAPACITY AND GENERAL OPERATION

A. The FACP shall be capable of communicating on Noti-Fire-Net over a Local Area Network (LAN) or Wide Area Network (WAN) utilizing a peer-to-peer, inherently regenerative communication format and protocol. The network shall support communication speed up to 100 Mb and support up to 200 panels / nodes per network.

B. The control panel shall be capable of expansion via up to 10 SLC loops. Each module shall support up to 318 analog/addressable devices for a maximum system capacity of 3180 points. The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit 640-character liquid crystal display, individual, color coded system status LEDs, and a keypad for the control of the fire alarm system. Said LCD shall also support graphic bit maps capable of displaying the company name and logo of either thpany.

C. All programming or editing of the existing program in the system shall be achieved without interrupting the alarm monitoring functions of the fire alarm control panel.

D. The FACP shall be able to provide the following software and hardware features:

1. Pre-signal and Positive Alarm Sequence: The system shall provide means to cause alarm signals to only sound in specific areas with a delay of the alarm from 60 to up to 180 seconds after start of alarm processing. In addition, a Positive Alarm Sequence selection shall be available that allows a 15-second time period

for acknowledging an alarm signal from a fire detection/initiating device. If the alarm is not acknowledged within 15 seconds, all local and remote outputs shall automatically activate immediately.

2. Smoke Detector Pre-alarm Indication at Control Panel: To obtain early warning of incipient or potential fire conditions, the system shall support a programmable option to determine system response to real-time detector sensing values above the programmed setting. Two levels of Pre-alarm indication shall be available at the control panel alert and action.
3. Alert: It shall be possible to set individual smoke detectors for pre-programmed pre-alarm thresholds. If the individual threshold is reached, the pre-alarm condition shall be activated.
4. Action: If programmed for Action and the detector reaches a level exceeding the pre-programmed level, the control panel shall indicate an action condition. Sounder bases installed with either heat or smoke detectors shall automatically activate on action Pre-Alarm level, with general evacuation on Alarm level.
5. The system shall support a detector response time to meet world annunciation requirements of less than 3 seconds.
6. Device Blink Control: Means shall be provided to turn off detector/module LED strobes for special areas.
7. NFPA 72 Smoke Detector Sensitivity Test: The system shall provide an automatic smoke detector test function that meets the sensitivity testing requirements of NFPA 72.
8. Programmable Trouble Reminder: The system shall provide means to automatically initiate a reminder that troubles exist in the system. The reminder will appear on the system display and (if enabled) will sound a piezo alarm.
9. On-line or Off-line programming: The system shall provide means to allow panel programming either through an off-line software utility program away from the panel or while connected and on-line. The system shall also support upload and download of programmed database and panel executive system program to a Personal Computer/laptop. A single change to one CPU database shall not require a database download to other CPUs.
10. History Events: The panel shall maintain a history file of the last 4000 events, each with a time and date stamp. History events shall include all alarms, troubles, operator actions, and programming entries. The control panels shall also maintain a 1000 event Alarm History buffer, which consists of the 1000 most recent alarm events from the 4000 event history file.
11. Smoke Control Modes: The system shall provide means to perform FSCS mode Smoke Control to meet NFPA-92A and 90B and HVAC mode to meet NFPA 90A.
12. The system shall provide means for all SLC devices on any SLC loop to be auto programmed into the system by specific address. The system shall recognize specific device type ID's and associate that ID with the corresponding address of the device.
13. Passwords and Users: The system shall support two password levels, master and user. Up to 9 user passwords shall be available, each of which may be assigned access to the programming change menus, the alter status menus, or both. Only the master password shall allow access to password change screens.
14. Block Acknowledge: The system shall support a block Acknowledge for Trouble Conditions.
15. Sensitivity Adjust: The system shall provide Automatic Detector Sensitivity Adjust based on Occupancy schedules including a Holiday list of up to 15 days.

16. Environmental Drift Control: The system shall provide means for setting Environmental Drift Compensation by device. When a detector accumulates dust in the chamber and reaches an unacceptable level but yet still below the allowed limit, the control panel shall indicate a maintenance alert warning. When the detector accumulates dust in the chamber above the allowed limit, the control panel shall indicate a maintenance urgent warning.
17. Custom Action Messages: The system shall provide means to enter up to 100 custom action messages of up to 160 characters each. It shall be possible to assign any of the 100 messages to any point.
18. Local Mode: If communication is lost to the central processor the system shall provide added survivability through the intelligent loop control modules. Inputs from devices connected to the SLC and loop control modules shall activate outputs on the same loop when the inputs and outputs have been set with point programming to participate in local mode or when the type codes are of the same type: that is, an input with a fire alarm type code shall activate an output with a fire alarm type code.
19. Read status preview - enabled and disabled points: Prior to re-enabling points, the system shall inform the user that a disabled device is in the alarm state. This shall provide notice that the device must be reset before the device is enabled thereby avoiding activation of the notification circuits.
20. Custom Graphics: When fitted with an LCD display, the panel shall permit uploading of a custom bit-mapped graphic to the display screen.
21. Multi-Detector and Cooperating Detectors: The system shall provide means to link one detector with up to two detectors at other addresses on the same loop in cooperative multi-detector sensing. There shall be no requirement for sequential addresses on the detectors and the alarm event shall be a result of all cooperating detectors chamber readings.
22. ACTIVE EVENT: The system shall provide a Type ID called FIRE CONTROL for purposes of air-handling shutdown, which shall be intended to override normal operating automatic functions. Activation of a FIRE CONTROL point shall cause the control panel to (1) initiate the monitor module Control-by-Event, (2) send a message to the panel display, history buffer, installed printer and annunciators, (3) shall not light an indicator at the control panel, (4) Shall display ACTIVE on the LCD as well a display a FIRE CONTROL Type Code and other information specific to the device.
23. NON-FIRE Alarm Module Reporting: A point with a type ID of NON-FIRE shall be available for use for energy management or other non-fire situations. NON-FIRE point operation shall not affect control panel operation nor shall it display a message at the panel LDC. Activation of a NON-FIRE point shall activate control by event logic but shall not cause any indication on the control panel.
24. Mass Notification Override: The system shall be UL 2572 listed for Mass Notification and shall be capable, based on the Risk Analysis, of being programmed so that Mass Notification/Emergency Communications events take precedence over fire alarm events.
25. Security Monitor Points: The system shall provide means to monitor any point as a type security.
26. One-Man Walk Test: The system shall provide both a basic and advanced walk test for testing the entire fire alarm system. The basic walk test shall allow a single operator to run audible tests on the panel. All logic equation automation shall be suspended during the test and while annunciators can be enabled for the

test, all shall default to the disabled state. During an advanced walk test, field-supplied output point programming will react to input stimuli such as CBE and logic equations. When points are activated in advanced test mode, each initiating event shall latch the input. The advanced test shall be audible and shall be used for pull station verification, magnet activated tests on input devices, input and output device and wiring operation/verification.

27. Control By Event Functions: CBE software functions shall provide means to program a variety of output responses based on various initiating events. The control panel shall operate CBE through lists of zones. A zone shall become listed when it is added to a point's zone map through point programming. Each input point such as detector, monitor module or panel circuit module shall support listing of up to 10 zones into its programmed zone map.
28. Permitted zone types shall be general zone, releasing zone and special zone. Each output point (control module, panel circuit module) can support a list of up to 10 zones including general zone, logic zone, releasing zone and trouble zone. It shall be possible for output points to be assigned to list general alarm. Non-Alarm or Supervisory points shall not activate the general alarm zone.
29. 1000 General Zones: The system shall support up to 1000 general purpose software zones for linking inputs to outputs. When an input device activates, any general zone programmed into that device's zone map will be active and any output device that has an active general zone in its map will be active. It shall also be possible to use general zone as arguments in logic equations.
30. 1000 Logic Equations: The system shall support up to 1000 logic equations for AND, OR, NOT, ONLY1, ANYX, XZONE or RANGE operators that allow conditional I/O linking. When any logic equation becomes true, all output points mapped to the logic zone shall activate.
31. 100 trouble equations per device: The system shall provide support for up to 100 trouble equations for each device, which shall permit programming parameters to be altered, based on specific fault conditions. If the trouble equation becomes true, all output points mapped to the trouble zone shall activate.
32. Control-By-Time: A time based logic function shall be available to delay an action for a specific period of time based upon a logic input with tracking feature. A latched version shall also be available. Another version of this shall permit activation on specific days of the week or year with ability to set and restore based on a 24 hour time schedule on any day of the week or year.
33. Multiple agent releasing zones: The system shall support up to 10 releasing zones to protect against 10 independent hazards. Releasing zones shall provide up to three cross-zone and four abort options to satisfy any local jurisdiction requirements.
34. Alarm Verification, by device, with timer and tally: The system shall provide a user-defined global software timer function that can be set for a specific detector. The timer function shall delay an alarm signal for a user-specified time period and the control panel shall ignore the alarm verification timer if another alarm is detected during the verification period. It shall also be possible to set a maximum verification count between 0 and 20 with the "0" setting producing no alarm verification. When the counter exceeds the threshold value entered, a trouble shall be generated to the panel.

E. Network Communication

1. The FACP shall be capable of communicating on Noti-Fire-Net over a Local Area Network (LAN) or Wide Area Network (WAN) utilizing a peer-to-peer,

inherently regenerative communication format and protocol. The network shall support communication speed up to 100 Mb and support up to 200 panels/nodes per network.

F. Central Processing Unit

1. The Central Processing Unit shall contain and execute all control-by-event (including Boolean functions including but not limited to AND, OR, NOT, ANYx, and CROSSZONE) programs for specific action to be taken if an alarm condition is detected by the system. Such control-by-event programs shall be held in non-volatile programmable memory, and shall not be lost with system primary and secondary power failure.
2. The Central Processing Unit shall also provide a real-time clock for time annotation, to the second, of all system events. The time-of-day and date shall not be lost if system primary and secondary power supplies fail.
3. The CPU shall be capable of being programmed on site without requiring the use of any external programming equipment. Systems that require the use of external programmers or change of EPROMs are not acceptable.
4. The CPU shall provide an EIA-232 interface between the fire alarm control panel and the UL Listed Electronic Data Processing (EDP) peripherals.
5. The CPU shall provide two EIA-485 ports for the serial connection to annunciation and control subsystem components.
6. The EIA-232 serial output circuit shall be optically isolated to assure protection from earth ground.

G. Display

1. The system display shall provide a 640-character backlit alphanumeric Liquid Crystal Display (LCD). It shall also provide eleven Light-Emitting-Diodes (LEDs) that indicate the status of the following system parameters: AC POWER, FIRE ALARM, PREALARM, SECURITY, SUPERVISORY, SYSTEM TROUBLE, OTHER EVENT, SIGNALS SILENCED, POINT DISABLED, CONTROLS ACTIVE, and CPU FAILURE.
2. The system display shall provide a keypad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels with up to ten (one Master and nine User) passwords shall be accessible through the display interface assembly to prevent unauthorized system control or programming.

H. Loop (Signaling Line Circuit) Control Module:

1. The Loop Control Module shall monitor and control a minimum of 318 intelligent addressable devices. This includes 159 intelligent detectors (Ionization, Photoelectric, or Thermal) and 159monitor or control modules.
2. The Loop Control Module shall contain its own microprocessor and shall be capable of operating in a local/degrade mode (any addressable device input shall be capable of activating any or all addressable device outputs) in the unlikely event of a failure in the main CPU.
3. Each Loop shall be capable of operating as a NFPA Style 4 (Class B) circuit.
4. The SLC interface board shall receive analog or digital information from all intelligent detectors and shall process this information to determine whether normal, alarm, or trouble conditions exist for that particular device. Each SLC Loop shall be isolated and equipped to annunciate an Earth Fault condition. The SLC interface board software shall include software to automatically maintain

the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information may also be used for automatic detector testing and the automatic determination of detector maintenance requirements.

I. Digital Voice Command Center

1. The Digital Voice Command Center located with the FACP, shall contain all equipment required for all audio control, emergency telephone system control, signaling and supervisory functions. This shall include speaker zone indication and control, telephone circuit indication and control, digital voice units, microphone and main telephone handset.
2. Function: The Voice Command Center equipment shall perform the following functions:

a. Operate as a supervised multi-channel emergency voice communication system.

Operate as a two-way emergency telephone system control center.

b. Audibly and visually annunciate the active or trouble condition of every speaker circuit and emergency telephone circuit.
c. Audibly and visually annunciate any trouble condition for digital tone and voice units required for normal operation of the system.
d. Provide all-call Emergency Paging activities through activation of a single control switch.
e. As required, provide vectored paging control to specific audio zones via dedicated control switches.
f. Provide a factory recorded "library" of voice messages and tones in standard WAV. File format, which may be edited and saved on a PC running a current Windows® operating system.
g. Provide a software utility capable of off-line programming for the DVC operation and the audio message files. This utility shall support the creation of new programs as well as editing and saving existing program files. Uploading or downloading the DVC shall not inhibit the emergency operation of other nodes on the fire alarm network.
h. Support an optional mode of operation with four analog audio outputs capable of being used with UL 864 fire-listed analog audio amplifiers and SLC controlled switching.
i. The Digital Voice Command shall be modular in construction, and shall be capable of being field programmable without requiring the return of any components to the manufacturer and without requiring use of any external computers or other programming equipment.
j. The Digital Voice Command and associated equipment shall be protected against unusually high voltage surges or line transients.

J. Power Supply:

1. The Main Power Supply shall operate on 120/240 VAC, 50/60 Hz, and shall provide all necessary power for the FACP.
2. The Main Power Supply shall provide the required power to the CPU using a switching 24 VDC regulator and shall incorporate a battery charger for 24 hours of standby power using dual-rate charging techniques for fast battery recharge.
3. The Main Power Supply shall provide a battery charger for 24 hours of standby using dual-rate charging techniques for fast battery recharge. The supply shall be

capable of charging batteries ranging in capacity from 7-200 amp-hours within a 48-hour period.

4. The Main Power Supply shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.
5. The Main Power Supply shall be power-limited per UL864 requirements.
6. The Main Power Supply shall communicate power supply, line voltage, battery status and charger status to the local LCD display. Any abnormal condition shall be annunicated and logged to the system alarm history log.
7. Addressable Field Power Supply. The auxiliary addressable power supply is a remote 24 VDC power supply used to power Notification Devices and field devices that require regulated 24 VDC power. NOTIFIER model FCPS-24S6.
8. The addressable power supply for the fire detection system shall provide up to a minimum of 6.0 amps of 24 volt DC regulated power for Notification Appliance Circuit (NAC) power or 10.0 amps of 24 volt DC general power. The power supply shall have an additional 0.5 amp of 24 VDC auxiliary power for use within the same cabinet as the power supply. It shall include an integral charger designed to charge 12 - 200 amp hour batteries.
9. The addressable power supply shall provide four individually addressable Notification Appliance Circuits that may be configured as Class "A" or Class "B" circuits. All circuits shall be power-limited per UL 864 requirements.
10. The addressable power supply shall provide built-in synchronization for certain Notification Appliances on each circuit without the need for additional synchronization modules. The power supply's output circuits shall be individually selected for synchronization. A single addressable power supply shall be capable of supporting both synchronized and non-synchronized Notification Devices at the same time.
11. The addressable power supply shall operate on 120 or 240 VAC, 50/60 Hz.
12. The interface to the power supply from the Fire Alarm Control Panel (FACP) shall be via the Signaling Line Circuit (SLC) or other multiplexed means Power supplies that do not use an intelligent interface are not suitable substitutes. The required wiring from the FACP to the addressable power supply shall be a single unshielded twisted pair wire.
13. The addressable power supply shall supervise for battery charging failure, AC power loss, power brownout, battery failure, NAC loss, and optional ground fault detection. In the event of a trouble condition, the addressable power supply shall report the incident and the applicable address to the FACP via the SLC.
14. The addressable power supply shall have an AC Power Loss Delay option. If this option is utilized and the addressable power supply experiences an AC power loss, reporting of the incident to the FACP will be delayed. A delay time of zero, two, eight or sixteen hours shall be programmable.
15. The addressable power supply shall have an option for Canadian Trouble Reporting and this option shall be programmable.
16. The addressable power supply mounts in either the FACP backbox or it's own dedicated surface mounted backbox with cover.
17. Each of the power supply's four output circuits shall be programmed- for Notification Appliance Circuit or General Purpose 24 VDC power. Any output circuit shall be able to provide up to 2.5 amps of 24 VDC power.
18. The addressable power supply's output circuits shall be individually supervised when they are selected to be either a Notification Appliance Circuit when wired Class "A" or by the use of and end-of-line resistor. When the power supply's

output circuit is selected as General 24 VDC power, the circuit shall be individually supervised when an end-of-line relay is used.

19. When selected for Notification Appliance Circuits, the output circuits shall be individually programmable for Steady, March Time, Dual Stage or Temporal.
20. When selected as a Notification Appliance Circuit, the output circuits of the addressable power supply shall have the option to be coded by the use of a universal zone coder.
21. The addressable power supply shall interface and synchronize with other power supplies of the same type. The required wiring to interface multiple addressable power supplies shall be a single unshielded, twisted pair wire.
22. An individual or multiple interfaced addressable power supplies shall have the option to use an external charger for battery charging. Interfaced power supplies shall have the option to share backup battery power.

K. Audio Amplifiers

1. The Audio Amplifiers will provide Audio Power for distribution to speaker circuits.
2. Multiple audio amplifiers may be mounted in a single enclosure, either to supply incremental audio power, or to function as an automatically switched backup amplifier(s).
3. The audio amplifier shall include an integral power supply, and shall provide built-in LED indicators for the following conditions:

    a. Earth Fault on DAP A (Digital Audio Port A)
    b. Earth Fault on DAP B (Digital Audio Port B)
    c. Audio Amplifier Failure Detected Trouble
    d. Active Alarm Bus input
    e. Audio Detected on Aux Input A
    f. Audio Detected on Aux Input B
    g. Audio Detected on Firefighter's Telephone Riser
    h. Receiving Audio from digital audio riser
    i. Short circuit on speaker circuit 1
    j. Short circuit on speaker circuit 2
    k. Short circuit on speaker circuit 3
    l. Short circuit on speaker circuit 4
    m. Data Transmitted on DAP A
    n. Data Received on DAP A
    o. Data Transmitted on DAP B
    p. Data Received on DAP B
    q. Board failure
    r. Active fiber optic media connection on port A (fiber optic media applications)
    s. Active fiber optic media connection on port B (fiber optic media applications)
    t. Power supply Earth Fault
    u. Power supply 5V present
    v. Power supply conditions - Brownout, High Battery, Low Battery, Charger Trouble

4. The audio amplifier shall provide the following built-in controls:

    a. Amplifier Address Selection Switches
    b. Signal Silence of communication loss annunciation Reset

c. Level adjustment for background music
d. Enable/Disable for Earth Fault detection on DAP A
e. Enable/Disable for Earth Fault detection on DAP A
f. Switch for 2-wire/4-wire FFT riser

5. Adjustment of the correct audio level for the amplifier shall not require any special tools or test equipment.
6. Includes audio input and amplified output supervision, back up input, and automatic switch over function, (if primary amplifier should fail).
7. System shall be capable of backing up digital amplifiers.
8. One-to-one backup shall be provided by either a plug-in amplifier card or a designated backup amplifier of identical model as the primary amplifier.
9. One designated backup amplifier shall be capable of backing up multiple primary amplifiers mounted in the same or adjacent cabinets.
10. Multi-channel operation from a single amplifier shall be supported by the addition of an optional plug-in amplifier card.

L. Audio Message Generator (Prerecorded Voice)/Speaker Control:

1. Each initiating zone or intelligent device shall interface with an emergency voice communication system capable of transmitting a prerecorded voice message to all speakers in the building.
2. Actuation of any alarm initiating device shall cause a prerecorded message to sound over the speakers. The message shall be repeated four (4) times. Pre- and post-message tones shall be supported.
3. A built-in microphone shall be provided to allow paging through speaker circuits.
4. System paging from emergency telephone circuits shall be supported.
5. The audio message generator shall have the following indicators and controls to allow for proper operator understanding and control:

a. Lamp Test
b. Trouble
c. Off-Line Trouble
d. Microphone Trouble
e. Phone Trouble
f. Busy/Wait
g. Page Inhibited
h. Pre/Post Announcement Tone

M. Controls with associated LED Indicators:

1. Speaker Switches/Indicators

a. The speaker circuit control switches/indicators shall include visual indication of active and trouble status for each speaker circuit in the system.
b. The speaker circuit control panel shall include switches to manually activate or deactivate each speaker circuit in the system.\

2. Emergency Two-Way Telephone Control Switches/Indicators

a. The emergency telephone circuit control panel shall include visual indication of active and trouble status for each telephone circuit in the system.

b. The telephone circuit control panel shall include switches to manually activate or deactivate each telephone circuit in the system.

N. Remote Transmissions:

1. Provide local energy or polarity reversal or trip circuits as required.
2. The system shall be capable of operating a polarity reversal or local energy or fire alarm transmitter for automatically transmitting fire information to the fire department.
3. Provide capability and equipment for transmission of zone alarm and trouble signals to remote operator's terminals, system printers and annunciators.
4. Transmitters shall be compatible with the systems and equipment they are connected to such as timing, operation and other required features.

O. Field Programming

1. The system shall be programmable, configurable and expandable in the field without the need for special tools, laptop computers, or other electronic interface equipment. There shall be no firmware changes required to field modify the system time, point information, equations, or annunciator programming/information.

2. All field defined programs shall be stored in non-volatile memory.

P. Specific System Operations

1. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all addressable intelligent detectors in the system from the system keypad. Sensitivity range shall be within the allowed UL window and have a minimum of 9 levels.
2. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently selected and enabled to be an alarm verified detector. The alarm verification delay shall be programmable from 0 to 60 seconds and each detector shall be able to be selected for verification. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.

Q. System Point Operations:

1. Any addressable device in the system shall have the capability to be enabled or disabled through the system keypad or video terminal.
2. System output points shall be capable of being turned on or off from the system keypad or the video terminal.
3. Point Read: The system shall be able to display the following point status diagnostic functions without the need for peripheral equipment. Each point shall be annunciated for the parameters listed:

   a. Device Status.
   b. Device Type.
   c. Custom Device Label.
   d. Software Zone Label.
   e. Device Zone Assignments.
   f. Analog Detector Sensitivity.
   g. All Program Parameters.

4. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 4000 system events. Each of these events will be stored, with time and date stamp, until an operator requests that the contents be either displayed or printed. The contents of the history buffer may be manually reviewed; one event at a time, and the actual number of activations may also be displayed and or printed. History events shall include all alarms, troubles, operator actions, and programming entries.
5. The history buffer shall use non-volatile memory. Systems which use volatile memory for history storage are not acceptable.
6. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent system detector and shall analyze the detector responses over a period of time.
7. If any intelligent detector in the system responds with a reading that is below or above normal limits, then the system will enter the trouble mode, and the particular Intelligent Detector will be annunciated on the system display, and printed on the optional system printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
8. The system shall include the ability (programmable) to indicate a "pre-alarm" condition. This will be used to alert maintenance personal when a detector is at 80% of its alarm threshold in a 60 second period.

2.4 SYSTEM COMPONENTS

A. Universal Digital Alarm Communicator Transmitter (UDACT). The UDACT is an interface for communicating digital information between a fire alarm control panel and an UL-Listed central station.

1. The UDACT shall be compact in size, mounting in a standard module position of the fire alarm control cabinet. Optionally, the UDACT shall have the ability for remote mounting, up to 6,000 feet from the fire alarm control panel. The wire connections between the UDACT and the control panel shall be supervised with one pair for power and one pair for multiplexed communication of overall system status. Systems that utilize relay contact closures are not acceptable.
2. The UDACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA/FCC requirements. It shall include the ability for split reporting of panel events up to two different telephone numbers.
3. The UDACT shall be capable of transmitting events in 4+2, SIA, and Contact ID.
4. Communication shall include vital system status such as:

    a. Independent Zone (Alarm, trouble, non-alarm, supervisory)
    b. Independent Addressable Device Status
    c. AC (Mains) Power Loss
    d. Low Battery and Earth Fault
    e. System Off Normal
    f. 12 and 24 Hour Test Signal
    g. Abnormal Test Signal (per UL requirements)
    h. EIA-485 Communications Failure
    i. Phone Line Failure

5. The UDACT shall support independent zone/point reporting when used in the Contact ID format. In this format the UDACT shall support transmission of up to

3,064 points. This enables the central station to have exact details concerning the origin of the fire or response emergency.

6. The UDACT shall be capable of being programmed with the same programming utility as the host FACP, and saved, edited and uploaded and downloaded using the utility. UDACT shall be capable of being programmed online or offline. The programming utility shall also support upgrading UDACT operating firmware.
7. The UDACT shall be capable of generating Central Station reports providing detailed programming information for each point along with the central station point address.
8. An IP or IP/GSM Communicator option shall be provided to interface to the UDACT and be capable of transmitting signals over the internet/intranet or Cellular (GSM) network to a compatible receiver.

2.5 GATEWAY & WEBSERVER OPTIONS

A. Webserver: The system shall support a webserver allowing remote connection via the Internet or Intranet. Authorized users will have the ability to view panel/network history, event status and device properties. The webserver shall also support sending event information via email or text to up to 50 registered users, the webserver shall be available from the fire alarm control panel manufacturer.

B. Web Portal Interface: The system shall be capable of being interfaced with a web portal to integrate with Inspection and Service Manager utilities. The web portal and inspection and service manager utilities shall be available fr om the fire alarm control panel manufacturer.

2.6 ADDRESSABLE DEVICES – GENERAL

A. Addressable devices shall provide an address-setting means using rotary decimal switches. Addressable devices that require the address be programmed using a programming utility are not an allowable substitute.

B. Addressable devices shall use simple to install and maintain decade, decimal address switches. Devices shall be capable of being set to an address in a range of 001 to 159.

C. Addressable devices, which use a binary-coded address setting method, such as a DIP-switch, are not an allowable substitute. Addressable devices that require the address be programmed using a special tool or programming utility are not an allowable substitute.

D. Addressable devices, which use a binary-coded address setting method, such as a DIP-switch, are not an allowable substitute. Addressable devices that require the address be programmed using a special tool or programming utility are not an allowable substitute.

E. Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel Signaling Line Circuits.

F. Addressable smoke and thermal detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash green under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady red illumination by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.

G. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. The panel on a time-of-day basis shall automatically adjust sensitivity.

H. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72.

I. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Base options shall include a sounder base with a built-in (local) sounder rated at 85 DBA minimum, a relay base and an isolator base designed for Style 7 applications. The system shall also support an intelligent programmable sounder base, the programmable sounder base shall be capable of providing multiple tones based on programming and at a minimum be capable of providing a Temp-4 tone for CO (Carbon Monoxide) activation and a Temp-3 tone for fire activations and be capable of being synchronized with other programmable sounder bases and common area notification appliances; 85 DBA minimum.

J. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).

K. Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.

L. Addressable devices shall store an internal identifying code that the control panel shall use to identify the type of device.

M. A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.

N. Addressable modules shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box. An optional surface mount Lexan enclosure shall be available.

2.7 PERIPHERAL DEVICES AND EQUIPMENT

A. Manual Stations: Interior Use: Station shall be Notifier, addressable semi-flush, non-breakable glass type. Station housing shall be fabricated of die-cast aluminum with reset lock and key.

B. Smoke Detectors: Smoke Detectors shall be Notifier Model No. FAPT-851 addressable smoke detectors. Provide base Model No. B710LP. Detector shall be microprocessor based, using a combination of photoelectric, and thermal sensing technologies. The smoke detector shall have its loop number and electronic address permanently and clearly labeled onto the device base using a p-touch type labeling system. The label shall be visible without removing the detector head.

C. Automatic Heat Detectors shall be combination rate-of-rise and fixed-temperature type. When fixed-temperature portion is activated, units shall provide visual evidence of such operation (LED). Addressable Heat detectors shall be Notifier Model No. FST-851R or equal. Provide base Model No. B-710LP. The location of the heat detector must be clearly marked below the ceiling and the detector must be readily accessible. The heat detector shall have its electronic address permanently and clearly labeled onto the device

and be readily accessible. For spaces where the normal ambient temperature can reach temperatures as high as 150^0 F. such as in attic spaces, use Notifier FST-851H with base B-710LP. The heat detector shall have its loop number and electronic address permanently and clearly labeled onto the device using a p-touch labeling system. The label shall be visible without removing the detector head.

D. Monitor Modules:

1. Monitor module shall be Notifier Model No. FMM-1 or equal. Module shall connect a supervised zone of conventional initiating devices, N.O. dry contact devices, including 4-wire smoke detectors, to one of SLC loops. Monitor module shall install in a 4-inch square by 2-1/8 inch deep electrical box. The module shall have its loop number, electronic address, and function label on the front cover using a P-Touch type labeling system.
2. Monitor module shall provide address-setting means using rotary decimal switches and shall store an internal type of device. An LED shall be provided which shall flash under normal conditions indicating that monitor module is operational and in regular communication with control panel.

E. Control Modules:

1. Control module shall be Notifier Model No. FCM-1 or equal. Module shall be used to connect a conventional indicating appliance or MR type isolation relay to one of the SLC loops. Control module shall install in a standard 4-inch square by 2-1/8 inches deep electrical box. Audio/visual/relay power shall be provided by a separate loop from main control panel or from supervised remote power supplies. The module shall have its loop number, electronic address, and function label on the front cover using a p-Touch type labeling system. Provide and install System Sensor Model A77-716B or equal power supervision relay to monitor 24 volt DC power.
2. Control module shall provide address-setting means using rotary decimal switches and shall store an internal identifying code which control panel shall use to identify type of device. An LED shall be provided which shall flash under normal conditions, indicating that control module is operational and in regular communication with control panel.

F. Relay Modules:

1. Relay Module shall be Notifier FRM-1 the module shall provide as a minimum one set of form “C” dry contacts and have its loop number, electronic address, and function labeled on the front cover using a P-Touch type labeling system.
2. Provide and installed a buffer relay that is part of the control system if controlled circuit(s) exceeds the voltage or current rating of the relay module.

G. Isolator Modules:

1. Isolator module shall be Notifier, Model No. ISO-X or equal. Module shall isolate wire-to-wire circuits on an SLC loop in order to limit number of other modules or detectors that are incapacitated by short circuit fault. If a wire-to-wire short occurs, isolator shall automatically open-circuit SLC loop. When short is corrected, isolators shall automatically reconnect isolated section of SLC loop.
2. Isolator module shall not require address setting, although isolators will electrically reduce capacity of loop by 2 detectors or module addresses. Isolator module will install in a standard 4-inch deep electrical box. It shall include a

single LED that shall flash to indicate that isolator is operational and shall illuminate steadily to indicate that a short has been detected and isolated.

H. Strobes: All strobes shall be products of the same manufacturer. In order to establish a standard of quality.

1. Strobe indicating appliances shall be System Sensors, wall or ceiling mounted units as shown on the drawings, standard candela output or high candela output. Devices shall be UL listed. Entire unit shall be red finish. Strobe light shall have a clear Lexan lens. Strobes shall meet ADA and UL 1971 requirements. The strobe shall provide a selectable minimum light intensity of 15, 30, 60, 75, 90, 110, 135, 150, or 185 Candela as indicated on the Drawings to meet or exceed requirements of ADA and UL 1971. Strobes shall be mounted on manufacturer recommended outlet boxes.
2. Strobe synchronization modules shall be System Sensors or equal, to be installed in conjunction with two or more strobes located in same room or corridor or as indicated on Drawings. (Strobe synchronization modules must be compatible with installed strobes).

I. Serially Connected Remote Annunciator

1. The annunciator shall communicate to the fire alarm control panel via an EIA 485 (multi-drop) two-wire communications loop. The system shall support two 6,000 ft. EIA-485 wire runs. Up to 32 annunciators, each configured up to 96 points, may be connected to the connection, for a system capacity of 3,072 points of annunciation.
2. An EIA-485 repeater shall be available to extend the EIA-485 wire distance in 3,000 ft. increments. The repeater shall be UL864 approved.
3. Each annunciator shall provide up to 96 alarm and 97 trouble indications using a long-life programmable color LED's. Up to 96 control switches shall also be available for the control of Fire Alarm Control Panel functions. The annunciator will also have an "ON-LINE" LED, local piezo sounder, local acknowledge and lamp test switch, and custom zone/function identification labels.
5. Annunciator switches may be programmed for System control such as, Global Acknowledge, Global Signal Silence, Global System Reset, and on/off control of any control point in the system.
6. An optional module shall be available to utilize annunciator points to drive EIA-485 driven relays. This shall extend the system point capacity by 3,072 remote contacts.
7. The LED annunciator shall offer an interface to a graphic style annunciator and provide each of the features listed above.
8. Annunciator shall have a microphone.

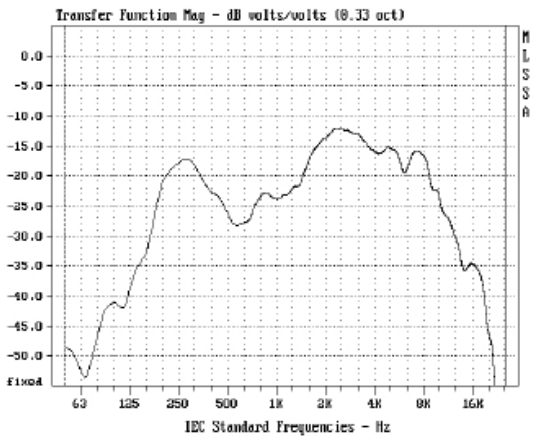
J. SpectrAlert Advance Speakers

1. The Speaker appliance shall be System Sensor SpectrAlert Advance. The speaker shall be listed to UL 1480 for Fire Protective Signaling Systems. It shall be a dual-voltage transformer speaker capable of operation at 25.0 or 70.7 nominal Vrms. The speaker shall have a frequency range of 400 to 4,000 Hz and shall have an operating temperature between 32°F and 120°F. It shall mount to a 4 x 4 x 2 1/8-inch back box.
2. A universal mounting plate shall be used for mounting ceiling and wall speaker products. The notification appliance circuit and amplifier wiring shall terminate at the universal mounting plate.

3. Speakers shall be plug-in and shall have the ability to check wiring continuity via a shorting spring on the universal mounting plate. The shorting spring shall also provide tamper resistance via an open circuit if the device is removed. Speaker design shall isolate speaker components to reduce ground fault incidents.
4. The speaker shall have power taps (from ¼ watt to 2 watts) and voltage that are selected by rotary switches. All models shall have a maximum sound output of 86 dB at 10 feet and shall incorporate an open back construction.
5. All notification appliances shall be backward compatible.

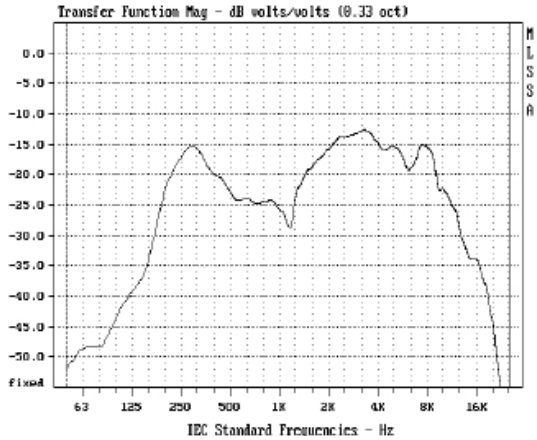
Ceiling Speaker

Wide Band Frequency Response



Wall Speaker

Wide Band Frequency Response



Note: The wide band frequency response is derived using MLS methods

K. SpectrAlert Advance Speaker Strobes

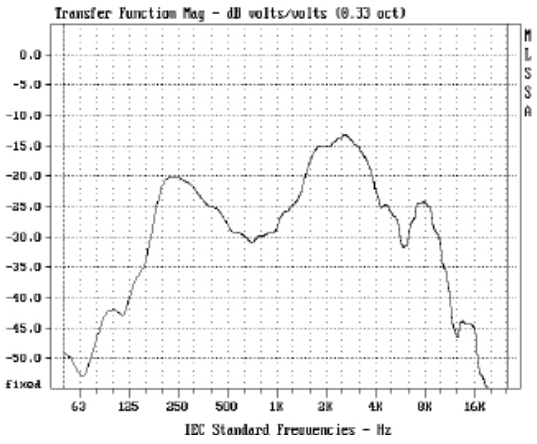
1. The Speaker Strobe appliance shall be System Sensor SpectrAlert Advance Speaker Strobe. The speaker strobe shall be listed to UL 1971 and UL 1480 and be approved for fire protective signaling systems. It shall be a dual-voltage transformer speaker strobe capable of operation at 25.0 or 70.7 nominal Vrms. The speaker shall have a frequency range of 400 to 4,000 Hz and shall have an operating temperature between 32°F and 120°F. It shall mount to a 4 x 4 x 2 1/8-inch back box.
2. A universal mounting plate shall be used for mounting ceiling and wall speaker strobe products. The notification appliance circuit and amplifier wiring shall terminate at the universal mounting plate. Also, SpectrAlert Advance speaker strobes and the Sync•Circuit™ Module MDL3 accessory, if used, shall be powered from a non-coded notification appliance circuit output and shall operate on a nominal 12 or 24 volts (includes fire alarm panels with built in sync). When used with the Sync•Circuit Module MDL3, 12-volt rated notification appliance circuit outputs shall operate between 8.5 and 17.5 volts; 24-volt rated notification appliance circuit outputs shall operate between 16.5 to 33 volts. If the notification appliances are not UL 9th edition listed with the corresponding panel or power supply being used, then refer to the compatibility listing of the panel to determine maximum devices on a circuit.
3. Speaker strobes shall be plug-in and shall have the ability to check wiring continuity via a shorting spring on the universal mounting plate. The shorting

spring shall also provide tamper resistance via an open circuit if the device is removed. Speaker strobe design shall isolate speaker components to reduce ground fault incidents.

4. The speaker strobe shall have power taps (from ¼ watt to 2 watts) and voltage that are selected by rotary switches. All models shall have a maximum sound output of 86 dB at 10 feet and shall incorporate an open back construction. The strobe shall consist of a xenon flash tube with associated lens/reflector system and operate on either 12V or 24V. The strobe shall also feature selectable candela output, providing options for 15 or 15/75 candela when operating on 12V and 15, 15/75, 30, 75, 110, or 115 when operating on 24V. The strobe shall comply with NFPA 72 and the Americans with Disabilities Act requirement for visible signaling appliances, flashing at 1 Hz over the strobe's entire operating voltage range.
5. All notification appliances shall be backward compatible.

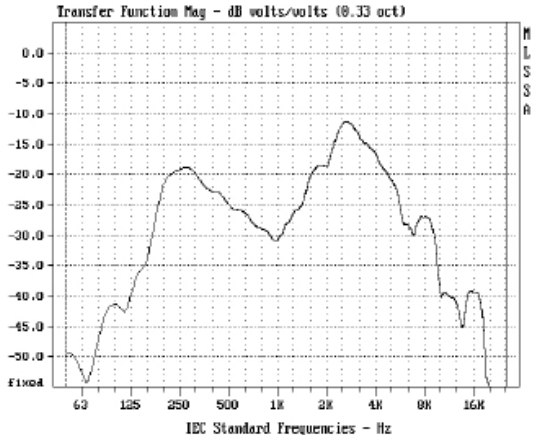
Ceiling Speaker Strobe

Wide Band Frequency Response



Wall Speaker Strobe

Wide Band Frequency Response



Note: The wide band frequency response is derived using MLS methods

6. Strobe lights shall meet the requirements of the ADA, UL Standard 1971and be fully synchronized.

PART 3 - EXECUTION

3.1 GENERAL

A. Fire alarm system shall not be used for any purpose other than fire alarm functions.

3.2 SYSTEM INSTALLATION

A. Installation shall confirm but not limited to CFC Section 907.7 through 907.7.5.2 and NFPA 72.

B. Install required conductors to devices indicated on Drawings. Provide required conductor terminations to devices for a complete system to function as specified and indicated on Drawings. Refer to Section 260519: Wire and Cable, for installation and color coding requirements.

C. Splices are not allowed in junction boxes. Terminations shall be in terminal cabinets or on equipment terminals. There shall not be any splicing in underground boxes, no exception.

D. Conductors shall be installed within conduits, boxes, and terminal cabinets in a totally enclosed installation. Furnish and install conductors required to connect incoming and outgoing circuits, including spare conductors, to terminal strips within terminal cabinets.

E. Wiring within equipment and terminal cabinets shall be installed to conform to contract documentation and NFPA 72 standards, and shall be terminated on terminal blocks having terminals for required connections. Wiring shall be cabled, laced, and securely fastened in place so that no weight is imposed on equipment or terminals.

F. Install required terminal blocks within terminal cabinets. Terminal blocks shall be installed on inside back of cabinets only, not on side. Incoming wiring shall be terminated on the left side of terminal blocks; outgoing wiring shall be terminated on the right side of the terminal blocks.

G. Conductors shall be color-coded per specification section 260519 Low Voltage wires and tagged with code markers at terminal cabinets, and equipment. A wire index shall be typed and installed on terminal cabinet doors. Index shall be covered with clear plastic adhesive covers. Wiring shall be identified as to building and location of devices in the index.

H. Wiring within equipment and terminal cabinets shall be carefully strapped, and shall be formed in rectangular configuration. Wires shall be properly numbered in numerical order and shall maintain same number throughout the Project site.

I. Complete installation shall comply with local building codes and applicable provisions of the California Electrical Code, California Fire Code and the NFPA 72 National Fire Alarm Code.

J. Location of outlet boxes and equipment on Drawings is approximate, unless dimensions are indicated. Do not scale Drawings to determine locations and routing of conduits and outlet boxes. Location of outlet boxes and equipment shall conform to architectural features of the building and other Work already in place, and must be ascertained in the field before the start of Work.

K. Drawings generally indicate Work to be provided, but do not indicate all bends, transitions or special fittings required to clear beams, girders or other Work already in place. Investigate conditions where conduits are to be installed, and furnish and install required fittings.

L. Provide p-touch label of approximately 1 inch wide with red lettering for each initiating device that is hidden from view. Tags shall indicate the name and type of device: Heat Detector, or Duct Smoke Detector. Tags shall be permanently attached on access panel or t-bar grid which is used to access a hidden device.

M. Provide and install adjacent to each annunciator a neatly drawn site map showing all rooms with designations and buildings with names as programmed into the system. This map shall be sized to allow (normal vision) reading of the designations, names etc. A map so reduced in size to the point of not being readable will not be acceptable. This map

shall include symbols indicating the locations of all installed fire sprinkler flow switches, riser shut off valves, post indicating valves and manual pull stations. Provide a symbol list on the map for the symbols used. The site map shall be placed into a suitably sized dark colored wood or metal frame with a glass document face cover. The frame shall be attached to the wall with a minimum of two screws into the wall material with the appropriate anchors.

3.3 SYSTEM OPERATION

A. Unless otherwise specified, but not limited to actuation of manual stations, smoke detectors, heat detectors, linear heat or smoke detectors, or water-flow switches shall cause the following operations to occur:

1. Activate audible circuits.
2. Actuate strobe units until the panel is reset or strobe circuit time-out.
3. UL listed central station shall be notified via – Universal Digital Alarm Communicator Transmitter (UDACT).

3.4 TESTING

A. A 48 hour notice shall be provided to the IOR before final testing.

B. Testing of fire detection system shall be as required by CFC 901.2.1 (Prior to request testing from Local Fire) and by the State Fire Marshal and local authorities having jurisdiction. Installer is responsible for identifying required testing, coordinating, scheduling, and conducting tests before Substantial Completion. Tests shall include the following:

1. Operation of all signal-initiating devices (smoke detectors, heat detectors, pull stations etc.).
2. Operation of all indicating devices (speakers and alarm strobes).
3. Operation of all system features under normal operation.
4. Operation of all system supervisory features.
5. Operation of all system features on standby power, with primary power turned off.
6. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
7. Open initiating device circuits and verify that trouble signal actuates.
8. Open signaling line circuits and verify that trouble signal actuates.
9. Open and short notification appliance circuits and verify that trouble signal actuates.
10. Open and short (wire only) network communications and verify that trouble signals are received at network annunciators or reporting terminals.
11. Ground initiating device circuits and verify response of trouble signals.
12. Ground signaling line circuit and verify response of trouble signals.
13. Ground notification appliance circuit and verify response of trouble signals.
14. Check alert tone to alarm notification devices.
15. Check installation, supervision, and operation of intelligent smoke detectors.
16. Alarm conditions that the system is required to detect shall be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
17. When the system is equipped with optional features, consult the manufacturer manual to determine proper testing procedures.

C. Upon completion of installation of fire alarm equipment, provide to the OAR a signed, written statement confirming that fire alarm equipment was installed in accordance with the Specifications, Shop Drawings, instructions and directions provided by the manufacturer.

D. Demonstrate in presence of the IOR that circuit and wiring tests are free of shorts and grounds and that installation performs as specified herein and within manufacturer's guidelines.

E. Software Modifications:

1. Provide the services of a factory trained and authorized technician to perform system software modification, upgrades or changes. Response time of the technician to the Project site shall not exceed 24 hours.
2. Provide hardware, software, programming tools, and documentation necessary to modify the fire alarm network on the Project site. Modification includes: addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modification on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being provided.

F. Complete the inspection and testing form as required by CFC / 907.9 and NFPA 72, and submit one copy of the completed form to the Architect and IOR.

3.5 OPERATING/SERVICE MANUALS

A. Deliver to OAR, 3 copies of service manuals including the following:

1. Installation manuals, programming manuals and user manual if applicable for every control panel, control panel power supply, FACP input/output/relay or control module, auxiliary power supply, UDACT, remote NAC extender power supply, door holder power supplies, all installed annunciators, initiating and indicating devices and all addressable monitor, relay and control modules. Catalog cut sheets are not acceptable.
2. A printed copy of the system configuration as programmed, including all system labeling codes, and passwords.
3. An electronic copy on compact disk of the system configuration program
4. Final test report.
5. Detailed explanation of the operation of the system.
6. Instructions for routine maintenance.
7. Detailed wiring diagram for the connection of relays, addressable monitor, control or relay modules as applied in the interfacing of peripheral systems or equipment to the fire alarm system.
8. An electronic copy (CD) of the posted site/fire alarm map in Auto-Cad and pdf formats.
9. A single reproducible set of record drawings reflecting the system exactly as it was installed including exact location of components.
10. Provide codes and passwords for fire alarm system at testing.

3.6 SYSTEM USER AND MAINTENANCE PERSONNEL TRAINING

A. Before Substantial Completion, provide one instruction period for the Project site based Owner operators and system users.

1. The instruction period shall be scheduled and coordinated by the OAR.

3.7 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.8 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

END OF SECTION

SECTION 31 1000

SITE CLEARING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Removal of vegetation, grass, grass roots, shrubs, tree stumps, trees, upturned stumps, weed growth, tree roots, brush, masonry, concrete, rubbish, debris and other materials.

2. Removal of concrete and bituminous surfaces.

3. Removal of existing fences and gates.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 31 2200 - Grading.

3. Section 31 2313 - Excavation and Fill.

4. Section 31 2316 - Excavation and Fill for Pavement.

5. Section 31 2319 - Excavation and Fill for Structures.

6. Section 31 2323 - Excavation and Fill for Utilities.

7. Section 31 2326 - Base Course.

8. Section 32 3113 - Chain Link Fences and Gates.

1.02 SUBMITTALS

A. Shop Drawings: Submit site plan indicating extent of site clearing.

1.03 QUALITY ASSURANCE

A. Comply with Standard Specifications for Public Works Construction, current edition, as a minimum requirement.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 TREE AND STUMP REMOVAL

A. Remove trees and stumps indicated or required to be removed. Remove trees, together with bulk of roots, to a minimum depth of 4 feet below required grade, and within a radius of approximately 7 feet beyond perimeter of trunk at grade.

B. Fill and compact excavation from tree and stump removal. Fill in 6 inch layers, each compacted to 90 percent of maximum density in accordance with ASTM D1557.

1. Back filling shall not commence until the excavation is inspected and tested.

3.02 CONCRETE AND BITUMINOUS SURFACING REMOVAL

A. Break up and completely remove existing concrete surfacing, curbs, gutters, walks and bituminous surfacing to indicated limits. Cutting shall be performed to a neat and even line with proper tools or a concrete cutting saw. Minimum depth of cut shall be 1 1/2-inch, unless otherwise indicated. Remove concrete broken beyond the indicated limits to the nearest joint or score line and replace with new concrete to match existing.

3.03 FENCING

A. Existing fences scheduled to remain may be removed to facilitate the Work, provided they are installed to their original condition in accordance with requirements of Section 32 3113 - Chain Link Fences and Gates.

B. Fencing indicated to be removed and not reinstalled shall be completely removed, including footings. Fill and compact excavations.

C. Install chain link fencing indicated to be relocated or reset in accordance with applicable requirements specified under Section 32 3113 - Chain Link Fences and Gates.

3.04 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 31 2200

GRADING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. General exterior grading, cutting and filling, including grading for building area, paving, planting areas, banks and hillsides.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 31 1000 - Site Clearing.

3. Section 31 2316 - Excavation and Fill for Pavement.

4. Section 31 2319 - Excavation and Fill for Structures.

5. Section 31 2323 - Excavation and Fill for Utilities.

6. Section 31 2326 - Base Course.

1.02 PROJECT REQUIREMENTS

A. General:

1. Fees: Pay as required by authorities having jurisdiction over the area.

2. Bonds: Post as required by authorities having jurisdiction over the area.

3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.

4. Before grading, contact Underground Service Alert of Southern California (USASC) for information on public buried utilities and pipelines. Retain the services of an underground utility locator for on-site utilities.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials shall conform to requirements specified in this and related sections.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect and maintain installed stakes until their removal is required for the Work. Provide replacement grade or location stakes lost or disturbed.

B. Install grade stakes and compare to indicated grades. If discrepancies are found between existing grades and grades indicated on Drawings, do not proceed until discrepancies are resolved.

3.02 ROUGH AND FINE GRADING

A. Rough grade area sufficiently high to require cutting by fine grading:

1. Grade area for bituminous surfacing and other paving to the indicated grades, equal to the section of the indicated base and pavement.

2. Slope banks to required finish grades as cut progresses or leave cuts full and finish grade by mechanical equipment to provide grades and soil densities indicated on the Drawings.

3. Rough grade, fill and compact banks beyond indicated finish grades. Finish grade banks and slopes to indicated grades and specified soil densities.

4. Grade Only Areas: In areas not indicated to receive pavement, rough grade to approximate finish grades and then scarify, moisten and roll to obtain required density and indicated finish grades.

5. Tolerances: Finish grades shall be within a tolerance of 0.05 inch per foot above or below grades indicated. Provide an average grade as indicated.

B. Base or Subgrade:

1. After subgrade has been constructed to approximate required grades, scarify to a depth of at least 6 inches:

a. After scarifying, process loosened material to a finely divided condition and adjust moisture content to optimum condition by addition of water, addition and blending of dry suitable material, or by drying of existing material.

b. Subgrade material shall be compacted by tamping, sheepsfoot rollers or pneumatic tire rollers. Required relative compaction shall be [**95**] percent minimum for the top 6 inches below subgrade.

c. Install base course in accordance with Section 31 2326 - Base Course.

2. Tolerance of completed grades of base or subgrade shall not vary more than 0.03 inch per foot from grades indicated. Provide an average grade as indicated.

3.03 SHORING

A. Provide shoring as necessary to properly and safely support earth sides of excavations, and existing curbs, sidewalks, gutter, drives and stairs, against movement and collapse.

B. Design and Calculations: Provide in accordance with requirement of CalOHSA.

C. Remove shoring upon completion of the Work of this section or when no longer needed unless required otherwise by authorities having jurisdiction.

3.04 EXCESS MATERIAL DISPOSAL

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.05 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 31 2316

EXCAVATION AND FILL FOR PAVING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Excavating, backfill, and compacting for paved areas.

2. Installation of fill materials.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 01 4524 - Environmental Import/Export Materials Testing.

3. Section 31 1000 - Site Clearing.

4. Section 31 2200 - Grading.

5. Section 31 2323 - Excavation and Fill for Utilities.

6. Section 32 2326 - Base Course.

7.. Section 32 1216 - Asphalt Paving.

8. Section 32 1313 - Site Concrete Work.

1.02 PROJECT REQUIREMENTS

A. Import and Export of Earth Materials:

1. Fees: Pay as required by authorities having jurisdiction over the area.

2. Bonds: Post as required by authorities having jurisdiction over the area.

3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.

1.03 QUALITY ASSURANCE

A. Comply with Standard Specifications for Public Works Construction, current edition, except as modified herein.

B. Sampling, testing, and certification of imported and/or exported soils shall be performed in accordance with Section 01 4524 - Environmental Import/Export Materials Testing.

1.04 TESTING

A. OWNER will retain a Geotechnical Engineer as an OWNER Consultant who will provide observations, tests, inspections and approvals identified in the Contract Documents as being responsibility of OWNER.

B. Imported Soils: The Geotechnical Engineer will obtain initial product Sample for testing in accordance Article 3.05 of this Section.

1.05 PROJECT CONDITIONS

A. Information on Drawings or in soils report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.

PART 2 - PRODUCTS

2.01 BASE MATERIALS

A. Concrete Slabs On Grade: Provide "Crushed Aggregate Base "as specified in the Standard Specifications for Public Works Construction, Section 200: "Rock Materials," with ¾ inch maximum size aggregates. Provide 3-inch thick base, unless noted otherwise.

B. Bituminous Surfacing: As indicated on Drawings and specified in Section 31 2326 - Base Course.

2.02 FILL AND BACKFILL MATERIALS

A. Fill and backfill materials shall be previously excavated materials or imported fill material, free of clods and stones larger than 3-inch, foreign materials, vegetable growths, sod, expansive soils, rubbish and debris. Material shall conform to these specified requirements and related sections.

B. Fill material exhibiting a wide variation in consistency and moisture content shall be blended or aerated to stabilize and upgrade the material.

C. Imported Fill Material:

1. Provide suitable materials obtained from Project site excavations for earthwork and fill materials. If excavated materials are not of suitable quality or sufficient quantity, import additional materials as necessary.

2. Imported fill shall be a granular material with sufficient binder to form a firm and stable unyielding subgrade and shall not have more than 60 percent of fines passing 200 mesh sieve. Material shall have a coefficient of expansion of not more than 2 percent from air dry to optimum moisture content and not

more than 6 percent from air dry to saturation. Imported material shall be clean and free of rubbish, debris, and toxic or hazardous contaminants. Adobe or clay soils are not permitted.

D. Brick rubble and broken concrete originating from the Project site shall be legally disposed of off the Project site. No such materials shall be imported from outside the Project site.

E. Permeable Backfill:

1. Provide permeable backfill material behind retaining structures consisting of gravel, crushed gravel, crushed rock, natural sands, manufactured sand, or combinations of these materials conforming to the following gradations:

Sieve Size:	Percentage Passing:
3/4 inch (19mm)	100
3/8 inch (10mm)	80 to 100
No. 100	0 to 8
No. 200	0 to 3

2. Those portions of fill material passing a No. 4 sieve shall provide a sand equivalent of at least 60.

3. Provided backing for weep holes shall consist of two cubic feet of aggregate in burlap sacks, securely tied. Aggregate shall conform to requirements for No. 3 concrete aggregate as specified in subsection 200-1.4 of the Standard Specifications for Public Works Construction.

4. Permeable Backfill Alternate Materials: Instead of the materials specified for retaining structures backfill, a drainage matting system, Miradrain by Mirafi, Inc., or equal, may be provided if reviewed and approved by the ARCHITECT.

PART 3 - EXECUTION

3.01 GENERAL

A. Before initiating intrusive activities, contact Underground Service Alert of Southern California (USA or Dig Alert) to obtain a Dig Alert ticket for location information on buried public and USA member utilities and pipelines at least 48-hours prior to beginning work. A copy of the Dig Alert ticket shall be forwarded to the OWNER. For on-site utilities, retain a state-licensed third party underground utility locating service.

B. Clear the Project site as indicated in Section 31 1000 - Site Clearing.

3.02 PROTECTION

A. Protect and guard excavations against danger to life, limb, and property as required by, but not limited to, Cal-OSHA regulations.

B. Protect adjacent existing improvements including landscaping against damage.

3.03 EXISTING UTILITY LINES

A. Protect existing utility lines from damage or displacement.

B. Remove conduits or pipes not in service, exposed during Work, unless a minimum cover of 2 feet is provided. Remove concrete, clay or other non-metallic pipe over 8 inches in diameter, unless otherwise indicated.

3.04 EXCAVATION

A. Unclassified Excavations: Comply with the Standard Specifications for Public Works Construction, Section 300: "Earthwork," except as modified herein.

3.05 FILL

A. Unclassified Fill and Compaction: Comply with the Standard Specifications for Public Works Construction, Section 300: "Earthwork," except as modified herein.

B. Provide fill materials as specified in Part 2 - Products. If excavated materials from the Project site are not of required quality or sufficient quantity, import additional materials as necessary.

C. In addition to the requirements of this Section, import and/or exported materials shall comply with the requirements of Section 01 4524 - Environmental Import/Export Materials Testing.

D. Imported fill materials will be sampled by the Geotechnical Engineer for compliance with the requirements of Part 2 of this Section.

E. The Geotechnical Engineer will submit samples to a DSA approved independent approved testing laboratory for testing.

F. Initial sampling will be performed by the Geotechnical Engineer before importing material to the Project site. Identify the location of the source site in addition to the address, name of the person and/or entity responsible for the source site. The Geotechnical Engineer will obtain both the initial and additional samples from the identified site and will submit samples to the approved independent testing laboratory for testing.

G. The Geotechnical Engineer will perform additional sampling during import operations. If the total quantity of import is determined to be greater than 1,000 cubic yards of material, one sample shall be obtained and submitted for testing for each 250 cubic yards of imported material. If the total quantity of import is determined to be less than 1,000 yards, one sample shall be obtained and submitted for testing for each 100 cubic yards of imported material.

H. The independent approved testing laboratory will perform the required tests and report results of tests noting if the tested material passed or failed such tests and will furnish copies to the Project Inspector, ARCHITECT, OAR, DSA, CONTRACTOR, and others as required. Report shall state tests were conducted under the responsible charge of a licensed State of California professional engineer and the material was tested in

accordance with applicable provisions of the Contract Documents, CBC, and the DSA. Upon completion of the Work of this Section, the independent testing laboratory and Geotechnical Engineer shall submit a verified report to the DSA as required by CBC.

I. Bills of lading or equivalent documentation will be submitted to the Project Inspector on a daily basis.

J. Upon completion of import operations, provide the OAR a certification statement attesting that imported material has been obtained from the identified source site.

3.06 INSTALLATION OF MATERIALS

A. Fill or backfill materials shall be installed in horizontal layers of 6 inches, unless otherwise required. Each layer shall be evenly placed and moistened or aerated as necessary. Unless otherwise reviewed by the Geotechnical Engineer, each layer of fill material shall cover the length and width of the area to be filled before the next layer of material is installed. Top surface of each layer shall be installed to an approximate level with a crown or crossfall of at least 1 in 50, but no more than 1 in 20. Provide adequate drainage at all times during construction of the Work of this Section.

3.07 COMPACTING

A. Each layer of fill material shall be compacted by tamping, sheepsfoot rollers, or pneumatic-tired rollers to provide specified relative compaction. At inaccessible locations, provide specified compaction by manually held, operated and directed compaction equipment.

B. Unless otherwise indicated, compact each layer of earth fill to a relative compaction of at least 95 percent.

C. When fill materials, or a combination of fill materials, are encountered or provided which develop densely packed surfaces as a result of installation or compacting operations, scarify each compacted layer before installing the next succeeding layer.

3.08 INSPECTION AND TESTING

A. The Geotechnical Engineer will inspect and test excavations, sample material quality as required in Part 2, and observe installation and compaction of fill materials.

B. The Geotechnical Engineer will sample imported fill materials from their designated source before delivery to the Project site.

C. Installation of backfill will be observed by the Geotechnical Engineer.

D. The Geotechnical Engineer will inspect and test excavation Work before the installation of fill and/or other materials.

E. Compaction: Test compaction in accordance with ASTM D1557, Method C.

3.09 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

3.10 CLEANING

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 31 2319

EXCAVATION AND FILL FOR STRUCTURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Excavating, backfilling, and compacting for buildings and structures.

2. Fill materials.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 01 4524 - Environmental Import/Export Materials Testing.

3. Section 31 1000 - Site Clearing.

4. Section 31 2200 - Grading.

5. Section 31 2616 - Excavation and Fill for Paving.

6. Section 31 2323 - Excavation and Fill for Utilities.

1.02 PROJECT REQUIREMENTS

A. Import and Export of Earth Materials:

1. Fees: Pay as required by authorities having jurisdiction over the area.

2. Bonds: Post as required by authorities having jurisdiction over the area.

3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.

1.03 SUBMITTALS

A. Imported Soils: A Geotechnical Engineer, retained by the Owner as an Owner Consultant, will obtain initial product Sample for testing in accordance with the terms of Article 3.05 of this Section.

B. Shoring calculations as required in Article 3.03 of this Section.

1.04 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction, current edition, except as modified herein.

B. Sampling, testing, and certification of imported and/or exported soils shall be performed in accordance with Section 01 4524 - Environmental Import/Export Materials Testing.

1.05 TESTING

A. OWNER will retain a Geotechnical Engineer as an OWNER Consultant who will provide observations, tests, inspections and approvals identified in the Contract Documents as being responsibility of OWNER.

B. Imported Soils: The Geotechnical Engineer will obtain initial product Sample for testing in accordance Article 3.05 of this Section.

1.06 PROJECT CONDITIONS

A. Information on Drawings or in soils report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.

PART 2 - PRODUCTS

2.01 FILL AND BACKFILL MATERIALS

A. Fill and backfill materials shall be a granular material previously removed from excavation, or imported fill material, free of large clods and stones larger than 3 inches, foreign materials, vegetable growths, sod, expansive soils, rubbish and debris. Material shall conform to these specified requirements and related sections.

B. Fill material exhibiting a wide variation in consistency and or moisture content shall be blended and/or aerated to stabilize and upgrade the material.

C. Imported Fill Material:

1. Provide suitable materials obtained from Project site excavations for earthwork and fill materials. If excavated materials are not of suitable quality or sufficient quantity, import additional materials as necessary.

2. Imported fill shall be a granular material with sufficient binder to form a firm and stable unyielding subgrade and shall not have more than 60 percent of fines passing 200 mesh sieve. Material shall have a coefficient of expansion of not more than two percent from air dry to optimum moisture content and not more than six percent from air dry to saturation. Imported material shall be clean and free of rubbish, debris and toxic or hazardous contaminants. Adobe or clay soils are not permitted.

D. Brick rubble and broken concrete originating from the Project site shall be legally disposed of off the Project site No such materials shall be imported from outside the Project site.

E. Permeable Backfill:

1. Provide permeable backfill material behind retaining structures consisting of gravel, crushed gravel, crushed rock, natural sands, manufactured sand, or combinations of these materials conforming to the following gradations:

Sieve Size	Percentage Passing
3/4 inch	100
3/8 inch	80 to 100
No. 100	0 to 8
No. 200	0 to 3

2. Those portions of fill material passing a No. 4 sieve shall provide a sand equivalent of at least 60.

3. Provided backing for weep-holes shall consist of two cubic feet of aggregate in burlap sacks, securely tied. Aggregate shall conform to requirements for No. 3 concrete aggregate as specified in subsection 200-1.4 of the Standard Specifications for Public Works Construction.

4. Permeable Backfill Alternate Materials: Instead of the materials specified for retaining structures backfill, a drainage matting system, Miradrain by Mirafi, Inc., or equal, may be provided if reviewed and approved by the ARCHITECT.

PART 3 - EXECUTION

3.01 GENERAL

A. Before initiating intrusive activities, contact Underground Service Alert of Southern California (USA or Dig Alert) to obtain a Dig Alert ticket for location information on buried public and USA member utilities and pipelines at least 48-hours prior to beginning work. A copy of the Dig Alert ticket shall be forwarded to the OWNER. For on-site utilities, retain a state-licensed third party underground utility locating service.

B. Clear the Project site as indicated in Section 31 1000 - Site Clearing.

3.02 PROTECTION

A. Protect and guard excavations against danger to life, limb, and property as required by, but not limited to, Cal-OSHA regulations.

B. Protect adjacent existing improvements including landscaping against damage.

C. Shore, crib, or lag excavations and earthen banks as necessary to prevent caving-in, erosion or gullying of sides.

D. Divert or de-water excavations until concrete is placed, forms are removed, and backfilling is complete.

3.03 SHORING

A. Provide shoring as necessary to properly and safely support earth sides of excavations, curbs, sidewalks, gutter, drives and stairs, against movement and collapse.

B. Design and Calculations: Provide in accordance with requirement of Cal-OHSA. Remove shoring upon completion of Work, or when no longer needed.

3.04 EXCAVATION

A. Form sides of footings, pads, grade beams, and slab foundations, unless otherwise indicated. Provide excavations of sufficient size to permit installation and removal of forms and other Work as required.

B. Machine-drill excavation for round footings to size and depth indicated. Provide a collar or casing, or other adequate protection, to exclude dirt and debris. Protect excavations with plank covers until concrete is placed.

C. Provide excavation bottoms level and free from loose material. Excavate to indicated or required elevations of undisturbed earth.

D. Provide excavations free from standing water by pumping, draining, or providing protection against water intrusion. If soil becomes soft, soggy, or saturated, excavate to firm undisturbed soil and fill as required. Slope adjacent grades away from excavations to minimize entry of water.

E. Calculate excavation quantities based on elevations or depths indicated on Drawings.

F. Provide 2,000 psi concrete for backfill of over-excavated areas to indicated or required elevations.

G. Special preparation of bottom of excavated planes areas: Excavate areas designated on Drawings as bottom of excavated planes (B.E.P.), by excavating and filling to indicated grades and elevations.

3.05 IMPORT/EXPORT OF MATERIALS

A. Provide fill materials as specified in Part 2- Products. If excavated materials from the Project site are not of required quality or sufficient quantity, import additional materials as necessary.

B. In addition to the requirements of this Section, import and/or exported materials shall comply with the requirements of Section 01 4524 - Environmental Import/Export Materials Testing.

C. Imported fill materials will be sampled by the Geotechnical Engineer for compliance with the requirements of Part 2 of this Section.

D. The geotechnical engineer will submit all samples to a DSA approved independent testing laboratory for testing.

E. Initial sampling will be performed by the Geotechnical Engineer before importing material to the Project site. Identify the location of the source site in addition to the address, name of the person and/or entity responsible for the source site. The Geotechnical Engineer will obtain both the initial sample and additional samples from the identified site and will submit samples to the approved independent testing laboratory for testing.

F. The Geotechnical Engineer will perform additional sampling during import operations. If the total quantity of import is determined to be greater than 1,000 cubic yards of material, one sample shall be obtained and submitted for testing for each 250 cubic yards of imported material. If the total quantity of import is determined to be less than 1,000 yards, one sample shall be obtained and submitted for testing for each 100 cubic yards of imported material.

G. The independent approved testing laboratory will perform the required tests and report results of tests noting if the tested material passed or failed such tests and will furnish copies to the Project Inspector, ARCHITECT, OAR, DSA, CONTRACTOR, and others as required. Report shall state tests were conducted under the responsible charge of a licensed State of California professional engineer and the material was tested in accordance with applicable provisions of the Contract Documents, CBC and the DSA. Upon completion of the Work of this Section, the independent testing laboratory and Geotechnical Engineer will submit a verified report to the DSA as required by CBC.

H. Bills of lading or equivalent documentation will be submitted to the Project Inspector on a daily basis.

I. Upon completion of import operations, provide the OAR a certification statement attesting that all imported material has been obtained from the identified source site.

3.06 BACKFILLING

A. After concrete has been placed, forms removed and concrete Work inspected, backfill excavations to indicated or required grades. Backfill simultaneously on each side of walls or grade beams. Remove rubbish, debris, and other waste materials from excavations before placing backfill.

B. Before installing backfill, adequately cure concrete and provide bracing to stabilize structures. Protect waterproofing or dampproofing against damage during backfilling operations with required protection board. Remove bracing as backfill operation progresses.

C. Do not furnish or install expansive soils for below grade building walls.

D. Install each layer of material in a not to exceed thickness of 6 inches, unless otherwise required.

E. Rigidly control the amount of water to be installed to provide optimum moisture content for type of fill material furnished. Do not over-saturate or compact by flooding or jetting.

F. Install wall backfill before installing railings and fences on walls.

G. Impervious backfill materials shall be installed in layers along with and by the same methods specified for structure backfill. Impervious backfill materials shall be at the approximate grade and elevation and where exposed to erosion, shall be covered with at least a 12-inch layer of fill material as reviewed by the Geotechnical Engineer.

H. Install weep hole drainage at the backside of walls so the backing completely covers the weep holes, is horizontally centered and extends at least 12 inches above the bottom of the weep opening. Provide an 8-inch square section of 1/4 inch galvanized or aluminum screen, with a minimum wire diameter of 0.03 inch, and install at the backside of each weep hole before installing the backfill material.

I. Where a reviewed drainage matting system is provided instead of permeable backfill for retaining structures, install in accordance with the manufacturer recommendations.

3.07 COMPACTING

A. Compact each layer of fill material by tamping, sheepsfoot rollers or pneumatic-tired rollers, to such extent as to provide specified relative compaction. At inaccessible locations, compact to specified requirements with hand-held, operated and directed compaction equipment.

A. Unless otherwise indicated, compact each layer of fill material to a relative compaction of at least 95 percent.

B. Do not compact by flooding or jetting.

C. When fill materials, or a combination of fill materials, are encountered or provided which develop densely packed surfaces as a result of installation or compacting operations, scarify each layer of compacted fill before installing the next succeeding layer.

3.08 INSPECTION AND TESTING

A. The Geotechnical Engineer will inspect and test excavations, sample material quality as required in Part 2, and observe installation and compaction of fill materials.

B. The Geotechnical Engineer will sample imported fill materials from their designated source before delivery to the Project site.

C. Installation of backfill shall be observed by the Geotechnical Engineer.

D. The Geotechnical Engineer will inspect and test excavation Work before the installation of fill and/or other materials.

E. Compaction: Test compaction in accordance with ASTM D1557, Method C.

F. The Project Inspector will inspect foundation excavations when completed and ready for forms, after forms are in place and before first placement of concrete.

3.09 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

3.10 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 31 2323

EXCAVATION AND FILL FOR UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Excavating, backfilling, and compacting utility trenches such as water, gas, irrigation, storm drain, sewer lines, concrete-encased conduits, and manholes, vaults, valve boxes, catch basins, underground tanks, thrust blocks, yard boxes, pull boxes and other utility appurtenances.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 01 4524 - Environmental Import/Export Materials Testing.

3. Section 31 1000 - Site Clearing.

4. Section 31 2200 - Grading.

5. Section 31 2316 - Excavation and Fill for Paving.

6. Section 31 2319 - Excavation and Fill for Structures.

7. Section 32 1313 - Site Concrete Work.

8. Section 33 1100 - Site Water Distribution Utilities.

9. Section 33 4000 - Storm Drainage Utilities.

1.02 PROJECT REQUIREMENTS

A. Import and Export of Earth Materials:

1. Fees: Pay as required by authorities having jurisdiction over the area.

2. Bonds: Post as required by authorities having jurisdiction over the area.

3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works construction, current edition except as modified herein.

B. Sampling, testing, and certification of imported and/or exported soils shall be performed in accordance with Section 01 4524 - Environmental Import/Export Materials Testing.

1.04 TESTING

A. OWNER will retain a Geotechnical Engineer as an OWNER Consultant who will provide observations, tests, inspections and approvals identified in the Contract Documents as being responsibility of OWNER.

B. Imported Soils: The Geotechnical Engineer will obtain initial product Sample for testing in accordance Article 3.02 of this Section.

1.05 PROJECT CONDITIONS

A. Information on Drawings or in soils report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Bedding material from trench bottom to one foot above the pipe:

1. Sand, gravel, crushed aggregate or native free-draining granular material providing a sand equivalent of at least 30 or a coefficient of permeability greater than 1.4 inches per hour.

2. Sand complying with the Specifications for cement concrete aggregates.

B. Backfill Materials:

1. Excavated trench material to be installed for backfilling shall be clean, free of large clods, and stones larger than 2 ½-inch in any dimension.

2. Cement-sand slurry shall be provided with one sack of cement per cubic yard of the mixture.

3. Imported Fill Material: Imported fill material shall be a granular material with sufficient binder to form a firm and stable unyielding subgrade and shall not have more than 60 percent of fines passing a 200 mesh sieve. Material shall provide a coefficient of expansion of not more than two percent from air dry to optimum moisture content and not more than six percent from air dry to saturation. Imported materials shall be clean and free of rubbish, debris, and toxic or hazardous contaminants. Adobe or clay soils are not permitted.

PART 3 - EXECUTION

3.01 GENERAL

A. Before initiating intrusive activities, contact Underground Service Alert of Southern California (USA or Dig Alert) to obtain a Dig Alert ticket for location information on buried public and USA member utilities and pipelines at least 48-hours prior to beginning work. A copy of the Dig Alert ticket shall be forwarded to the OWNER. For on-site utilities, retain a state-licensed third party underground utility locating service.

B. Barricade trenches, ditches, pits, sumps, and similar Work outside the barricaded working area with chain link fence as specified in Section 01 5000, Construction Facilities and Temporary Controls, and in accordance with Cal-OSHA standards and requirements.

C. Saw-cut concrete or bituminous paving for trench installation.

D. Trenches over 5 feet in depth shall conform to the Cal-OSHA.

E. Where indicated and required to excavate in lawn areas, protect adjoining lawn areas outside of the Work area. Replace or install removed sod upon completion of backfill by installing sod level with adjacent lawns. If installation of removed sod fails, furnish sod and install to match existing lawns.

F. Backfill over excavations to the required elevations with earth, gravel, sand, or concrete and compact as required. Provide excavations free from standing water by pumping, draining, or providing protection against water intrusion. Slope adjacent grades away from excavations to minimize entry of water.

G. Do not install piping lengthwise under concrete walks without review by the ARCHITECT.

H. Do not excavate trenches parallel to footings closer than 18 inches from the face of the footing or below a plane having a downward slope of two horizontal to one vertical, from a line 9 inches above bottom of footings.

1. Unless otherwise indicated on Drawings, depth of excavations outside the buildings shall allow for a minimum coverage above top of pipe, tank, or conduit measured from the lowest adjoining finished grade, as follows:

Steel Pipe	24 inches below finished grade
Copper Water Tube	18 inches below finished grade
Cast-Iron Pressure Pipe	36 inches below finished grade
Plastic Pipe (other than waste)	30 inches below finished grade
Tanks or other structures	36 inches below finished grade
Soil, Sewer & Storm Drain	minimum 18 inches below finished grade, and as required for proper pitch and traffic load. (Install polypropylene sewer pipe with at least 24 inches coverage)
Irrigation Pipe:	nonpressure pipe 12 inches, pressure pipe 24 inches

2. Trench width shall provide ample space for fitting and joining. Excavate for piping bells and fittings, bell and spigot pipe and other fittings.

I. Unless indicated otherwise, excavate trenches to the required depths for utilities, such as pipes, conduit and tanks, with minimum allowances of 6 inches at the bottom and 6 inches at the sides for bedding of unprotected piping or as required for concrete encasement of conduits as indicated on Drawings. Grade bottom of trenches to a uniform smooth surface. Remove loose soil from the excavation before installing sand bedding or concrete encasement.

J. Provide excavations free from standing water by pumping, draining, or providing protection against water intrusion. If soil becomes soft, soggy, or saturated, excavate to firm undisturbed soil and fill as required. Slope adjacent grades away from excavations to minimize entry of water.

K. Provide a minimum clear dimension of 2 inches from sides of wall excavation to outer surfaces of buried pipes or conduits installed in the same trench or outside surfaces of containers and tanks.

L. Do not install backfill until required inspections and testing is completed.

M. Backfill electrical or other excavated utility trenches located outside of barricaded installation areas within 24 hours after inspection by the Project Inspector.

N. Install backfill materials in layers not exceeding 4 inches in thickness and compact to 95 percent of the maximum density.

O. If materials excavated from the Project site are not permitted for trench backfill in paved areas, backfill trenches with a cement-sand slurry mix. Install backfill to an elevation of the existing undisturbed grade plus one inch.

P. Install and compact sand bedding to provide a uniform full length bearing under piping and conduits.

Q. Where portions of existing structures, walks, paving, or other improvements are removed or cut for piping or conduit installation, replace the material with equal quality, finished to match adjoining existing improvements. Repair pavement as specified in Section 32 0117, Pavement Repair.

3.02 IMPORT/EXPORT OF MATERIALS

A. Provide fill materials as specified in Part 2, Products. If excavated materials from the Project site are not of required quality or sufficient quantity, import additional materials as necessary.

B. In addition to the requirements of this Section, import and exported materials shall comply with the requirements of Section 01 4524, Environmental Import/Export Material Testing.

C. Imported fill materials will be sampled by the Geotechnical Engineer for compliance with the requirements of Part 2 of this Section.

D. The Geotechnical Engineer will perform the tests by utilizing an independent approved testing laboratory.

E. Initial sampling will be performed by the Geotechnical Engineer before importing material to the Project site. Identify the location of the source site in addition to the address, name of the person and/or entity responsible for the source site. The Geotechnical Engineer will obtain both the initial sample and additional samples from the identified site and shall submit all samples to the approved independent testing laboratory.

F. The Geotechnical Engineer will perform additional sampling during import operations. If the total quantity of import is determined to be greater than 1,000 cubic yards of material, one sample shall be obtained and submitted for testing for each 250 cubic yards of imported material. If the total quantity of import is determined to be less than 1,000 yards, one sample shall be obtained and submitted for testing for each 100 cubic yards of imported material.

G. The independent approved testing laboratory will perform the required tests and report results of all tests noting if the tested material passed or failed such tests and will furnish copies to the Project Inspector, ARCHITECT, OAR, DSA, CONTRACTOR, and others as required. Report shall state tests were conducted under the responsible charge of a licensed State of California professional engineer and the material was tested in accordance with applicable provisions of the Contract Documents, CBC and the DSA. Upon completion of the Work of this Section, the independent testing laboratory and Geotechnical Engineer will submit a verified report to the DSA as required by CBC.

H. Bills of lading or equivalent documentation will be submitted to the Project Inspector on a daily basis.

I. Upon completion of import operations, provide the OAR a certification statement attesting that imported material has been obtained from the identified source site.

3.03 INSPECTION AND TESTING

A. The Geotechnical Engineer will inspect and test excavations, sample material quality as required in Part 2, observe installation and compaction of fill materials.

B. Compaction test shall be performed in accordance with ASTM D1557, method "C."

3.04 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

3.05 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 31 2326

BASE COURSE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Installation of base material.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 01 4524 – Environmental Import / Export Material Testing.

2. Section 31 1000 - Site Clearing.

3. Section 31 2200 - Grading.

4. Section 31 2316 - Excavation and Fill for Paving.

7. Section 32 1216 - Asphalt Paving.

5. Section 32 1313 - Site Concrete Work.

1.02 SUBMITTALS

A. Crushed aggregate base (CAB) shall consist of native rock without naturally occurring asbestos or recycled materials. The CONTRACTOR shall submit written documentation, which identifies the source, volume, and proposed transport date of the material for review and approval by OWNER'S Office of Environmental Health and Safety (OEHS) prior to importing the material. A statement on company letterhead from the CAB source, stamped by either a California Professional Geologist or Engineer, which states that the subject materials are native rock, do not contain any recycled materials and that the source quarry does not mine ultramafic materials, a source of natural occurring asbestos shall be included in the submittal to OEHS. The CONTRACTOR may request variance from analytical testing required by Section 01 4524 for CAB. To be considered for a variance, the CONTRACTOR shall submit a documentation package for OEHS approval, which includes all of the aforementioned information at least 48 hours in advance of planned import.

1. Frequently used suppliers for LAUSD projects include:

a. Hansen Aggregates.

b. Vulcan Materials, Reliance Company.

c. Vulcan Materials Durbin.

C. Product Data: Submit material source, technical information and test data for base materials. Gradation and quality certifications shall be dated within 30 days of the submittal.

D. Sample: Submit sample of proposed base course material.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction, current edition.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Crushed Aggregate Base (CAB) materials shall conform to the requirements of the Standard Specifications for Public Works Construction: Section 200 - Rock Materials.

B. Crushed Miscellaneous Base (CMB) or materials generated on site shall not be used as a base course material.

2.02 MATERIAL APPROVAL

A. Base material shall be inspected by the Project Inspector for gradation and material content prior to installation. The OWNER may choose to have additional tests performed by a geotechnical engineer, retained by the OWNER, before installation.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install base course material in layers not exceeding 4 inches in thickness, unless required otherwise. Grade and compact to indicated levels or grades, cut and fill, water and roll until the surface is hard and true to line, grade and required section. Provide a relative compaction of at least 95 percent, unless otherwise required.

B. Grade base course to elevations indicated on Drawings, ready to receive surfacing, in accordance with Section 31 2200 - Grading.

3.02 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.03 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 32 0117

ASPHALT PAVEMENT REPAIR

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Bituminous Surfacing Repair: Areas removed for utility trenches, heaved by tree roots, cracked areas, protruding areas where pavement meets hard surfaces, depressed areas, holes and areas around new structures, and raveled bituminous pavement.

2. Areas heaved by tree roots, cracked areas, holes and trenches, and areas around new structures.

B. Related Sections:

1. Division 01 - General Requirements.

2. Section 01 3593 - Off-site Improvement Procedures.

3. Section 31 2200 - Grading.

5. Section 31 2316 - Excavation and Fill for Paving.

6. Section 31 2319 - Excavation and Fill for Structures.

7. Section 31 2323 - Excavation and Fill for Utilities.

8. Section 31 2326 - Base Course.

9. Section 32 1216 - Asphalt Paving.

11. Section 32 1313 - Site Concrete Work.

12. Section 32 1236 - Seal for Bituminous Surfacing.

1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating areas to be repaired.

B. Product Data: Submit manufacturer’s technical data for materials and products.

1.03 QUALITY ASSURANCE

A. Comply with Standard Specifications for Public Works Construction, current edition.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Base course materials: Section 31 2326 - Base Course.

B. Asphalt paving materials: Section 32 1216 - Asphalt Paving.

C. Seal materials: Section 32 1236 - Seal for Bituminous Surfacing.

D. Headers: Section 32 1216 - Asphalt Paving.

2.02 BITUMINOUS MATERIALS

A. Provide materials and products of the class, grade or type indicated, conforming to relevant provisions of Section 203 - Bituminous Materials of the latest Standard Specifications for Public Works Construction.

PART 3 - EXECUTION

3.01 PAVEMENT REMOVAL

A. Remove bituminous and concrete pavement in accordance with applicable provisions of Section 300 - Earthwork of the Standard Specifications for Public Works Construction.

B. Pavement Heaved By Roots: Remove pavement to limits of distortion and expose roots. Trim roots to provide at least 12-inch clearance to pavement.

C. Remove protruding bituminous surfaces flush with the surrounding grade using a suitable tool or equipment so that adjacent finishes are not blackened.

D. Remove raveled and depressed bituminous pavement to limits indicated or required.

E. Saw cut existing improvements, trim holes and trenches in bituminous and concrete pavement to permit mechanical hand tampers to compact the fill.

F. Remove broken concrete by saw cutting. If the required cut line is within 30 inches of a score or joint line or edge, cut and remove to the score, joint line, or edge.

3.02 EXCAVATING, BACKFILLING AND COMPACTING

A. Conform to requirements in Section 31 2316 - Excavation and Fill for Paving; Section 31 2319 - Excavation and Fill for Structures; or Section 31 2323 - Excavation and Fill for Utilities, as required.

B. Where subgrade or base is deemed to be unstable or otherwise unsuitable, excavate such materials to firm earth, and replace with a required material. Install and compact fill materials in accordance with the requirements of related Specification sections.

3.03 HEADERS

A. Install headers along edge of bituminous surfacing abutting turf, earth, or planting area, unless indicated otherwise.

B. Install headers so the bottom surface has continuous bearing on solid grade. Where excavation for headers is undercut, thoroughly tamp soil under the header. Compact backfill on both sides of header to the density of the adjacent undisturbed grade.

C. Fasten headers in place with redwood or Douglas fir stakes of length necessary to extend into solid earth a minimum of 12 inches. Stakes shall be of sound material, neatly pointed, driven vertically, and securely nailed to headers. Space stakes, not to exceed 4 feet on centers with top of stakes set one inch below top of header. Provide a minimum of two 12d galvanized common nails through each stake.

D. Remove existing headers where new surfacing is installed adjacent to existing surfacing.

E. Install temporary headers at transverse joints of paving where continuous paving operations are not maintained.

F. Provide additional stakes and devices as required to fasten headers.

3.04 BASE COURSE

A. Unless otherwise indicated, base course shall be crushed aggregate base, fine grade, 3 inches thick or equal to thickness of the existing base, whichever is greater.

B. Fill grade and compact as specified in Section 31 2200 - Grading.

3.05 RESURFACING

A. Holes and Trenches: Remove loose dirt and backfill with cement-sand slurry allowing for surfacing one inch thicker than existing. Resurface flush with existing adjoining pavement installing the same type of materials and section provided in existing improvements.

B. Other Areas: Other surface improvements damaged or removed shall be cut to a neat even line and excavated one inch below the bottom of the existing pavement. Resurface by following the original grades and installing the same type of materials provided in existing improvements.

C. Where bituminous surfacing abuts concrete, masonry, walks or paving, tamp joint smooth, if necessary, as described above to obtain a uniformly even joint, true to line and grade. Tamp and smooth materials before asphalt cools.

3.06 REPAIRING AND RESEALING EXISTING SURFACES

A. Preparation of Surfaces: Prior to filling cracks, clean existing bituminous surfacing of loose and foreign materials and coat with a film of asphalt emulsion.

B. Repair of Existing Surfacing:

1. Fill cracks ½ inch wide and less with RS-1 emulsion and silica sand or other required material. Cracks larger than ½ inch wide shall be filled with Type C2 Asphalt Concrete as specified. Cracks shall be filled to the level of adjacent surfacing.

2. Where low areas, holes, or depressions occur in existing surfacing, repair with emulsified asphalt. Install material, strike off the emulsified asphalt with a straightedge flush with adjoining surfacing. Finish with a steel trowel, and after dehydration, compact by rolling or tamping.

C. Testing: Flood test entire area in presence of the Project Inspector. Entire area tested shall be free of standing water or puddles.

D. Surface Seal: After surface has been repaired and tested, install seal coat over entire area indicated. Surface seal shall be as specified in Section 32 1236 - Seal For Bituminous Surfacing.

3.07 CLEANING

A. Remove all stains on the Project site and adjacent properties caused by or attributed to the Work of this section.

B. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.08 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 32 1216

ASPHALT PAVING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Paving for playground, parking areas, areas between buildings, synthetic track surfacing adjacent to planting and turf areas as indicated.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 31 2200 - Grading.

3. Section 31 2326 - Base Course.

4. Section 32 1236 - Seal for Bituminous Surfacing.

5. Section 32 1313 - Site Concrete Work.

1.02 SUBMITTALS

A. Shop Drawings: Submit site plan indicating extent of paving and accessories.

B. Product Data: Manufacturer’s technical data for materials and products.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction.

1.04 PROJECT CONDITIONS

A. Information on Drawings or in soils report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.

B A copy of the soils report is available for examination in the office of the Architect during regular office hours of the Architect.

PART 2 - PRODUCTS

2.01 BITUMINOUS MATERIALS

A. Provide materials of the class, grade, or type indicated on the Drawings, conforming to relevant provisions of Section 203 - Bituminous Materials of the Standard Specifications for Public Works Construction.

2.02 HEADERS

A. Concrete: Per specification Section 32 1313 - Site Concrete Work.

B. Wood:

1. Redwood, Construction Heart Grade, size 2 by 6, unless otherwise indicated.

2. Stakes: 2 by 4 redwood or 2 by 3 Douglas fir, Construction Grade.

3. Nails: Common, galvanized, 12d minimum.

PART 3 - EXECUTION

3.01 HEADERS

A. Install headers along edge of bituminous surfacing abutting turf, earth, or planting area, unless indicated otherwise.

B. Install headers so the bottom surface has continuous bearing on solid grade. Where excavation for headers is undercut, thoroughly tamp soil under the header. Compact backfill on both sides of header to the density of adjacent undisturbed earth.

C. Where wood headers are indicated on drawing, fasten headers in place with redwood or Douglas fir stakes of length necessary to extend into solid grade a minimum of 12 inches. Stakes shall be of sound material, neatly pointed, driven vertically, and securely nailed to headers. Space stakes, not to exceed 4 feet on center with top of stakes set one inch below top of header. Provide a minimum of two 12d galvanized common nails through each stake.

D. Remove existing headers where new surfacing is installed adjacent to existing surfacing.

E. Install temporary headers at transverse joints of paving where continuous paving operations are not maintained.

F. Provide additional stakes and anchorage as required to fasten headers in place.

3.02 CONSTRUCTION OF ASPHALT CONCRETE PAVEMENT

A. Thickness of Surfacing: Unless otherwise indicated on Drawings or specified, install bituminous surfacing to a compacted thickness of 2 inches.

B. Provide surfacing material over base course as specified in Section 31 2326 - Base Course.

C. Surfaces of walls, concrete, masonry, or existing bituminous surfacing indicated to be in direct contact with installed bituminous surfacing shall be cleaned, dried and uniformly coated with an asphaltic emulsion film.

D. Thicken edges of bituminous surfacing that do not abut walls, concrete, or masonry, and edges joining existing bituminous surfaces. Remove headers at existing bituminous surfacing where new bituminous surfacing is to be installed. Thicken edges an additional 2 inches and taper to the indicated or specified thickness 6 inches back from such edges.

E. At stairways, adjust thickness of paving such that the first tread is equal in height to all other treads.

F. Provide adequate protection for concrete, planting areas, and other finish Work adjacent to areas indicated to receive bituminous surfacing.

G. Placing:

1. Do not install bituminous surfacing when atmospheric temperature is below 40 degrees F; or when fog or other unsuitable weather conditions are present. Temperature of mixture at time of installation shall not be lower than 260 degrees F in warm weather or higher than 320 degrees F in cold weather.

2. Where 2-inch or 3-inch thick surfacing is indicated or specified, install surfacing in one course. Where surfacing is indicated or specified 4 inches or more in thickness, except for thickened edges, install bituminous surfacing in courses of approximately equal thickness, each course not exceeding 2 ½ inches in thickness.

H. Stakes or Screeds: Provide grade or screed stakes spaced not more than 15 feet apart in flow lines with grades of less than one percent. Continuous screeds may be provided instead of stakes.

I. Spreading: Install bituminous surfacing in a manner to cause least possible handling of mixture. In open areas and wherever practicable, install by mechanical means with a self-propelled mechanical spreader. In confined or restricted areas, install mixture with hot shovels and rakes, and smooth with lutes.

J. Joints: Provide vertical joints between successive runs. Install joints true to line, grade, and cross section. Lapped joints are not permitted.

K. Rolling:

1. Finish roll with a self-propelled tandem roller weighing at least 8 tons. Break down roll with a self-propelled roller weighing between 1 ½ tons and 8 tons.

2. Roll in a manner that preserves flow lines and the established finished grades. Break down roll in areas adjacent to flow lines parallel to flow lines. Break down roll after bituminous surfacing is installed without shoving or cracking of mixture under roller. Continue finish rolling until surfacing is unyielding, true to grade, and meets requirements for specified smoothness. Areas inaccessible

to finish roller may be finish rolled with breakdown roller or tamped with hot tamping irons and smoothed with hot smoothing irons or hand roller.

3. Where bituminous surfacing abuts concrete, masonry, walks or paving, tamp joint smooth, if necessary, as described above to obtain a uniformly even joint, true to line and grade. Tamp and smooth to properly compact.

4. Compacted bituminous surfacing shall be provided with a bulk specific gravity of at least 2.31 when tested in accordance with ASTM D1188.

3.03 TOLERANCE

A. Smoothness: Surface of bituminous surfacing after rolling, shall be even, smooth and uniform in texture with no voids or rock pockets, free of roller marks or other irregularities, and not varying by more than 0.03 foot, except at local depressions or raised areas as indicated, when a 10-foot straightedge is placed on surface.

B. Grade: Finished grade shall not vary more than 0.02 foot above or below required grade. Variations within prescribed tolerance shall be compensating so that average grade and cross-section are provided.

C. Premium paving tolerances and requirements for synthetic track:

1. General: Test in-place asphalt concrete courses for compliance with requirements or thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Owner's representative.

2. Thickness: Tolerances for thickness shall be ¼ inch, plus or minus.

3. Planarity: The asphalt substrate shall not vary from the planned cross slope by more than plus or minus 0.1 percent. The finished asphalt shall not vary, plus or minus, under a 10 feet straight edge greater than 1/8 inch. Flood test the surface with the use of a water truck. If, after 30 minutes on a 70 degree F day, "bird baths" are evident at a depth more than 1/8 inch repair using the best method of correction.

4. Corrective Measures: Determine if the planarity, cross slopes, and general specifications have been met. If all of the conditions have been met notify the Owner in writing of the acceptance of the asphalt paving.

5. No slurry or fog seals are to be applied to areas of asphalt paving that are to receive synthetic track surfacing.

3.04 TESTING

A. After first coat of surface seal has been installed and after a 24 hour period, the flood test shall be completed of the bituminous surfacing in presence of the Project Inspector. Repair areas of standing water or puddles and flood test locally; install surface seal and retest as necessary.

3.05 SURFACE SEALING

A. After bituminous surfacing has passed flood test, clear and allow to dry and provide one more coat of surface seal as specified in Section 32 1236 - Seal for Bituminous Surfacing.

B. Where indicated, provide multiple coats of surface seal to existing bituminous surfacing.

C. Where new bituminous surfacing joins existing bituminous surfacing, overlap surface seal a minimum of 12 inches onto existing bituminous surfacing.

3.06 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.07 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 32 1236

SEAL FOR BITUMINOUS SURFACING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Surface sealer over bituminous surfacing.

B. Related Requirements:

1. Division 01 - General Requirements.

2. 3. Section 32 1216 - Asphalt Paving.

4. Section 32 1723 - Pavement Marking.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product information and application procedures for bituminous surfacing.

1.03 QUALITY ASSURANCE

A. Comply with the Standard Specifications For Public Works Construction, current edition.

B. Agitate bulk materials during transport.

1.04 MAINTENANCE

A. Extra Materials: Provide 10 gallons in unopened containers.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide one of the following surface seals:

	Product Name	Manufacturer
1.	Guard-Top	CALMAT / Industrial Asphalt
2.	Over Kote	Diversified Asphalt Product
3.	Park Top	Western Colloid Products

4. Sure Seal Asphalt Coating Engineering

5. Super Drive Top. SAF– T Seal. Inc.

6. Equal.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

A. Thoroughly wash surfaces with water to remove dirt, debris, excessive oil and grease, or other foreign matter.

3.02 APPLICATION

A. Install seal coat in strict accordance with manufacturer's written directions and recommendations.

B. Install two coats of surface seal to new bituminous surfacing. First coat shall be installed before flood testing. Clean surface and allow to dry before installing second coat. Second coat shall be installed after bituminous surfacing has passed flood test.

C. Where new bituminous surfacing is installed adjacent to existing bituminous surfacing, overlap surface seal a minimum of 12 inches onto existing bituminous surfacing.

D. Where existing bituminous surfacing is indicated to be patched and sealed, install two coats of surface seal after patching. Refer to Section 32 1216 - Asphalt Paving.

3.03 PROTECTION OF SURFACES

A. Protect sealed and unsealed surfaces from damage and traffic during performance of the Work of this section and until surface seal has thoroughly set and cured. Do not permit traffic of any kind for at least 24 hours after completion of installation.

B. Protect the Work of this section until Substantial Completion.

3.04 TESTING

A. Owner reserves the right to obtain samples, perform tests to ensure compliance with the Specifications, and to review weight slips and invoices of materials delivered to the Project site.

3.05 CLEAN UP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 32 1313

SITE CONCRETE WORK

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Portland cement concrete pavement, cement walks, curbs, gutters, trash pick-up area, ramps, mowing strips, fence post footings, sliding gate concrete tracks, catch basins, pipe bedding and encasements, thrust blocks, transition structures, flagpoles and light standard bases and footings, athletic equipment footings and equipment pads.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 31 2200 - Grading.

3. Section 31 2316 - Excavation and Fill for Pavement.

4. Section 31 2326 - Base Course.

10. Section 32 1216 - Asphalt Paving

5. Section 32 3113 - Chain Link Fences and Gates.

6. Section 33 4000 - Storm Drainage Utilities.

1.02 SUBMITTALS

A. Shop Drawings: Submit plans, elevations and details of concrete site Work.

B. Product Data: Submit mix designs and manufacturer’s technical data for materials and products. Submit 3-inch by 3-inch concrete Sample of each specified color.

C. Material Sample: Submit one concrete bumper to the Project Inspector for destructive testing.

1.03 QUALITY ASSURANCE

A. Comply with Standard Specifications For Public Works Construction.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete, Mortar and Related Materials: Comply with applicable provisions of Standard Specifications for Public Works Construction, Section 201 - Concrete, Mortar and Related Materials:

1. Concrete: 28-day compressive strength 2,500 psi, unless specified otherwise.

2. Reinforcing Mesh: ASTM A185, 4 by 4/W1.4 by W1.4 welded wire mesh.

3. Expansion Joint Filler: Preformed expansion joint filler, bituminous type, complying with ASTM D994.

B. Form Materials:

1. Side forms: Douglas fir, Construction Grade or Better or metal forms.

2. Stakes: Douglas fir, Construction Grade or Better or metal stakes.

C. Concrete Parking Bumpers:

1. Precast concrete, smooth and free of pits and rock pockets, providing a minimum 28-day compressive strength of 3,500 psi. Size at least 7 ½-inch wide, 5 ½-inch high and 6-foot long. Reinforce with two #5 reinforcing bars. Provide 2 3/4-inch diameter pre-drilled holes for anchor installation.

2. Bumper Anchors: Provide ½ inch diameter by 18-inch long galvanized steel pipe.

3. Bumper Adhesive: Provide adhesive recommended by bumper manufacturer/installer for fastening bumpers to concrete pavement.

PART 3 - EXECUTION

3.01 CONSTRUCTION OF FORMS FOR CAST-IN-PLACE STRUCTURES

A. Concrete Pavement: Install Portland cement concrete pavement in compliance with the Standard Specifications for Public Works Construction, Section 302- Roadway Surfacing.

B. Miscellaneous Exposed Concrete: Install concrete curbs, walks, gutters, cross gutters, access ramps, driveways, catch basins, yard boxes, vaults and similar structures, in compliance with the Standard Specifications for Public Works Construction, Section 303 - Concrete and Masonry Construction.

C. Exposed Concrete Bases: Install bases, such as for post, flagpole, light standards and similar bases, in compliance with the Standard Specifications for Public Works Construction, Section 303 - Concrete and Masonry Construction.

D. Post, flagpole, light standard footings below grade, underground conduit bedding, encasements, thrust blocks and similar structures may be placed \directly in excavations conforming to the required sizes.

E. Reinforcement installation and concrete placement, surface finishes, curing and removal of forms shall be performed in compliance with applicable provisions of Standard Specifications for Public Works Construction, Section 303 - Concrete and Masonry Construction. Provide heavy broom finish at slopes exceeding six percent and medium broom finish at slopes up to six percent.

F. Exterior Paving and Cement Walks: Finish as specified above, except surface shall be given a non-slip broom finish.

3.02 INSTALLATION OF PARKING BUMPERS

A. Install bumpers as indicated on the Drawings. On bituminous paving, install anchors through pavement and into the ground a minimum of 12 inches. On concrete pavement, install bumpers in a continuous bed of adhesive.

3.03 CLEAN UP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.04 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 32 1700

PAVING SPECIALTIES

PART 1: GENERAL

1.01 SUMMARY - Perform all work required to complete, as indicated by the Contract Documents and furnish all supplementary items necessary for the proper installation of:

A. Precast Concrete ADA Pavers

B. Concrete Wheel Stops

C. Bollards

1.02 RELATED SECTIONS

A. 32 13 13 Site Concrete Work - Concrete shall not exceed 1/8" in 10'-0" from required plane. Concrete to be steel troweled with fine broom finish. No curing or sealing compound used.

1.03 SYSTEM DESCRIPTION SUMMARY

A. System shall consist of precast concrete ADA Warning pavers installed on Latex thinset mortar setting bed.

B. The ADA Warning paver installation shall be absolutely rigid and even large slabs when subjected to vehicular traffic, shall not be displaced.

C. Recycled Rubber Wheel stops

D. Metal Bollards

1.04 REFERENCES

A. Refer to Section 01090 - References Standards

B. American Society for Testing and Materials (ASTM)
1. ASTM C 33: Specification for Concrete Aggregates
2. ASTM C 150: Specification for Portland Cement
3. ASTM C 67: Method of Sampling and Testing Brick and Structural Clay Tile
4. ASTM C 140: Specification for concrete

C. T.C.A. Tile Council of America
1. Installation Method Cement Mortar Bonded F102.

D. A.N.S.I. American National Standards Institute
1. A-118.4 Latex Portland Cement Mortar

2. A-118.6 Grout - Latex

1.05 SUBMITTALS

A. Submit the following in accordance with the Supplementary General Conditions:

1. Manufacturer's Literature: Materials descriptive literature, installation instructions
and paver color selection chart.
2. Test Reports: Three (3) copies, showing compliance with specified ASTM requirements.
3. Shop drawings
   a. Layout drawings of each paved area showing the pattern of pavers, indicate pavers requiring cutting, indicate setting bed methods in each area, drainage patterns and drains. Include details of setting beds, noting all materials and their thickness, show details at curbs and vertical surfaces.

   b. Layout drawings of wheel stops and installation details

   c. Details of custom (nonstandard) curbs and stair tread/risers, include methods ofinstallation

4. CHPS v2009 ME4.1: Recycled Content: Provide certification that Wheel Stop materials contain 100 percent Post Consumer Recycled Content.

5. Samples: Three (3) sample ADA Warning pavers of each manufactured, type, size and color selected or specified.

6. ADA Pavers 5 Year Warranty.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications for ADA Pavers:

1. All products covered under this Section shall be produced by a single manufacturer unless otherwise specified.
2. Manufacturer shall submit evidence of having not less than fifteen (15) years successful production of this product.
3. The paver manufacturer shall demonstrate, either by proven field performance or a laboratory freeze-thaw test, that the ADA paving units have adequate durability if they are to be subjected to a freeze-thaw environment.
   a. Satisfactory field performance is indicated when units similar in composition and made with the same manufacturing process as those to be supplied to the purchaser, do not exhibit objectionable deterioration after at least 3 years.
   b. The units used as the basis for proven field performance shall have been exposed to the same general type of environment,

temperature range and traffic volume as is contemplated for the units supplied to the purchaser.

B. Subcontractor Qualifications:
1. Subcontractor shall submit evidence of skill and not less than five (5) years specialized experience with this product.

C. Pre-Installation Conference: As directed by the Architect.

1.07 PROJECT/SITE CONDITIONS

A. Environmental Requirements: Do no work during freezing weather or on wet or frozen sub-base.

B. Mock-up Installation
1. Prior to the start of precast concrete ADA warning paver work construct mock-up on each type of paver size and pattern area including precast curb for the Owner and Architect to review. The mock-ups will be at the project site at a location mutually agreed to by the Owner and Contractor.
2. Construct the mock-up installations in a minimum 2 foot x 4 foot area of typical
precast concrete ADA warning units and slabs with all setting beds, joints, edge and curb details as shown on th drawings.
3. After review of the mock-ups, they should be retained and used as a standard of quality for the precast concrete ADA warning paver work. At completion of the work remove the mock-up installations and related materials from the project site. If the mock-ups are incorporated in the actual construction, record their actual locations and sizes on the actual built record drawings for the project.

1.08 SEQUENCING AND SCHEDULING

A. Coordinate sequencing and scheduling of work with other supporting, adjacent, contiguous or otherwise related material trades.

PART 2: PRODUCTS

2.02 MATERIALS –

1. ADA PAVERS:
A. Basis of Design:: Wausau Tile, Precast Concrete Warning Pavers
B. Other Manufactuers:
a. Hanover
b. ADA Armor-Tile
c. Castek

B. System Name: Thinset Mortar Method - Pedestrian Installation

C. Precast Concrete ADA Warning Pavers
1. Name: Terra-Pavers ADA Warning Pavers, Truncated Dome
2. Size: As selected
3. Texture: Per Drawings
4. Color: Federal Yello
5. Reference Standard:
a. Cementitious Materials: Materials shall conform to the following applicable ASTM Specifications
1.) Portland Cement: ASTM C 150 for Portland Cement
b. Aggregates shall conform to these ASTM specifications, except that grading requirements shall not necessarily apply:
1.) Normal Weight: ASTM C 33 for Concrete Aggregates
c. Other Constituents: Coloring pigments, integral water repellents, etc., shall be previously established as suitable for use in concrete and either shall conform to
ASTM Standards where applicable, or shall be shown by test or experience not to be detrimental to the durability of the concrete.
6. Performance Requirements:
a. Compressive Strength: At the time of delivery to the work site, the average compressive strength shall not be less than 8,000 psi with no individual unit less than 7,500 psi per ASTM C 140.
b. Absorption: The average shall not be greater than 6% per ASTM C140.
c. Flexural Strength: Not less than 700 psi per ASTM 293 .
d. Load carrying capacity: Paver units shall have a tested center load capacity of 1,850 lbs. WT CL96
e. Latex Mortar Mix: A.N.S.I A-118.4
f Water: Clean and free of deleterious acids, alkalies or organic materials
g. Grout: A.N.S.I. A-118.6, Grout - Latex
h. Sealant: As specified in Section 07920 - Sealants and Caulking
i. Back-up: As specified in Section 07920 - Sealants and Caulking
j. Bond Breaker: As specified in Section 07920 - Sealants and Caulking

2. RECYCLED RUBBER WHEEL STOPS:
A. American Precast Concrete, or Approved Equal
1. 4”H x 6”W x 72” long
2. Color: As Selected from Manufactors standard
3. 100% Post Consumer Recycled Content
4. Hardware as required for concrete slab mechanical fastening
5. Other accessories required for complete installation

B. System Name: Thinset Mortar Method - Pedestrian Installation

3. METAL BOLLARDS
   A. Dawn Enterprises or Approved Equal
      1. Size: 4" Dia X 4'-0" AFF
      2. Type: Extra Heavy Duty Steel Pipe
      3. Cap: Flat
      4. Finish: Powder Coated
      5. Color: As Selected from Manufactors standard
      6. Installation: Surface Mounted Concealed Plate, Fixed
      7. Other accessories required for complete installation

2.03 MIXING

A. Latex Portland Cement Mortar setting bed: As recommended by the manufacturer.

B. Grouting Mix: Latex fortified as recommended by manufacturer. Color as selected.

C. Rework mixes from time to time to maintain proper consistency, as recommended by manufacturer but do not add ingredients. Discard mortar that has reached its initial set.

PART 3: EXECUTION

3.01 INSPECTION

A. Examine all surfaces to receive the parts of the work specified herein. Concrete slab shall not exceed 1/8" in 10'-0" from required plane. Notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected. Installation of precast concrete pavers and associated construction constitutes acceptance of the adjacent and underlying construction.

B. Installation of Mortar bed as per TCA F102. All materials used follow instructions of manufacturer for use in mortar method.

C. Install precast concrete ADA Warning pavers

D. Grouting of pavers in strict accordance with grout manufacturer's directions and instructions. Latex or acrylic additives of the same manufacturer as the grout.

E. All control and expansion joints to be installed as per TCA EJ 171. All joint materials used to follow manufacturer's directions and instructions.

F. Field cut precast pavers in accordance with manufacturer's recommendations for methods, equipment and precautions.

3.02 CLEANING AND PROTECTION

A. Remove and replace ADA Warning pavers which are loose, chipped, broken, stained or other wise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment to eliminate evidence of replacement.

B. Cleaning: Remove mortar stains and all other types of soiling from exposed paver surfaces, wash and scrub clean.

C. Provide final protection and maintain conditions in a manner acceptable to installer, which ensures paver work being without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 32 1723

PAVEMENT MARKINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Parking stripes, markings and accessibility symbols.

2. Exterior athletic court markings.

3. Playground markings.

4. Fire lane “No Parking.”

5. Curb marking and red curbs.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 32 1236 - Seal for Bituminous Surfacing.

1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings, indicating location, extent, color and texture of markings.

B. Material Samples: Submit color Samples.

1.03 PROJECT CONDITIONS

A. Do not install markings when adverse weather conditions are forecasted.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Paint: Water emulsion-based traffic paint must be approved by OEHS (LAUSD’s Office of Environmental Health and Safety)

1. Dunn Edwards: Vin-L-Stripe.

2. Pervo Paint Company: Acrylic Traffic Paint.

3. Sherwin Williams: Setfast Acrylic Traffic Paint.

4. Vista Paint Corporation: Traffic Paint.

5. Equal.

PART 3 - EXECUTION

3.01 PAVEMENT MARKINGS

A. Application of Paint:

1. Prior to application of paint, allow the pavement to properly cure. Clean and prepare in accordance with paint manufacturer's written recommendations.

2. Provide mechanical equipment to apply paint in a uniform, straight or curved pattern, without gaps, holidays, runs, or other defects.

3. Do not permit traffic until paint has completely cured.

4. Apply two coats in thickness recommended by manufacturer.

5. Playground Markings: Submit Samples to Architect for review. Limited color palettes may be submitted.

B. Marking Width and Color: Unless indicated otherwise, marking width and color are as follows:

Location	Width	Color
Parking stall lines	4 inches	White
Traffic markings		
Striping:	4 inches	Yellow
General	4 inches	Yellow
Accessible Parking	4 inches	Blue
International Symbol of Accessibility (ISA)	2 inches	White on blue background
Athletic Court Lines:	2 inches	*White
Letters and numbers:		As indicated

*Where two sets of lines overlap, one set shall be white and the other set shall be yellow.

3.02 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.03 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 32 3110

CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Chain link fences and gates as indicated and to meet all applicable specifications for doors and hardware.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 05 5000 - Metal Fabrications.

3. Section 31 2200 - Grading.

4. Section 31 2316 - Excavation and Fill for Paving.

5. Section 32 0117 - Pavement Repair.

6. Section 32 1313 - Site Concrete Work.

7. Section 08 7100 – Door Hardware.

1.02 SUBMITTALS

A. Shop Drawings:

1. Submit plans and details indicating extent of fences, locations of gates, and details of attachment and footings. Indicate means and methods for surface preparation and finishing.

1.03 QUALITY ASSURANCE

A. Chain Link Fence Manufacturers Institute: CLFMI Product Manual.

B. ASTM A123: Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.

C. ASTM A392: Specification for Zinc-Coated Steel Chain Link Fence Fabric. ASTM F567: Practice for Installation of Chain Link Fence.

E. ASTM F626: Specification for Fence Fittings.

F. ASTM F668: Specification for Poly(Vinyl Chloride) (PVC) and Other Organic Polymer-Coated Steel Chain Link Fence Fabric.

G. ASTM F900: Specification for Industrial and Commercial Swing Gates.

H. ASTM F1083: Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.

I. ASTM F1184: Specification for Industrial and Commercial Horizontal Slide Gates.

J. ASTM F1553: Guide for Specifying Chain Link Fence.

1.04 REGULATORY REQUIREMENTS**:**

A. Locate latching hardware between 34 inches to 44 inches above the finished floor, per 2016 California Building Code, Section 11B-404.2.7.

1. Panic hardware: locate between 36 inches to 44 inches above the finished floor.

B. Handles, pull, latches, locks, other operable parts**:**

1. Readily openable from egress side with one hand and without tight grasping, tight pinching, or twisting of the wrist to operate. 2016 California Building Code Section 11B-309.4.

2. Force required to activate the operable parts: 5.0 pounds maximum, per 2016 California Building Code Section 11B-309.4.

C. Adjust doors to open with not more than 5.0-pounds pressure to open at exterior doors and 5.0-pounds at interior doors. As allowed per 2016 California Building Code Section 11B-404.2.9, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15-pounds.

1. Exception: exterior doors' pressure-to-open may be increased to 8.5-pounds if: at a single location, and one of a bank of eight leafs or fraction of eight, and one leaf of this bank is fitted with a low- or high-energy operator.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete Materials and Properties: Comply with requirements of Section 03 3000 - Cast-in-Place Concrete to provide normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3,000 psi, 4-inch slump, and one inch maximum size aggregate.

1. Concrete may be provided in the following volumetric proportions:

Portland Cement 1 part

Fine Aggregate	2 parts
Coarse Aggregate (1/4 inch to 1-1/2 inches)	4 parts
Water	7 ½ gallons, maximum per sack of cement.

B. Chain Link Fence Fabric: Polymer Coated Steel Fabric: ASTM F668, the wire gauge specified for polymer-coated wire is that of the metallic coated steel core wire, mesh size shall be 1" x 1", Class 2b fused and adhered. Color: black in compliance with ASTM F934.

C. Posts, Top Rails, Brace Rails and Gate Frames: Standard weight, galvanized, welded or seamless steel pipe conforming to ASTM F 1083, with a minimum yield strength of 35,000 psi. Embed posts into footing 6 inches less than the depth of the footing unless noted otherwise on drawings.

D. Schedule of Posts and Footings:

Item	Height	Nominal Pipe Size (inches)	Outside Diameter (inches)	Weight (pounds per foot)	Footings*	
					Diameter (inches)	Depth (inches)
Top Rail, Brace Rails and Transom Rails	Up to 10'-0"	1-1/4	1.660	2.27	N/A	N/A
Line Posts	Up to 6'-0"	2	2.375	2.65	12	24
	6'-1" to 8'-0"	2	2.375	2.65	12	36
Terminal, Corner, Angle & Pull Posts	Up to 8'-0"	2-1/2	2.875	5.79	12	36
Pedestrian Gate Posts	Up to 8'-0"	2-1/2	2.875	5.79	14	36
Gate Frames	Up to 8'-0"	1-1/2	1.900	2.72	N/A	N/A
Driveway Double-Leaf Swing Gate Posts: Opening						
Up to17'-3-1/2"	Up to 8'-0"	3 1/2	4	9.11	16	42
17'-4" to 20'-3-1/2"	Up to 8'-0"	3-1/2	4	9.11	16	42

E. Post Caps: Malleable iron, ASTM F 626, , designed to fit snugly over posts with a minimum projection of 1-1/2 inches below top of posts. Post caps shall be manufactured with a curved top.

F. Eye Tops: Malleable iron, ASTM F 626, , designed to fit over line posts, and for through passage of top rail.

G. Expansion Sleeve Couplings for Top Rails: Steel, 6 inches long, designed to fit tightly on inside of rail, fitted with raised center.

H. Rail Ends for Top Rails and Brace Rails: Malleable iron, ASTM F 626, , with holes to receive 3/8 inch bolts for securing to rail end bands.

I. Tension Bands and Bands for Securing Rail Ends: Mild steel flats, at least 11 gage x one inch, tension bands in gates shall be 11 gage by 1 inch. Bolts for use with tension bands and rail end bands shall be 3/8 inch by 1 ½-inch.

J. Tension Bars: Mild steel flats at least 3/16 inch by 3/4 inch.

K. Tension Wire for Installation at Bottom of Fabric: 6 gage steel spring wire, conforming to requirements of AISI Steel Products Manual, Carbon Steel Wire, Section 16, merchant quality, galvanized, soft temper with Type I coating. Wavy type wire is not acceptable.

L. Turnbuckles for installation with Tension Wires: Eye and hook type, drop forged steel, right and left hand threads, at least 3/8 inch screw diameter with at least 4 ½-inches of take-up.

M. Tie Wire: Aluminum ties 6 gage for fastening fabric to posts, top rails and brace rails. At bottom tension wire 9 gage galvanized hog rings shall be installed.

N. Finish of Metal Parts: Post caps, couplings, rail ends, tension bands, tension bars, turnbuckles, rivets, bolts, and other metal parts and fittings shall be hot-dipped galvanized after fabrication, except bolts, which may be galvanized or cadmium-plated. Galvanizing shall conform to ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products, and ASTM F 626Specification for Fence Fittings.

O. Paints for Refurbishing Existing Fence Posts, Rails, and Accessories: As required to provide the galvanized color of a new installation.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install fences to heights indicated on Drawings.

B. Space fence posts at equal intervals between terminal, angle, corner, and gate posts, and not more than 10 feet apart measured from center to center of posts. In curved fence sections having a radius of 50 feet or less, space posts not more than 5 feet - 6 inches apart. Install posts so that top of eye of post caps are level with top of fabric.

C. Install angle or corner posts at each change in direction of 15 degrees or more, at change of 5 percent or more in grade of fencing, and at the beginning and end of curved fence sections.

D. Install terminal posts at ends of runs of fencing. Install gateposts on both sides of driveway and pedestrian gates. For double-leaf gates, net opening between gate posts shall be gate size as indicated on Drawings, plus 3 ½-inches; for single leaf gates, net opening shall be gate size plus 2 ½-inches.

E. Where a fence is to be installed on a curb, construct footings with top of footing level with the lower finish grade. Align posts, set plumb and true before placing footings. Remove splattered concrete from exposed pipe surfaces while concrete is still soft. In bituminous surfaced areas, install seal coat on top of concrete footings.

F. Install fences with top rail. Top rail shall pass through eye tops and be secured at ends with rail-end fittings and bands.

G. Install fences over 10 feet in height, in addition to top rail, with a full length horizontal mid-rail set at mid-height of fence and rigidly secured to posts with rail end fittings and bands.

H. In fences higher than 10 feet, install brace rails at angles, corners, and terminals at 1/4 and 3/4 of fence height. Provide one horizontal brace rail in panels adjacent to terminal, angle, corner, and gateposts, install at mid-height of fence and rigidly secured to posts with rail end fittings and bands. Provide horizontal brace rails, as specified, in panels of curved sections having a radius of 50 feet or less. Brace rails are not required in fencing 4 feet or less in height.

I. Provide a transom rail and fabric at top of pedestrian gate openings. Install transom rail 6 feet 8 inches above high point of grade at gate opening. Ends of transom rails shall be pinned or riveted to rail end fittings with 1/4 inch mild steel rivets. Pin or rivet must go through rail and peen. Welding on rail ends is not permitted.

J. Install bottom tension wire a minimum of 3 inches from grade for fencing, and provide a turnbuckle for each 150 feet of wire or fractional part thereof. Turnbuckles are not required in runs of 15 feet or less. Install ends of tension wires to posts in a manner to prevent slipping or loss of tension. Wrap should start from fence side of post. Turn end of wire around post tightly twisted at least three times around wire. At turnbuckles, wire through eye and tightly twist end at least three times around wire. Cut tail of bottom wire flush.

K. Install fence fabric on outward facing side of posts, except for tennis courts. Install fence fabric with top edge projecting above top rail of fence.

L. Install bottom of fence fabric to clear finish grades, except on bituminous surface install 3/4 inch above such surface. Locally shape and trench ground surfaces where necessary to provide uniform top and bottom alignment of fence.

M. Tightly stretch fabric and at terminal, pull corner, angle, and gateposts, secure with tension bars extending full height of fence. Secure tension bars to posts with bolted tension bands spaced not more than 14 inches apart.

N. Bands and Ties: Install bands and ties in accordance with following schedule:

15 bands on 16 feet fence	16 ties on 16 feet fence
11 bands on 12 feet fence	12 ties on 12 feet fence
7 bands on 8 feet fence	7 ties on 8 feet fence
6 bands on 6 feet fence	6 ties on 6 feet fence
4 bands on 4 feet fence	4 ties on 4 feet fence

O. Fasten fabric to line posts with wire ties spaced not more than 16 inches apart. Where 6 gage aluminum ties are furnished, hook the tie at both ends. Installation of hooked ties with links is not permitted.

P. Fasten fabric to top rails, mid-rails, brace rails, with wire ties spaced not more than 18 inches apart. Bend back ends of tie wires so as not to be a hazard. At bottom tension wire, install hog rings spaced not more than 18 inches apart. Where 2 fabrics are furnished, lap the fabrics one mesh at mid-rail and tie both fabrics with 9 gage wire or 6 gage aluminum ties to midrails.

Q. Grind all field welds smooth, clean off flux and spatter, damaged galvanizing removed, burrs and projections ground off, properly prepared, then heavily coated with galvanizing repair coating as specified in Section 05 5000; or equal product approved by Owner's Office of Environmental Health and Safety. Install coating in accordance with written recommendations of manufacturer.

R. Fabrication of Gates:

1. Frames: Fabricate gate frames from steel pipe of size specified, with joints at corners miter cut and continuously welded to sides.

2. Fabric: Install fence fabric to side members with tension bars and tension bands as specified, spaced not more than 14 inches apart. Tension bars shall extend full height of gate. Install fence fabric to top and bottom members and to brace rail with wire ties as specified for top rails, spaced not more than 12 inches apart.

3. Latches: Gate latches and strikes will be furnished by the Owner. Weld gate latches and strikes to gate posts and frames. Welding shall be performed before gate frames are galvanized, or welds shall be finished as specified for field welds.

4. Hinges: Install and adjust hinges; burr or center punch threads of gate hinge bolts to prevent removal of nuts. Install 3 hinges on each post for swing gates more than 16 feet wide. Hinges will be provided by the Owner.

5. Grind welds flush and smooth. Hot-dip galvanize fabricated parts after welding, or finish weld as specified for field welds.

3.02 TENNIS COURTS PERIMETER FENCING

A. Perimeter fences for tennis courts shall not be less than 12 feet in height. Instead of providing bottom tension wire, provide with horizontal bottom rail. Remove bottom tension wire or redwood header in existing chain link fences and add bottom rail, if not existing. Install fabric on courtside of posts.

3.03 FENCING ON TOP OF HANDBALL COURT WALLS

A. Posts, rails, chain link fabric and accessories required for a complete installation shall be as specified, except that chain link fabric shall be 9 gage wire minimum by 1 inch mesh.

3.04 INSTALLATION ON TOP OF CONCRETE WALLS

A. Posts for fences on top of new concrete or concrete masonry walls shall be installed in 24 gage galvanized iron inserts one inch larger than the outside post diameter. Wall thickness for such installation shall be 8 inches minimum. Depth of embedment of post shall not be less than 15 inches for fence height not exceeding 4 feet. Install post plumb, true, and fill joint space with non-shrink grout as specified in Section 05 5000, finished flush with top of wall. Remove excess grout and clean posts.

B. Fencing on Gravity Walls: Post of fence not exceeding 8 feet high shall have a minimum of 15 inches embedment in gravity walls with a top width of 10 inches minimum and side of 1H: 4V. Where the height of gravity wall from top to bottom, within 5 feet from each side of a post, is less than 22 inches, provide concrete fence post footings and embed posts in accordance with the schedule of posts and footings as set forth in this section.

C. Do not install footings on existing walls without the review of the Architect and DSA.

3.05 REINSTALLED FENCING

A. Where existing fencing is indicated to be reset or relocated, remove existing concrete footings from posts and legally dispose of off the Project site. Construct new concrete footings, as specified, in their designated location. Replace parts of fencing broken or damaged during removal and re-installation with new parts as specified to complete reinstallation. New materials shall closely match design of existing installation. Top rail will be required in reinstalled fencing, which does not have top rail in its existing condition. Install as specified for new installations.

B. Existing fences shall be reset where finish pavement is raised or lowered more than 6 inches from existing grade. Remove and reinstall entire fence assembly as specified.

3.06 FENCING ADJUSTMENTS

A. Where the finish grade is raised 6 inches or less, cut and re-knuckle the existing fence fabric. Adjust tension wire and tie to fabric. Bottom of fence fabric shall be installed ¾" above finish grade.

B. Where the finish pavement is lowered 6 inches or less, demolish the fence footing flush with the finish grade and adjust the fabric and its attachments. Bottom of fence fabric shall be installed ¾ inches above finish grade.

C. Post footings and fabrics that require readjustment after installation shall be entirely replaced.

3.07 INSTALLATION OF GATES

A. Provide gates of the sizes indicated on Drawings. Allow clearance on gates of 1-1/2 inches at bottom and one inch at top. Construct gates installed in sloping areas to conform to the grade. Provide an opening in each gate for access to locking device or padlock. Knuckle ends of fabric cut for opening to eliminate hazards.

B. Sliding Gates and Swing Barricade Gates: Fabricate and install as indicated on Drawings. Wheel housing must be designed to fit tightly to roll track and prevent gate from rolling over objects. Unsupported cantilever type roll gates are not acceptable. Install gate stops in accordance with the drawings. Both top and track stops are required.

3.08 RE-FENCING

A. Hardware Removal: Disassemble existing fence and all attachment hardware (bands, pipe, and wire) prior to preparation of posts for painting

B. Fabric Removal: Do not remove more than what can be replaced during one day unless a barricade, providing equal security, will be installed in its place. If freestanding temporary fence is used, it must be clamped and wrap tied.

C. Post and Rails: Bent posts, rails and accessories shall be replaced. Cut bent portion of posts and weld new sections of equal diameter and thickness. Install splice to inside of all welded section prior to welding. Previously repaired or welded posts shall be replaced as necessary.

D. Painting:

1. Preparation: Prepare exposed steel posts, rails and accessories thoroughly cleaned of rust, oil and foreign materials. Painted galvanized metal shall be stripped to bare metal before applying prime coat.

2. Priming: Spot prime areas from which the original surface coating had been removed with a metal primer to match adjoining surfaces. Subsequently, install a prime coat to the entire surface to be painted.

3. First Coat: Install first coat as recommended by the paint manufacturer. Furnish a color that is 10 percent to 15 percent lighter or darker than the finish coat.

4. Second or Finish Coat: Install finish coat after the first coat has cured.

5. Install paint in accordance with manufacturer's written recommendations.

6. Protect adjacent structures, walls, concrete or asphalt from paint.

3.09 COMPLETION

A. Completed fencing shall form continuous units between points indicated with required parts, accessories, and fittings provided and installed. Clean exposed metal surfaces of cement, grout and other foreign substances.

B. Fill in holes left by removal of existing fence footings, except in areas where grading Work is indicated or specified, to existing grade with clean earth thoroughly compacted to at least same density as adjoining soil.

3.10 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.11 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 32 8413

POTABLE WATER IRRIGATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Potable water irrigation system.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 01 4524 - Environmental Import/Export Materials Testing.

3. Division 22 - Plumbing.

4. Division 26 - Electrical.

5. Section 31 2313 - Excavation and Fill.

6. Section 31 2323 - Excavation and Fill (Utilities).

7. Section 32 8416 - Irrigation Controls.

8. Section 32 9000 - Planting.

1.02 SUBMITTALS

A. Materials List: Provide manufacturer’s name and description of items to be furnished.

B. Product Data: Provide catalog cuts, technical data, and manufacturer’s specifications.

C. Shop Drawings: Provide Shop Drawings indicating proposed system layout, locations of controllers, valves, backflow devices, flow sensors, master valves, quick couplers, heads and point of connections. Include details for sleeves, yard boxes, backflow devices, and controller installations.

D. Provide proof of purchase for energy saving devices to the Owner. Owner will receive rebates as part of energy savings program.

E. RECORD DOCUMENTS

1. Before Contract Completion, provide project record documents as follows:

    a. Indicate the location of each numbered sprinkler controlled valves and quick coupling valves with legible dimensions from two permanent points of reference such as building corners or sidewalks.

2. Closeout Submittals-As Built:

    a. Submit three copies of as-built including complete list of materials, manufacturer's name, and product installation literatures.

    b. Record drawings: Submit dimensioned drawings and details, before Contract Completion.

    c. Record Drawings shall contain the following:

        1) As-Built shall be computer generated (C.A.D.)

        2) Print shall show the locations of the numbered remote control valves, manual control valves, locations and size of supply and lateral lines, location and type of sprinkler heads, quick coupling valves, gate valves, backflow devices, point of connections, controllers and other related equipment.

        3) Dimensions shall be legible from two permanent points of reference such as buildings and sidewalks.

        4) Shall be 24-inch by 36-inch minimum size.

    d. Proof of Backflow Registration:

        1) Contractor to provide proof of registration with the jurisdictional authority.

        2) Backflow test results shall be acceptable to the jurisdictional authority.

3. Operation and Maintenance Manuals:

    a. Provide complete operating and maintenance instruction manuals for equipment.

    b. Provide in writing as part of the Water Management Program the controller settings for water under Best

Management Practices No. 5 Handbook for all seasons. This service shall be performed by a certified water auditor and paid by the Contractor. This report shall identify designed controller setting for water discharge and actual installed discharged tested. The audit report shall also include the status of items indicated in paragraph 1.07.C based on final inspection and testing.

1.03 REFERENCES

A. American Society for Testing and Materials International (ASTM):

1. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

2. ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.

3. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

4. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

B. American Society of Mechanical Engineers International (ASME):

1. B36.10M - Welded and Seamless Wrought Steel Pipe.

C. American National Standards Institute (ANSI):

1. ANSI B125.1 - Welded And Seamless Steel Pipe.

2. ANSI B125.2 - Black/Hot-Dipped Zinc Coated Welded/Seamless Pipe.

D. Federal Specifications:

1. FS WW-P-460 - Pipe Fittings: Brass Or Bronze.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with local, municipal and state laws, rules, and regulations governing or relating to this Work. Wiring shall conform to National Electrical Code.

B. Best Management Practices: Conform to “Handbook Five: A Guide for Implementing Large Scale Irrigation Projects” as required by The California Water Conservation in Landscaping Act (Assembly Bill 325).

1. AB 325 California Calculation of Estimated Applied Water Use (EWU).

2. AB 325 California Calculation of Maximum Applied Water Allowance (MAWA).

C. Conform to California Code of Regulations, Title 23, Division 2, Chapter 2.7, Model Water Efficient Landscape Ordinance.

D. Manufacturers Instructions: The manufacturer’s instructions and detailed drawings shall be followed where the manufacturers of products and/or materials furnish installation details not indicated in the Drawings and Specifications.

E. Qualifications: Work shall be performed by skilled workers with a minimum of five years experience in work of similar scope and complexity.

F. Designs and materials used shall conform to the Efficient Landscape Ordinance, AB 1881 water efficiency use requirements.

1.05 PRODUCT HANDLING

A. Do not damage materials during handling, loading, unloading, and storage of pipe and fittings. Store materials under cover, protect from direct sunlight. Transport materials in a manner to avoid undue stress on piping and other materials.

B. Do not install damaged materials or products into the Work.

1.06 PROJECT CONDITIONS

A. Before excavation, contact the "Underground Service Alert of Southern California" (USASC) for information on buried utilities and pipelines.

1.07 TESTING AND INSPECTION

A. Notify the Project Inspector 24 hours in advance of the pressure side piping inspection.

1. Pressure Side Piping: After welded joints have cured for at least 24 hours, lines flushed and outlets are capped, the system shall be tested under normal street water pressure for a minimum of 4 hours. Joints shall remain exposed for inspection during the

pressure test. Center loading of piping with small loads of sand backfill to prevent arching or slipping under pressure is permitted.

2. Correct defective Work and repeat tests until the entire system is tested watertight.

B. Submit a request for a final inspection 48 hours in advance. Perform a coverage test to determine if the coverage of water to turf and planting areas is complete and adequate as required.

C. Final Inspection: The following items shall be considered part of the final inspection:

1. Specified products and materials.

2. Irrigation coverage test, providing 100% head to head coverage.

3. Soils compacted in trenches and around sprinkler heads, level with existing grades.

4. Controller and cabinet installation.

5. Sprinkler control valves and boxes.

6. Backflow devices, pressure regulators, pumps.

7. Automatic sensors.

8. Final site review shall include operating each system in its entirety in the presence of the Landscape Architect or Project Inspector.

9. Provide any required adjustments and correct defective Work as required.

1.08 MAINTENANCE

A. Extra Materials, Tools and Accessories:

1. Spare Sprinkler Heads: Furnish twelve spare sprinkler heads, with inserts for each type, size and series installed.

2. Keys and Wrenches:

a. Keys: Furnish two tagged pin tumbler type keys.

b. Wrenches: Furnish two sets for each type of sprinkler head or nozzle.

c. Coupler: Furnish a minimum of one quick coupler key (quill) and an additional key for every three quick-coupler valves installed.

B. Training:

1. Before substantial completion provide at least 4 hours of training, by an authorized representative of the controller manufacturer, for each type of irrigation controller installed.

2. Instruct designated Owner personnel on operation and programming of the irrigation controller and hand held controller, demonstrating program features.

3. Review "As-Built" plans with Owner's personnel and explain the following features: master valve, flow sensor, rain sensors, pump, backflow devices and locations of critical valves.

4. Provide an attendance sheet to the Owner listing personnel trained.

1.09 WARRANTY

A. Provide a five year manufacturer's warranty for controller units.

B. Provide a one year warranty for materials, fabrication, and installation, including restoration of planted or paved areas due to settlement of trenches.

PART 2 - PRODUCTS

2.01 IRRIGATION SYSTEM

A. Systems shall be automatic with electrically operated control valves.

B. Provide 100 percent head to head triangulated coverage or other required 100 percent configuration.

C. Point of connection (POC) for irrigation systems:

1. Provide a single POC on a designated irrigation meter, with flow monitoring, unless otherwise indicated on the Drawings.

D. No PVC piping of any kind will be permitted for above grade pressure lines.

E. Full meter protection is required for irrigation systems by installing reduced pressure principle backflow prevention devices.

F. Install isolation valves in order to avoid a total system shutdown for maintenance and repairs. Include valves to isolate loop system and major branch lines.

G. Irrigation System shall incorporate the following requirements:

1. The flow velocity shall not exceed five feet per second for pressure/lateral lines based on industry standard friction pressure loss values.

2. Pressure line pipe size shall be sufficient to support a minimum of two control valves operating at the same time, one valve opening while another is closing.

3. G.P.M. demand and sprinkler head coverage shall follow the manufacturer's requirements.

4. Remote valves shall be sized no smaller than the piping it serves unless piping is increased in size to reduce friction loss. Remote valves shall then be sized no less than one pipe size smaller than the piping it serves.

5. Minimum pipe size shall be ¾ inch.

2.02 MATERIALS

A. Provide only new materials, of brands and types noted on Drawings and in the Specifications.

B. Plastic Pipe and Fittings:

1. Plastic Pipe: Schedule 40, extruded from 100 percent Virgin Polyvinyl Chloride (PVC) Compound, meeting requirements of Class 12454-B of ASTM D1784.

a. Plastic pipe shall be continuously and permanently marked with the following information: Manufacturer's name, nominal pipe size, Schedule or Class, SDR (Standard Dimension Ratio, or pressure rating in psi) National Sanitation Foundation (NSF).

2. Plastic fittings: Schedule 40 molded from PVC Type I Compound, conforming to the requirements of specification ASTM D2466.

a. Plastic Nipples: PVC schedule 80 conforming to ASTM D2467.

b. PVC Male Threaded Nipples: Schedule 80 only.

3. PVC primer and solvent for chemical weld of pipe and fittings shall be as recommended by pipe manufacturer. Containers for solvent and primer shall be clearly marked with manufacturer's data. Solvent and primer shall not be more than one year old. Blue or red hot glue is not permitted.

1. IPS Weld On P-70 primer.

2. IPS Weld On 2711 (gray) cement.

C. Pipe and Fittings:

1. Connection between any female threaded fitting and plastic pipe shall be bridged with a Schedule 80 PVC nipple.

D. Valves: (PVC Valves are not permitted):

1. Ball valves shall be as specified on plan.

a. Nibco Model T585-70 or equal

2. Quick coupler valves shall be brass, 1 inch, with lock top and resilient cap.

Rainbird 44LRC, or equal.

a. Quills shall be the same manufacturer as quick coupler valve, cast bronze, machine shank, stainless steel or bronze lugs.

3. Coupler keys (quills) shall be from the same manufacturer as quick coupler valve; cast bronze with stainless steel or bronze lugs.

4. Pressure Relief Valves shall be set at a 150 psi. Bronze body with internal brass parts, stainless steel springs, and 3/4 inch IPS, angle type, with purge lever:

a. Wilkins P220, Watts 31, or equal.

6. Check Valves:

a. Swing Type: Check Valves shall be 200 lbs. WOG: bronze screwed with replaceable neoprene disc. Shall have a straight through pattern with closing member set on angle.

Of size and type indicated on the Drawings. Disc shall close tight to prevent low head drainage:

1) Watts Series WCV-2, Nibco T-413, or equal.

b. Pop-up Type: Check valves shall be PVC body, neoprene disc, stainless steel spring and integral components, straight through pattern, screwed. Valve to be adjustable in field from5 feet to 40 feet head to prevent low head drainage. Size and type indicated on Drawings.

7. Electric remote control valves shall be 24 volt normally closed solenoid actuated valve, capable of operating on 14 gage UF wire; either bronze or brass, globe or angle pattern, and diaphragm actuated:

a. Superior 950, Rainbird GB Series, or equal.

8. Manual sprinkler control valves are not allowed.

9. Master Control Valves:

a. Shall be a normally open solenoid actuated valve. Valve shall have a NPT inlet and outlet, and shall be capable of working pressures up to 150 psi. Superior 3300 per plan.

b. Shall meet requirements for Automatic Valves, except for those indicated on article “a” above.

c. Shall be installed with separate power and common wires.

E. Sprinkler Heads:

1. In planters and shrub areas, provide 12” inch plastic pop-up sprinkler heads with built in check and adjustable nozzles with diameter of coverage as indicated on drawings:

a. Hunter Rotator Nozzles per plan.

2. Tree area sprinklers shall be pressure compensating flood bubbles surrounded by a perforated sleeve and gravel:

a. Rainbird 1400 Deep Root Series.

3. Install on triple swing assemblies: King Bros. Industries, TSA-0500-SS, Hunter SJ-505, or equal, through SJ 712 or swing joints assembled with PVC schedule 80 nipples and Marlex 90 degree “L”.

F. Back Flow Protection Device:

1. To operate on a reduced pressure principle furnished with a full port shut off valve up stream and down stream of the backflow device. Provide and install enclosure to house backflow device.

2. Wye strainers at back flow device shall be 125 pounds class customer brass with 40 mesh Monel screen.

3. Provide and install permanent enclosure to house backflow device

4. On Backflow Devices 2" and smaller. Enclosures shall be stainless steel "Strong Box- SMOOTH TOUCH" manufactured by V. I. T. Products. Inc or Equal

5. On Backflow Devices larger than 2" enclosure shall be vandal and weather resistant made of marine grade aluminum alloy or stainless steel. The enclosure shall have a mounting lip on one end and a locking mechanism on the other end. The locking mechanism shall be of the full release type which allows for complete removal of the enclosure.

    a. Le Muer, "Strong Box manufactured by V. I. T. Products. Inc, Cross Brothers Enclosures or Equal

G Tracer Wires: A No. 14, Green, Type TW plastic-coated copper tracer wire shall be installed with non-metallic irrigation main lines.

H. Control Wires to Control Valves: Control wires to electrically operated solenoid valves shall be direct burial type UF#14 AWG copper, 3/64 inch thick PVC coating. UL approved for Class 2 wiring for 24 volts, 60 cycle AC, use UL recognized waterproof connectors to connect control wires to solenoids.

1. Use UL recognized waterproof connectors to connect control wires to solenoids.

    a. Spears Dry splice DS400 or Equal.

I. Valve Boxes:

1. Rectangular valve boxes shall be green plastic 12-inch wide, 18 inch long, and 12-inch deep (outside dimensions) or larger as may be required to provide specified clearances.

    a. NDS #314BCB or Equal.

2. Round valve boxes shall be green, 7-inch diameter by 10-inch high with locking cover.

a. NDS #312BCB or Equal.

3. Covers on valve boxes shall be vandal resistant, locking, and marked "Water". Tops of boxes shall be set flush with finished turf grade or 2-inch above grade in shrubbery or groundcover areas.

a. The cover shall be identified and “hot branded”with 3-inch high letters “RCV (with Station No.) GV for Gate Valve, or QC for Quick Coupler.

b. Dura Boxes are not allowed.

PART 3 - EXECUTION

3.01 CONNECTIONS TO SUPPLY

A. Source of water supply shall be as indicated on the Drawings.

B. Connection to piping shall be provided with proper fittings:

1. When connecting to point of connection (POC) above grade pipes shall be copper with required fittings unless otherwise indicated.

2. POC from above to below grade transition shall be copper pipe to a depth of 18 inches from top of pipe.

3. No steel pipe or fitting shall be installed below grade.

4. When connecting plastic pipe to copper below grade, provide a schedule 80 PVC nipple.

5. Exposed copper or brass material above grade shall be painted green in color.

6. Connect steel and copper pipe or tube with a 6-inch brass nipple.

3.02 PIPE INSTALLATION

A. Excavate trenches deep enough to provide earth coverage of 12 inches for non-pressure lines and 24 inches for pressure lines, from finished grades to top of pipe. Bottom of trenches shall be free of rocks, clods and other sharp-edged objects. Below grade piping shall be installed on a firm sand bed for its entire length.

B. Plastic pipe and fittings shall be solvent welded. PVC pipe ends shall be cut ninety (90) degrees and cleaned of cutting burrs prior to cementing. Use approved reaming tool. Pipe ends shall be wiped clean with a rag and

lightly wetted with PVC primer. Cement shall be applied with a light coat on the inside of the fitting and a heavier coat on the outside of the pipe. Pipe shall be inserted into the fitting and given a quarter turn to seat the cement. Excess cement shall be wiped from the outside of the pipe. The pipe will be tested as indicated in paragraph 1.07.

C. Cure welded joints at least 15 minutes before moving or handling, and at least 24 hours before applying pressure to system, unless otherwise recommended by joint solvent manufacturer.

D. Irrigation piping installed under a driveway or sidewalk shall be sleeved. The sleeves shall be two pipe sizes larger than the pressure piping.

E. Piping through cement and asphalt pavement shall be L type copper with ¼ inch of foam wrap or other required material around the pipe to allow for expansion.

F. Holes cored through walls shall be two pipe sizes larger to allow for foam wrap around pipe.

G. PVC pipes shall not be installed above grade unless reviewed by the Architect.

H. Lettering shall be face up on below grade PVC piping. Pipe serving tree areas shall be located not more than 30 inch from center of tree area.

3.03 IRRIGATION HEAD INSTALLATION

A. Install sprinkler heads with 100 percent head to head coverage or other required 100 percent head to head coverage method where indicated.

B. To insure proper coverage spray heads and rotary heads shall be installed on separate control valves.

C. Install heads and or change heads, nozzles, or orifices as may be required to provide coverage.

D. Branch lines, swing joints or sprinkler risers shall not be sized smaller than the sprinkler heads inlet they serve.

E. Pop-up Head Installation:

1. Pop-up head shall be installed flush with finished grade and 24 inch from edge of walks, and 9 inches from buildings to parking areas.

2. Install pop-up heads on factory assembled triple-swing joints or triple-swing joints assembled with PVC Schedule 80 nipples and Marlex 90 degree elbows.

3.04 VALVE BOX INSTALLATION

A. Automatic control valves shall be enclosed in valve boxes of HDPE or polyolefin fibrous material, with locking lids.

B. Valve boxes shall be of sufficient size to provide no less than 1-1/2 inch of clearance on all sides of equipment installed within. The bottom section shall be slotted so as to extend below the pipe. Extensions shall be added as required to meet grade requirements.

C. Valve boxes installed in concrete or asphalt shall be set one inch below pipe and extensions shall be added as required to meet grade requirements. A homogeneous finished material shall surround valve boxes 4 inches below finished grade and match existing grade conditions.

D. Valve boxes shall be installed level to finish grade except in ground cover areas which shall extend 2 inches above finish grade.

E. Bottom of valve boxes shall be set level on 4 full size corner bricks on 2 inches of gravel bed.

F. ½" to ¾" crushed gravel shall be filled up to the bottom of the manual and remote valve and at least 4 inches of gravel inside of the valve box.

3.05 QUICK COUPLER VALVES AND ASSEMBLIES

A. Quick couplers shall be one inch brass with one or two piece bodies and locking brass tops with rubber cover.

1. In other applications, install next to walkways.

2. Top of quick coupler assembly shall be installed within 2" from bottom of cover.

3. Quick Coupler supply piping shall originate from a Point of Connection upstream of the Master Valve.

3.06 VALVES

A. ISOLATION AND SHUT-OFF OR BALL VALVES

1. Pressure piping system shall be furnished with valves at points indicated on Drawings or specified.

2. Valves shall be installed with neat appearance and groupings, so parts are easily accessible. Valves near walks, curbs etcetera, to be set-in 12 inches and parallel to the adjacent surface. Remote control valves shall be installed in ground cover or shrub areas wherever possible.

3. Valves shall be full size of line in which they are installed unless otherwise indicated.

B. Remote Control Valves:

1. Remote control valves shall be low wattage (24 volts,) and shall be capable of operating properly on no larger than #14 gage UF wire.

2. Remote control valves shall be adjustable to control flow of water through valve adjustments and shall be accessible through valve boxes installed above each valve. Valves shall be highest quality of manufacturer.

3. Remote control valves shall be installed and adjusted so that sprinkler heads operate at pressure recommended by head manufacturer. Remote control valves shall be adjusted so that sprinkler heads to planting areas from each individual valve system applies a uniform distribution of water.

4. Remote control valves on any line shall be installed 3-inch minimum, 8-inch maximum below finish grade to top of flow control stem.

5. Remote control valves shall be installed with schedule 80 PVC nipples on each side of the valve.

6. Valves for shrub/ground cover areas shall be installed within the perimeter of the area it serves. The location shall be accessible within 12 inches from curb or sidewalk and installed in a location to avoid wetting the person operating the valve manually.

3.07 CONTROLLER, CLOCK AND ENCLOSURE

A. Refer to Section 32 8416.

3.08 BACKFLOW DEVICE ASSEMBLY

A. Backflow devices shall be located where indicated on Drawings and in accordance with Inglewood City and L.A. County Codes. Locate as shown on plan.

B. Assembly shall be furnished with valves, test cocks, and other appurtenances as required by the Los Angeles County Health Department Cross Connection and Water Pollution Control Section.

C. Install thrust blocks and pipe support as required to support backflow assembly.

D. Install backflow device in locked stainless steel or marine grade aluminum enclosure.

E. Installations of backflow prevention devices shall be tested and certified by a certified L.A. County Backflow Prevention Device Tester before Substantial Completion. Test shall be performed in the presence of the Project Inspector. Test reports shall be turned over to the Project Inspector and sent to the jurisdictional authority.

F. Backflow devices shall be Pressure Reducing Valves (PRV) and shall be the same size of main line where installed.

3.09 CONTROL WIRE

A. Mainline control wires shall be taped together at five foot intervals with black electrical tape, then laid parallel to pressure line with 18 inches minimum cover to finish grade.

B. Control wiring located under paved areas shall be encased in Schedule 40 PVC pipe and shall extend a minimum of 12 inches beyond pavement.

C. Wires shall be color coded, white for common ground wire, red or black for valve control wires.

D. Wire splicing shall only be performed in controller cabinet and at remote control valve boxes. Splices shall be made with a mechanical connector equal to Spears Dry Splice Wire Connectors and encased in epoxy resin to provide a permanent watertight connection.

E. Stubbed out control wires shall terminate in concrete yard boxes.

F. Wire passing under future or existing paving or structures shall be encased in Schedule 40 PVC pipe extending at least 12 inches beyond edges of the paving or structure.

3.10 COVERAGE TEST

A. When sprinkler system has been completed, perform a coverage test to determine if coverage of water to turf and planting areas is complete and adequate.

B. Make adjustments, add heads, change heads, nozzles or orifices as may be required to provide complete coverage and provide layout indicated on Drawings.

3.11 PRESSURE TEST

A. After welded joints have cured at least 24 hours and before sprinkler heads are installed, flush out lines and cap outlets. Test system under normal street water pressure, in presence of the Project Inspector.

B. Joints shall remain exposed for examination during pressure test. Center load pipe with small amount of sand to prevent arching or slipping under pressure. Use normal street water pressure for test. Maintain pressure on plastic pipe for not less than four hours.

C. Replace or repair system, including joints that fail during pressure test. Repeat pressure testing until entire system passes the test period without le

3.12 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.13 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site. Hard surfaces shall be washed clean. Daily clean up shall be required on areas used for circulation, parking, or other use.

END OF SECTION

SECTION 32 8416

IRRIGATION CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Weather based irrigation controllers.

2. Flow sensors.

3. Master valves.

4. Enclosures.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Division 22 - Plumbing.

3. Division 26 - Electrical.

4. Section 32 8413 - Potable Water Irrigation.

5. Section 32 8416 - Irrigation Controls.

6. Section 32 8426 - Reclaimed Water Irrigation.

7. Section 32 9000 - Planting.

1.02 PROJECT REQUIREMENTS

A. Provide an Evapotranspiration (ET) weather based irrigation controller with capabilities to receive data from weather stations and sensing devices or servers to automatically adjust or terminate programmed watering schedules.

1.03 SUBMITTALS

A. Product Data: Provide catalog cuts, technical data, and manufacturer's specifications for each product provided.

B. Provide proof of purchase to the Owner. Owner will receive rebates as part of energy savings program.

C. Operation and Maintenance Manuals:

1. Provide complete operating and maintenance instruction manuals for each weather-based irrigation controller provided.

2. Provide complete programming instructions for each weather-based controller.

3. Provide documentation showing compliance with the State of California Water Efficient Landscape Ordinance, AB 1881 revised.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with local, municipal and state laws, rules, and regulations governing or relating to this Work. Wiring shall conform to National Electrical.

B. Conform to California Code of Regulations, Title 23 Division 2, Chapter 2.7, Model Water Efficient Landscape Ordinance.

C. Conform to the Efficient Landscape Ordinance, AB 1881 Standards.

1.05 PRODUCT HANDLING

A. Do not damage materials during handling, loading, unloading, and storage. Transport materials in a manner to avoid undue stress on products.

B. Packaging of weather-based controller shall be sufficient to eliminate damage to the controller upon shipping.

1.06 TRAINING

A. Provide a minimum 4 hours of on-site installation training per site from each ET irrigation controller manufacturer. Training shall explain facets necessary to set up a centrally managed irrigation system. Training is to include drawings and handouts for trainee reference. Training shall be provided by an authorized representative of the controller manufacturer.

B. Provide a minimum 2 hours of on-site operation training per site from each ET irrigation controller manufacturer. Training shall demonstrate all irrigation control and hand-held remote-control programming features. Training shall be provided by an authorized representative of the controller manufacturer.

C. Provide 8 hours of central management system training from each weather-based irrigation control manufacturer. Training, for designated

Owner personnel shall include generating reports from the Central Management Control Area to satisfy the Efficient Landscape Ordinance, AB 1881 requirements as well as operating and programming irrigation controllers using a remote personal computer. Training shall be provided by an authorized representative of the controller manufacturer.

D. Provide an attendance sheet to the Owner listing personnel trained. The attendance sheet shall list the date and time and type of training and shall have signatures and contact information of all attendees including the instructor.

1.07 WARRANTY

A. Provide a five-year manufacturer's warranty for controller units commencing from time of installation.

PART 2 – PRODUCTS

2.01 IRRIGATION CONTROLLERS

A. General:

1. Controllers shall be UL approved.

2. Controllers shall operate on 110 volts, single phase current, shall be completely automatic, and shall function with clock. Controllers output shall be at least 2 Amps and minimum 24 volts.

3. Controllers shall fully perform without soil moisture sensors, or mandatory telephone wires, repeaters or CAT5/Ethernet wiring.

4. Controllers shall have a Master Valve output circuit.

5. Controllers shall be capable of operating normally open or normally closed master valves.

6. After installation all ET weather based irrigation controllers shall be capable of being monitored and programmed from a single central location away from individual school sites.

7. Controllers shall have a built in flow metering circuit.

8. Controllers shall be capable of receiving EvapoTranspiration (ET) data to automatically adjust or terminate existing programmed watering schedules.

9. Weather based controllers shall be provided with appropriate antenna for wireless transceiver.

10. Weather based controllers with more than six stations shall be furnished with at least 3 extra stations for future use.

11. Weather based controllers shall be capable of fully operating without the need of excavating to conceal wiring infrastructure.

12. Controllers shall be capable of watering using (ET) Data without the need of a central monitoring station.

a. Hunter Industries per plan.

B.. Programming Capabilities:

1. Controllers shall allow programming changes to be performed at the controller.

2. Each controller shall be capable of being automatically updated with daily ET weather data.

3. System shall be capable of providing ET data from more than one source.

4. Controllers shall be able to pause or suspend irrigation automatically in real time.

5. Controllers shall be able to automatically read flow sensing equipment without adding on flow meter circuits.

6. Flow metering circuit shall provide high flow shutoff protection to individual remote control valves or circuits.

7. Controllers shall be capable of programming appropriate pipe size for accurate water consumption reports.

8. System shall be able to fully function using a hand held remote transmitter without additional set up requirements.

9. Controllers shall be password protected.

10. Controller management system shall not impose a security, infrastructure or product support impact on Owner's ITD department.

11. Controllers shall be capable of producing water savings efficiency data reports required by state agencies. (AB 1881).

C. Weather Based ET Data:

1. Provide with each controller a one year subscription of weather based ET data for each irrigation controller requiring a subscription.

2.02 FLOW SENSORS

A. Spinning impeller type, brass or PVC tee as required and sized to accurately read irrigation system designed flow maximum and minimum.

1 Data Industrial Model Series per plan.

2.03 MASTER VALVES

A. Normally open, solid brass (ASTM B584, B271, B505), self-cleaning, automatic electric globe valve with manual flow control stem. Valve shall operate with pressures to 200 psi and shall be slow closing with one-piece molded diaphragm incorporated with an integral O-ring seal reinforced with 600 pound test fabric and be guaranteed for 15 years. Equip with an internal self-flushing filter and self-cleaning metering rod for dirty water. Plunger and solenoid coil shall be electroless nickel plated for corrosion protection. 24 VAC 3-way solenoid coil shall be guaranteed for the life of the valve.

1. Superior Controls Model 3300 Series, or equal.

2.04 ENCLOSURES

A. Controllers shall be provided with a lockable weather resistant housing enclosure for protection of control panel and wireless transceiver.

B. Pedestal Enclosures:

1. Shall be constructed with 14 gage stainless steel.

2. Shall include a 110 Volt GFI inside enclosure.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Installations shall include at least one flow sensor and master valve.

B. Installation of irrigation controllers, flow sensors, master valves, antennas, cabinets, and enclosures will be the Contractors responsibility unless otherwise specified.

3.02 MANUFACTURERS' FIELD SERVICES

A. Provide technical support to assure communication capabilities between controllers and sensing devices and between controllers and servers are within acceptable range for operation of the syst

END OF SECTION

SECTION 32 9000

PLANTING

PART 1 – GENERAL

1.01 SUMMARY

A. Provide labor, material, equipment, and appliances necessary to provide trees, plants, and ground cover as indicated on Drawings, specified, and as required for a complete installation.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 01 4524 - Environmental Import/Export Material Testing.

3. Section 31 2200 - Grading.

4. Section 32 1313 - Site Concrete Work.

5. Section 32 8413 - Potable Water Irrigation.

6. Section 32 8426 - Reclaimed Water Irrigation.

1.02 SUBMITTALS

A. Comply with provisions of Section 01 3300.

B. Submit complete lists of landscape materials and equipment to be used, including manufacturers name and address, specific trade names, catalog numbers complete with illustrations and descriptive literature and clearly mark or underline proposed items; list sources of landscape topsoil.

C. Shop Drawings: Required for any landscape structure.

D. Material List: Plant materials list.

E. Certification: In addition to other required certification, furnish a certificate with each delivery of bulk material, including topsoil, planter mix soil, bark mulch, stating its source, quantity, type of material furnished and that such item or material conforms to requirements of this section.

F. Sample: Submit topsoil Sample and soil amendments with analysis.

G. Fertilizer analysis: Provide labels of each fertilizer used and quantities used at each application recommended in Soil Analysis Report.

H. Soil Test: After completing soil rough grading, have soil tested for fertility and agricultural suitability. Soil shall be tested from minimum of (1-2) locations as shown on the planting Plan. Record locations where samples were taken. A copy of soil test results shall be submitted to District and Architect before landscape work begins. Pay cost of soil test.

I. Sod: Furnish certificate by grower for type, and trueness to name of grass variety or strain. Where or seed issued, provide quality to be delivered.

1.03 QUALITY ASSURANCE

A. Workers: Furnish skilled workers thoroughly trained and experienced in required crafts and familiar with specified requirements for proper performance of Work of this section.

B. Codes and Regulations: Materials, fabrication, and installation in this section shall comply with applicable State Codes and Regulations. Deliver permits and testing certifications to Project Inspector.

C. Quality and Size: Comply with current edition of "Horticultural Standards" for number one nursery stock as adopted by "American Association of Nurserymen".

D. Plants:

1. True to name, with name of plants in accordance with standards of practice of "American Association of Nurserymen."

2. Botanical names take precedence over common names.

1.04 GENERAL REQUIREMENTS

A. Project Inspector will verify that irrigation systems are operating before starting Work of this section.

B. Inspection: Notify Architect at least 72 hours in advance to schedule following inspections:

1. Plant material at time of delivery to Project site.

2. Final location of plants prior to preparation of planting pits.

3. Finish grades prior to sodding or seeding areas.

4. Landscape construction items prior to start of maintenance of plant establishment period.

5. Final inspection.

C. Existing Utilities and Plant Materials:

1. Protect utilities and plant materials from damage.

    a. Perform modifications only as permitted by Architect, in accordance with applicable provisions noted or specified on Drawings, or in other sections of these Specifications.

2. Replace damaged plant material with like type and size material. Architect shall determine cost of irreplaceable plant material according to "square inch" method as described by Council of Tree and Landscape Appraisers' "Manual for Plant Appraisers" handbook, Current Edition, and "Guide for Establishing Values of Trees and Other Plants".

D. Verification of Dimensions and Quantities:

1. Verify scaled dimensions and quantities before starting landscaping Work.

2. Promptly notify Architect of any discrepancies between Drawings, Specifications or actual Project site conditi

E. Pest Management Method and Products:

1. Contractor shall ensure that plants provided are clean, healthy, free of physical damage, and show no symptoms of abiotic injury. Plants must also be free of diseases, arthropod pests, and any other type of plant pests. Before applying pesticides to plants on District property, the following criteria must be met:

    a Individuals who apply pesticides on behalf of contractor's company must have a Qualified Applicator License in appropriate category of pest control issued by California Department of Pesticide Regulation and registered to conduct pest control for hire as a business by Los Angeles County Agricultural Commissioner's Office.

    b. Products used must be approved by the local school district prior to application.

    c. Length of time from date of use of a pesticide products until beneficial occupancy by Owner may not be less than five half lives of products used.

    d. Contact District's Pest Management Department at (213) 743-1102 prior to any pesticide application to verify items above.

    e. Complete written records of pesticide applications made by a contractor and or their representative on District property, must be provided to District's Pest Management Department within 10 days of applications.

1.05 DELIVERY, STORAGE AND HANDLING

A. Plants shall be protected in transit and after delivery to Project site. Plants in broken containers and plants with broken branches or injured trunks will be deemed defective Work.

B. Plant materials damaged in planting operations shall be replaced.

1.06 WARRANTY

A. Shrubs and groundcover shall be growth and health guaranteed by installer for a period of 90 days after completion of maintenance period.

B. Within 15 days after notification by Owner, remove and replace failed plantings. Replacement plantings shall be guaranteed as specified for original plantings.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Fertilizers and Conditioning Materials: Comply with applicable requirements of State of California Agricultural Code:

1 General:

a. Fertilizing materials shall be packaged, first grade, commercial quality products identified as to source, type of material, weight and manufacturer's guaranteed analysis.

b. Fertilizing material shall not contain toxic ingredients and fillers in quantities harmful to animal, human or plant life.

c. Submit a certificate of compliance stating material substantially meets Specifications in accordance with provisions of Article 1.03B.

2. Materials:

a. Bone Meal: Commercial raw bone mean shall be finely ground, steamed dry material with a minimum analysis of 2.5 percent nitrogen and 22 percent phosphoric acid.

b. Gypsum: Hydrated calcium sulfate produce containing 23 percent calcium and 18 percent sulfur with a guarantee analysis of 84 percent calcium sulfate.

c. Soil Sulfur: Guarantee analysis of 99 percent sulfur.

d. Superphosphates: First grade finely ground phosphate rock used for agricultural purpose, containing minimum 18 percent phosphoric acid by volume.

e. Commercial Fertilizer: Pellets or granular product having a chemical analysis of 14-14-14, with a minimum of 68 percent of nitrogen from slow release nitrogen unless otherwise specified in Soil Analysis Report: it should be a free flowing material delivered in unopened bags, do not install material which becomes caked or otherwise damaged.

f. Nitrogen Fortified Wood Product: Derived from redwood, fir or cedar sawdust or from bark of fir or pine treated with a non-toxic agent to quickly absorb water and comply with following requirements:

1). Gradation:

SIEVE SIZE	PERCENT PASSING
¼-inch	95 percent minimum
#8	80 percent minimum
#35	30 percent minimum

Nitrogen Content:

NITROGEN CONTENT	PERCENT DRY WEIGHT
Redwood	0.4 to 0.6 percent
Fir	0.56 to 0.84 percent
Cedar	0.56 to 0.84 percent
Fir Bark	0.8 to 1.2 percent
Pine Bark	0.8 to 1.2 percent

3) Salinity: Maximum saturation extract conductivity 2.5 milliohms/centimeter at 25 degrees Celsius.

4) Absorption: When one teaspoon of water is applied to 4 cubic inches of air-dried products, material shall be become completely damp in a period of less than 2 minutes. Kellogg KRA, Sequoia Redwood/Cedar Blend or White Fir, Long Beach Soil Preparation, Bandini #101 Redwood Soil Builder of nitrogenized wood amendment.

g. Organic Fertilizer: Treated, relatively dry friable organic compost derived from sewage sludge processed for agricultural use; containing at least 1 percent nitrogen by dry weight, 2 percent phosphoric acid and comply substantially with gradation noted in sub-section 2.1, B6. Milorganic, Kellogg's Nitrohumus, or equal.

B. Prepared Backfill mix:

1. To be based upon recommendations from soils test performed by a certified laboratory.

2. Mix (for bidding purposes):

a. Seventy percent by volume clean excavated topsoil/import soil.

b. Thirty percent by volume nitrogen stabilizer wood residual.

c. One pound per cubic yard gypsum.

d. Two pounds fertilizer per cubic yard (14-14-14 with a minimum 68 percent of nitrogen from slow release nitrogen. Additional secondary and micronutrients preferred).

3. Mix (acid plants)

a. Thirty percent by volume clean excavated soil/imported soil.

b. Seventy percent by volume nitrogen stabilized wood residual.

c. Two pounds .per cubic yard. soil sulfur.

d. Two pounds. fertilizer per cubic yard (14-14-14 with a minimum 68 percent of nitrogen from slow release nitrogen. Additional secondary and micronutrients preferred).

D. Plants (General): Plant names indicated or listed on Drawings shall conform with Sunset, Western Garden Book, latest edition.

1. Type and Size: Plant materials shall be listed on Drawings.

2. Plants shall be true name, and one of each bundle or lot shall be tagged with Botanical/Common name and size of each plant in accordance with standards of practice recommended by American Association of Nurseryman

3. Tag one plant of each variety for identifying purposes.

4. Plantings shall be inspected before installation.

5. Substitutions: When plants of a specified kind or size are not available, substitution may be requested in accordance with General Conditions.

6. Plants shall have a growth habit normal to species in accordance with USA Standards for Nursery Stock, latest editions; shall be sound, healthy, vigorous, and free from insect pests, plant disease, sun scalds, fresh bark abrasions, excessive abrasions or other objectionable disfigurements. Tree trunks shall have normal well developed branch systems and vigorous and fibrous root systems, not root bound and shall be free of kinked or girding roots.

7. No pruning shall be performed before inspection at nursery by Architect. (Other than normal pruning during growth period).

8. Plantings specified for adverse conditions shall be Project site acclimated before planting. Purchase from local nurseries or store on Site for a period of 10 weeks for autumn planting and six weeks for spring planting.

E. Plant Material:

1. Shrubs/Ground Covers: Specified type and size selected from high quality well shaped nursery stock.

2.

PART 3 – EXECUTION

3.01 SURFACE CONDITIONS

A. Examine areas and conditions under which Work of this Section will be performed. Correct detrimental conditions before commencing Work of this section.

3.02 GRADING AND SOIL PREPARATION

A. Initial Rough Grading: Specified in Division 32.

B. Earthwork and Topsoil Placement: Shall include excavation and backfilling for irrigation system and preparation for spreading, densification, cultivation, and raking of topsoil, including fertilization and conditioning.

C. Preliminary Grading: Scarify existing soil to a depth of 6 inches before backfilling with topsoil. During preliminary grading operation, remove stones over ¾ inch.

D. In Previously Paved Areas: Remove top 6 inches of existing soil and legally dispose of off Project site. Replace with approved imported topsoil to indicated finish grade.

E. Topsoil Preparation and Conditioning:

1. Type and Thickness: Topsoil shall have a minimum depth of 6 inches above subgrade or as indicated on Drawings, whichever is greater.

2. Before installing amendments, subgrade shall be cleared of weeds, rock ¾ inch and larger and other extraneous materials from designated planting areas to a depth of 6 inches. The tools acceptable for use shall be carefully selected so no damage to the mature trees shall possibly occur. The finished planting bed preparation is subject to the approval of the Owner's representative. The Owner's Landscape Office shall coordinate with the Architect for a site visit and approval prior to plant installation.

F. Fertilizing and Conditioning: Provide planting areas to finish grades, including mounds, before installation of specified fertilizer or soil conditioning materials.

1. Mechanically install following amount of fertilizer or soil conditioning materials at a uniform rate per 1,000 square feet of planting area:

   a. Three cubic yards of nitrogen fortified wood compost.

   b. Two cubic yards of organic fertilizer.

   c. One hundred pounds. of gypsum.

   d. Thirty pounds of commercial fertilizer.

2. Quantities of required materials for planting areas shall be at Project site. Furnish Project Inspector with delivery tickets before installation to verify source, kind, and quantities delivered.

3. After installation of fertilizer and soil conditioning materials, uniformly cultivate materials into upper 6 inches of soil with suitable equipment operated in at least two directions at approximate at right angles. Process soil until friable.

G. Finish Grading:

1. Provide a finish grade, smooth, uniform, and free of abrupt grade changes and depressions to insure proper surface drainage. Protect the existing mature trees during the grading process.

2. Finish grades adjacent to paving curbs or headers shall be 2 inches lower in shrub or ground cover areas.

3. Irrigate soil after installation of fertilizer and soil conditioning materials. Allow soil to settle. Provide a stable surface. After soil has dried out to a workable condition, re-grade, rake, and smooth to required grades and contours. Finished surfaces to be left clean and suitable for planting.

4. Areas to be planted shall be graded and floated to provide complete surface drainage; water holding depressions and pockets shall be eliminated. Undulations and unsightly variations in grade which will not permit the use of normal mowing equipment without scalping or missing shall be removed so that proper use of mowing equipment can be performed.

5. Areas to be planted shall also be finished graded to meet any walks, paths or other adjoining surfaces so that, after compaction, no water pockets or ridges remain.

6. Areas where sod will interface with other modes of planting at catch basins and paved areas shall be finish shaped so as to counter sink the sod one inch such that once sod is placed, it shall be at grade with adjacent planting bed.

H. Weeding: Once site has been cleared, grubbed and rough graded, landscape areas shall be maintained free of vegetation growth until start of irrigation and planting phase of the work.

3.03 PLANTING

A. General: Planting materials shall be inspected before planting, including those tagged at nursery.

1. Perform planting with material, equipment and according to procedures favorable to optimum growth of plant. Do not plant during windy conditions.

2. Except as noted for specimen planting in sub-section 3.04D, commence planting operations immediately following completion of irrigation system.

B. Protection and Storage:

1. Maintain plantings delivered to Project site in a healthy condition.

2. Do not allow plantings to dry out.

3. Separate bare root stock and “heal in” in moist earth or other suitable material.

4. Cover root ball of bailed or burlap wrapped plantings with moist sawdust, wood chips, or other permitted materials.

C. Layout and Plant Locations:

1. Plant locations indicated on Drawings are approximate.

2. Plants may be re-spotted before planting as required by Architect.

3. Provide a detailed layout of plants and landscape elements in planting areas and obtain review of Architect before actual planting operations.

4. Locate first row of plantings in areas designated for on center spacing at one-half the designated spacing from edge of area.

D. Shrub/Ground Cover Installation:

1. Excavate planting holes approximately square with vertical sides shall be twice the width of plant container or root ball; larger if necessary to permit handling and installation without damage to root ball system. Bottom of plant container or root ball shall be placed on existing undisturbed soil.

2. Do not install plantings having a broken or cracked root ball.

3. Containers should be opened and removed in such a manner not to damage root system.

4. Remove balled plant wrappings after plant is positioned in hole.

5. Scarify native soil at bottom half of holes to a depth of 6 inches.

6. Backfill bottom half of hole with specified backfill mix minus fertilizers. Settle with water.

7. After water settling bottom half of hole, set planting approximately in center of hole and adjust root flush to finish grade.

8. Backfill balance of hole with specified backfill mix and fertilizer and water settle.

9. Prune or remove any broken or damaged limbs.

10. Form a circular watering basin slightly larger than hole; 2-inch high for shrubs/ground covers. Shape bottom of basin to be slightly lower than finish grade.

11. Restore area around plantings to finish grade.

12. After installation, plantings shall be plumb with root crown at its natural depth with respect to finish grade.

F. Backfill Planting Mix: Consists of 70 percent specified topsoil, and 30 percent nitrogen fortified sawdust mulch plus the amendments indicated in soil analysis report.

G. Ground Cover Planting from One Gallon Containers:

1. Complete soil preparation and fine grading before installation of ground cover plantings.

2. Install ground cover in moist soil, spaced as indicated on Drawings.

3. Following installation of ground cover, restore finish grade to insure proper surface draining.

3.05 MAINTENANCE AND PLANT ESTABLISHMENT

A. Required: Maintain areas on a continuous basis as they are completed during progress of Work and during establishment period. Maintenance shall include continuous operations of watering, weeding, trimming, rodent control, reseeding, planting replacement irrespective of cause or any other operations necessary to assure normal plant growth.

B. Keep planting areas free of debris and weeds. Cultivate at intervals not to exceed 10 days.

D. Pruning: Required pruning of plants at start of plant establishment period shall be as required by Architect.

E. Plant Establishment Inspection:

1. Request an inspection to begin plant establishment period after plantings and related Work has been completed in accordance with Contract Documents.

2. Upon successful completion of inspection, effective commencement date of plant establishment period shall begin.

3. Plant establishment period for shrubs and ground cover, shall be 90 calendar days or as otherwise indicated in Contract Documents.

4. Architect may recommend extension of plant establishment period if planting areas are improperly maintained, appreciable plant replacement is required, or other defective Work.

F. Damage:

1. Immediately replace failed or damaged plantings.

2. Provide replacement plantings of same type and size to match adjacent plantings. Furnish plantings and fertilizer as specified. New plantings shall be subject to a 30 day establishment period.

3. Damage to planting areas shall be repaired immediately. Depressions caused by vehicles or foot traffic shall be filled with topsoil and leveled.

G. Final Inspection:

1. Upon completion of plant establishment period, Architect will perform a final inspection.

2. If plant establishment period is completed before Substantial Completion, planting areas shall be maintained until Final Completion.

3.06 PESTICIDE APPLICATION

A. Contractor must comply with specifications outlined in paragraph 1.04.F.

3.07 PROTECTION

A. Unless noted otherwise, protect Work of this section until Substantial Completion.

3.08 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off Project site.

END OF SECTION

SECTION 33 4000

STORM DRAINAGE UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Catch basins, grates and frames; culverts; curb inlets; drainage pipes; sub-surface drains; manhole covers and frames; surface run-off collection or infiltration.

2. Stormwater treatment systems:

a. Catch Basin Inserts.

3. Closed-circuit television inspection of storm drain lines.

B. Related Requirements:

1. Division 01 - General Requirements.

2.

3.

4. Section 31 2323 - Excavation and Fill for Utilities.

5. Section 32 1313 - Site Concrete Work.

C. Definitions:

1. BMP: Stormwater Best Management Practice.

2. Post Construction BMP: Devices installed by the Contractor for storm water management to be left on site after construction completion.

3. SWPPP: Storm Water Pollution Prevention Plan.

1.02 SUBMITTALS

A. Shop Drawings: Submit site plan denoting locations of lines, valves, and appurtenances.

B. Product Data: Manufacturer's catalog data for all required materials. Include technical data for accessories, information concerning gaskets, joints and couplings.

C. Certificates: Certificates attesting that tests set forth in referenced publication have been performed and the results required by design have been met.

D. Closeout Documents: At Substantial Completion submit to the OAR two CD's and one hard copy of the documents indicated in paragraphs 1 through 5 below:

1. Maintenance Log: Provide Microsoft Excel Spreadsheet including the following information:

   a. Maintenance log and upkeep records of the installed Post Construction BMPs. Include the following headers as a minimum: "Date of Service", "Location of BMP", "Type of Maintenance or Service", "Notes", "Next Scheduled Preventive Maintenance Due", and "Inspector Signature".

   b. Maintenance Requirements: Include the following headers as a minimum: "BMP Description", "Location of BMP and Map Grid Location" and "Type of Maintenance or Service Needed", i.e.; weekly, monthly, quarterly, etcetera. "Stock No.", "Manufacturer Contact Information", along with "Frequency" namely: weekly, monthly, quarterly, etcetera and "Special Instructions".

2. Maintenance Manuals: Provide Maintenance Manual for storm drainage BMP components installed along with requirements, replacement or maintenance schedule and plans with the location of each BMP component. This manual shall include product information cut sheet, shop drawings, vendor information for each component and warranty.

3. Record drawings: 'As-Builts' site plan(s) showing Post Construction BMP. Provide a copy of marked record set with red pencil identifying any variations from design documents.

4. Training Documentation:

   a. OWNER attendees sign off training sheet.

   b. Two DVD's of materials covered in the training and components installed.

5. Post-Construction BMP Maintenance Plan: Submit complete Plan per Attachment "A", edit per As-Built conditions and provide missing information.

6. Records of Closed-Circuit Television Inspection: At Substantial Completion submit to the OAR three DVD's of Closed-circuit television inspections performed. Include the following information:

a. Electronic Media Recordings: Visual and audio record of the entire length of pipe. For existing laterals identify problem areas, such as roots, cracks, fractures, broken pipe, and other unusual conditions found.

b. Digital Photographs of the pipe condition, connections, points of interest and defects found. Indicate distance of defects to a point of reference such as face of building or mainline.

c. Inspection Log: Provide written report including:

1) Date and time of inspection.

2) Name of School, Project, Contractor, and operator name.

3) Location, material and size of pipe.

4) Description of defects found.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction, current edition.

1.04 TRAINING OF OWNER PERSONNEL

A. At Substantial Completion and when the storm drainage system is fully operational, knowledgeable representatives from the contractor and manufacturer(s) of the components specified and installed at the site shall provide up to 8 hours of training. Date, time and location for the training shall be coordinated through the project OAR. Have OWNER attendees sign off training sheet and provide a copy to the OAR.

B. Training period shall cover but not be limited to the following:

1. Explain the operation of storm drainage system and its design intent.

2. Explain the maintenance requirements of every component of the system.

3. Provide recommendations of practices to minimize or eliminate negative impact on the system.

4. Provide maintenance schedule as recommended by the manufacturers for every component and review it with OWNER's Maintenance and Operations staff.

5. Conduct a site walk, identify every component of the system and demonstrate its operation.

6. Training shall be conducted with the use of Maintenance log and Maintenance manual.

1.05 SURPLUS MATERIALS

A. Provide sufficient additional materials for each component of BMP that requires replacement or service during the first year.

1.06 ATTACHMENTS

PART 2 – PRODUCTS

2.01 MATERIALS

A. Storm Drain Pipe:

1. Cast Iron Pipe (CIP): Provide in conformance with Section 207 - Pipe and Section 208 - Pipe Joint Types and Materials of the Standard Specifications for Public Works Construction.

2. Ductile Iron Pipe (DIP): Provide in conformance with Section 207 - Pipe and Section 208 - Pipe Joint Types and Materials of the Standard Specifications for Public Works Construction.

3. Annular High Density Polyethylene (HDPEP): Provide in conformance with Section 207 - Pipe and Section 208 - Pipe Joint Types and Materials of the Standard Specifications for Public Works Construction.

B. Perforated Subsurface Drain Pipe: Shop-perforated with perforations symmetrically located within a maximum arc of 160 degrees. Perforations shall provide a total open area of at least 0.3 square inches per linear foot of pipe, with a minimum of one perforation per linear foot, except for joint areas. Perforation shall be either holes or slots. Hole diameters of ¼ inch minimum to 3/8 inch maximum. Width of slots of 3/16 inch minimum to 5/16 inch maximum with slot length not exceeding 4 inches.

C. Concrete, Mortar and Related Materials: Conform to Section 32 1313 - Site Concrete Work.

D. Metal Covers, Grates, Frames and Accessories:

1. Conform to Section 206 - Miscellaneous Metal Items of the Standard Specifications for Public Works Construction.

2. Hot-dip galvanize steel parts after fabrication and before installation, in accordance with Section 210 - Paint and Protective Coatings of the Standard Specifications for Public Works Construction.

3. Grates and Frames:

a. Vandal-proof design and construction.

b. ADA compliant, in conformance to CBC 11B-302.3.

c. Rated for vehicular traffic on areas intended for use by motor vehicles.

d. Hot-dip galvanized.

E. Bedding Material for Pipe: Conform to the requirements of Section 31 2313 - Excavation and Fill or Section 31 2323 - Excavation and Fill for Utilities, as required.

F. Subsurface Drain Fabric: Non-woven geotextile filter fabric,

1. TenCate Geosynthetics Americas, Mirafi 140N.

2. US Fabrics, Inc., 120NW.

3. Propex Fabrics, Inc., Geotex 451.

4. Equal.

G. Aggregate Around Perforated Pipe: 6 inches of gravel containing no particles finer than a 3/8 inch to 1/2 inch sieve opening size.

H. Manhole Brick Mortar, Grout, and Plaster: Conform to Standard Specifications for Public Works Construction, Section 202 - Masonry Materials.

2.02 STORMWATER TREATMENT SYSTEMS

A. Catch Basin Inserts

1. Manufacturer: AbTech Industries, Aquashield Inc., Contech Construction Products Inc., Ecosense International, Oldcastle Precast Inc., Nyloplat, FabCo Industries Inc., UltraTech International Inc., or Equal.

2. Products:

1.03 NAMEPLATES:

A. Stainless steel or aluminium nameplate permanently fastened to BMP showing the following information:

1. BMP ID number and BMP type.

2. Next service day, followed by a one inch by four inch long blank space.

3. Manufacturer name, model number, telephone number and stock ID number.

4. Installation or production date.

5. One inch by four inch blank space for Owner's use.

PART 3 – EXECUTION

3.01 EXCAVATION, BACKFILLING AND COMPACTING

A. Conform to the requirements of Section 31 2323 - Excavation and Fill for Utilities, as required.

3.02 INSTALLATION OF PIPE

A. Conform to Section 306 - Underground Conduit Construction of the Standard Specifications for Public Works Construction.

B. Non-ferrous drainpipe installed with less than 12 inches of cover to finish grade shall be provided with a 4 inch thick concrete pipe encasement.

3.03 DRAINAGE APPURTENANCES

A. Catch basins, junction chambers, manholes, box culverts, outlet chambers and other drainage structures: Construct as indicated on Drawings and as specified in Section 32 1313 - Site Concrete Work.

B. Ensure that Post Construction BMP have a visible identifying manufacturer tag with product identification, manufacturer contact information, date of last service and date of next service due.

C. Provide storm drain stencil per City or County requirements as applicable.

3.04 STORMWATER TREATMENT SYSTEMS

A.

3.05 ABANDONED DRAINAGE LINES AND STRUCTURES

A. Cap or plug existing drain lines that are cut and abandoned and remove existing drainage structures that are abandoned.

3.06 CLOSED-CIRCUIT TELEVISION INSPECTION

A. Coordinate with OAR time and date of inspection. Project Inspector shall be present during the CCTV inspection.

B. Clean laterals by hydraulic jet.

C. Perform internal closed-circuit television inspection of lateral from the building to the public mainline. Record drain line in its entirety with no breaks or interruptions. Move camera at a speed no grater than 30 feet per minute, stopping for a minimum of ten seconds to record pipe connections, defects, and points of interest.

D. Maintain technical quality, sharp focus and distortion free picture. Pan, tilt, and rotate as necessary to best view and evaluate connections, defects and points of interest.

E. Closed-circuit Television Equipment: As a minimum equipment shall include:

1. Television camera specially designed for pipe inspections, and operative in 100 percent humidity conditions.

2. Camera and television monitor capable of producing minimum 470H-line resolution color video picture.

3. Camera capable to inspect lines as small as three inches up to 70 feet from storm drain mainline.

4. Camera lighting shall be suitable to allow clear picture of inner wall at least ten feet in front.

F. Defective Work:

1. New Lines: Defective Work found shall be repaired at Contractor's expense. Perform a new closed-circuit television inspection at no cost to Owner.

2. Existing Laterals:

a. If roots, sludge, or sediment material or other defect not related to the Work of this project impedes inspection, withdraw camera, restart inspection from opposite end and notify OAR of defects found.

b. If obstruction or stoppage was caused by Work related to this project, remove obstruction at no cost to Owner. Perform a new closed-circuit television inspection at Contractor's expense.

3.07 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

B. Maintain Post Construction BMP after installation and keep a maintenance log to be turned over to OAR at Substantial Completion.

3.08 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION