PROJECT MANUAL

IUSD Bennet-Kew P-8 Academy

Inglewood Unified School District
Inglewood, California

DSA Submittal Documents
DSA A# 03-124773 FILE# 19-48

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PREPARED BY

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SECTION 01 1100

SUMMARY OF WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The furnishing of all labor, materials, equipment, services, and incidentals necessary for Work of the Bennett Kew P-8 Academy**,** located at 11710 S Cherry Ave, Inglewood, CA 90303**,** as set forth in the Construction Documents which include, but are not limited to, the Drawings, Addenda and Specifications.

1.02 RELATED REQUIREMENTS:

1. Section 01 1216: Phasing of the Work.
2. Section 01 2300: Alternates (Bid Items).
3. Section 01 3113: Project Coordination.
4. Section 01 3229: Project Forms.
5. Section 01 3213: Construction Schedule.
6. Section 01 4525: Testing, Adjusting, and Balancing for HVAC.
7. Section 01 5000: Construction Facilities and Temporary Controls.
8. Section 01 7123: Field Engineering.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 USE OF PREMISES

A. CONTRACTOR shall coordinate Work of all trades, Subcontractors, utility service providers, with OWNER and/or Separate Work Contract. CONTRACTOR shall sequence, coordinate, and perform the Work to impose minimum hardship on the operation and use of the existing facilities and/or Project site. CONTRACTOR shall install all necessary protection for existing improvements, Project site, property, and

new Work against dust, dirt, weather, damage, vandalism, and maintain and relocate all protection to accommodate progression of the Work.

B. CONTRACTOR shall confine entrance and exiting to the Project site and/or facilities to routes designated by the OAR.

C. Within existing facilities, OWNER will remove portable equipment, furniture, and supplies from Work areas prior to the start of Work. CONTRACTOR shall cover and protect remaining items in areas of the Work.

D. CONTRACTOR is advised school may be in session during performance of the Work. CONTRACTOR shall utilize all available means to prevent generation of unnecessary noise and maintain noise levels to a minimum. When required by the OAR, CONTRACTOR shall immediately discontinue noise-generating activities and/or provide alternative methods to minimize noise generation. CONTRACTOR shall install and maintain air compressors, tractors, cranes, hoists, vehicles, and other internal combustion engine equipment with mufflers, including unloading cycle of compressors. CONTRACTOR shall discontinue operation of equipment producing objectionable noise as required by the OAR.

E. CONTRACTOR shall furnish, install, and maintain adequate supports, shoring, and bracing to preserve structural integrity and prevent collapse of existing improvements and/or Work modified and/or altered as part of the Work.

F. CONTRACTOR shall secure building entrances, exits, and Work areas with locking devices as required by the OAR.

G. CONTRACTOR assumes custody and control of OWNER property, both fixed and portable, remaining in existing facilities vacated during the Work.

H CONTRACTOR shall cover and protect surfaces of rooms and spaces in existing facilities turned over for the Work, including OWNER property remaining within as required to prevent soiling or damage from dust, dirt, water, and/or fumes. CONTRACTOR shall protect areas adjacent to the Work in a similar manner. Prior to OWNER occupancy, CONTRACTOR shall clean all surfaces including OWNER property.

I. CONTRACTOR shall not use or allow anyone other than OWNER employees to use facility telephones and/or other equipment, except in an emergency. CONTRACTOR shall reimburse OWNER for telephone toll charges originating from the facility except those arising from emergencies or use by OWNER employees.

J. CONTRACTOR shall protect all surfaces, coverings, materials, and finished Work from damage. Mobile equipment shall be provided with pneumatic tires.

K. CONTRACTOR is advised OWNER will award Separate Work Contracts at this Project site.

L. CONTRACTOR shall not permit the use of portable and/or fixed radio's or other types of sound producing devices including walkmans and similar devices.

3.02 PROPERTY INVENTORY

A. Property, OWNER intends to remove; will be removed by OWNER before a room or space is vacated for the Work. Before performing Work in each room or space, OAR and CONTRACTOR shall prepare a detailed initial written inventory of OWNER property remaining within, including equipment and telephone instruments and the condition thereof. OAR and CONTRACTOR shall retain a signed copy of the inventory dated and signed by both parties. Prior to subsequent OWNER occupancy of each such room or space, OAR and CONTRACTOR shall perform a final inventory of OWNER property and all discrepancies between the initial inventory and final inventory shall be the responsibility of CONTRACTOR.

3.03 FURNITURE, FIXTURES AND EQUIPMENT (MATERIALS) OWNER FURNISHED CONTRACTOR INSTALLED (OFCI)

A. Certain materials identified in the Contract Documents as OWNER Furnished CONTRACTOR Installed, OFCI, will be delivered to the Project site by the OWNER.

B. If designated in the Contract Documents to be OWNER furnished CONTRACTOR installed, (OFCI), CONTRACTOR shall unload, store, uncrate, assemble, install, and connect OWNER supplied materials.

C. One-Hundred and Twenty days before the date the CONTRACTOR needs to have the OFCI materials on site, CONTRACTOR shall notify OWNER of the scheduled date for needed OFCI materials. Upon delivery to Project site, CONTRACTOR shall store OFCI materials inside rooms and/or protected spaces and will be responsible for security of OFCI materials until Substantial Completion. OAR will sign receipt or bill of lading as applicable.

D. CONTRACTOR shall, within ten days after delivery, uncrate and/or unpack OFCI materials in presence of OWNER who shall inspect delivered items. OWNER shall prepare an inspection report listing damaged or missing parts and accessories. OWNER shall transmit one copy of the report to CONTRACTOR. OWNER will procure and/or replace missing and or damaged OFCI materials, as indicated in inspection report.

E. CONTRACTOR shall install OFCI materials in the locations and orientation as indicated in the Contract Documents. CONTRACTOR shall verify exact locations with OAR before final installation of OFCI materials.

F. If required, OAR will furnish setting and or placement drawings for OFCI materials.

G. CONTRACTOR shall install OFCI materials by proper means and methods to ensure an installation as recommended by the manufacturer. CONTRACTOR shall furnish and install all necessary fasteners and required blocking to properly install OFCI materials.

H. CONTRACTOR shall install OFCI materials with manufacturer recommended fasteners for the type of construction to which the OFCI materials are being fastened and/or anchored.

I. CONTRACTOR shall provide final connections of any electrical, signal, gas, water, waste, venting and/or similar items to OFCI materials. CONTRACTOR shall, prior to final connection, verify the operating characteristics of OFCI materials are consistent with the designated supply.

3.04 FURNITURE, FIXTURES AND EQUIPMENT (Materials) - OWNER furnished, OWNER installed (OFOI)

A. Certain materials are identified in the Contract Documents as OWNER Furnished, OWNER Installed (OFOI)

B. On dates and during times designated by OWNER, CONTRACTOR shall provide clear off-loading, receiving, protected storage, and OWNER'S dumpster space areas for the use of OWNER or OWNER'S third party OFOI installation contractors. At such times, CONTRACTOR shall also make clear routes and access available to all rooms and spaces to receive OFOI materials.

C. On dates and during times designated by OWNER, CONTRACTOR shall provide access to the elevators for use of OWNER or OWNER'S third party OFOI installation contractors.

D. CONTRACTOR shall cooperate fully with OWNER or OWNER'S third part OFOI installation contractors.

E. CONTRACTOR may be requested by OWNER to provide supplemental labor and equipment to support OFOI activities. Such requests must be submitted in accordance with the change order clauses of Contract.

F. Immediately prior to mobilization of OWNER or OWNER'S third party OFOI installation contractors, OWNER shall document the condition of the Work in areas to be utilized for OFOI activities.

G. CONTRACTOR shall not be responsible for damage caused by OWNER or OWNER'S forces. OWNER shall document the condition of the Work and report to CONTRACTOR any damage in areas utilized for OFOI activities.

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 1219: Phasing of Work – Appendix A.

C. Section 01 3300: Submittal Procedures.

D. Section 01 3113: Project Coordination.

E. Section 01 3213: Construction Schedule.

F. Section 01 5000: Construction Facilities and Temporary Controls.

G. 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. Location of temporary or accessible fire protection.

12. Trash removal and location of dumpsters.

13. Concrete pumping locations.

14. Crane locations.

15. Location of portable sanitary facilities.

16. Mixer truck wash out locations.

17. Traffic control signage.

18. Perimeter and site lighting.

19. Storm Water Pollution Prevention Plan – SWPPP.

20. Stockpile or lay down areas.

21. Security lighting

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 1 Mobilization – (**# of days**) calendar days: Milestones 1 & 3.

2. Phase 2 Construction – (**#days**) calendar days: Milestone 2, 4-28.

3. Phase 3 Administrative Closeout – (**# of days**) calendar days: Milestone 29.

B. The Contract Time shall be a total of (**# days**) calendar days from date of commencement of Contract Time.

END OF SECTION

SECTION 01 2100

ALLOWANCES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies administrative and procedural requirements governing Contract allowances.

1 Allowances as set forth in the Specifications are to be used as compensation for items as set forth in this Section. The amounts listed in the schedule or Specifications are to be included in the base bid and shall be listed separately in the Schedule of Values and Application for Payment.

B. Type of allowances includes the following:

1. B-Permit as per Specification Section 01 3596.

2. Sewer assessment facility fee as per Supplementary Conditions, Section 00 7300.

3. Field Office Supplies as per Division 01 Section 01 5000, 3.11.

1.02 RELATED REQUIREMENTS

A. Section 01 2973: Schedule of Values.

B. Section 01 2976: Progress Payment Procedures.

C. Section 01 3213: Construction Schedule.

D. Section 01 3229: Project Forms.

E. Section 01 5000: Construction Facilities and Temporary Controls.

F. Divisions 02-49: Specifications.

1.03 ALLOWANCES

A. Use the allowances only as authorized for OWNER purposes and only by an approved allowance disbursement form that indicate the amounts to be charged to the respective allowance amount.

B. At Substantial Completion of the Work or at any time designated by the OAR, credit unused amounts remaining in the allowances to the OWNER by Change Order.

1.04 ALLOWANCE DISBURSEMENT

A. CONTRACTOR shall submit a request for allowance disbursement on an allowance disbursement form. Include all substantiating and/or required data along with the request. Utilize the allowance disbursement authorization form as set forth in the Project Forms Section 01 3229.

B. The request shall have the requested amount listed as an allowance disbursement without CONTRACTOR overhead and markup.

C. Once the OAR has accepted the disbursement, ARCHITECT and OAR will sign the allowance disbursement form.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 SCHEDULE OF ALLOWANCES

A. Include in the base bid the following allowances in the following amounts:

Section	Description	Amount
SECTION 01 3596	B-PERMIT	{$_____)
SECTION 00 7300.	SEWER CONNECTION FEES	{$_____)
SECTION 01 5000.3.11	OFFICE SUPPLIES	{$_____)

END OF SECTION

SECTION 01 2300

ALTERNATES

(Bid Items)

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. This Section specifies administrative and procedural requirements governing alternate bid items.

1.02 RELATED REQUIREMENTS:

A. Section 00 2113: Instructions to Bidders (Not a part of DSA approval).

B. Section 00 4100: Bid and Acceptance Form (Not a part of DSA approval).

C. Section 01 1100: Summary of Work.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 SPECIFIC:

A. Bid item is an amount proposed by bidder and stated on the Bid and Acceptance Form for certain Work defined in the Bidding Documents that may be added to or deducted from the base bid amount if OWNER decides to accept a corresponding change in either the amount of Work to be completed, the Contract Documents, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The amount added or deducted from the base bid is the net addition to or deducted from the base bid to incorporate bid item Work into the Work. Unless noted otherwise, no other adjustments are made to the Contract Amount, Milestones or the Contract Time.

3.02 PROCEDURES:

A. CONTRACTOR shall modify or adjust affected adjacent Work as necessary to completely and fully integrate OWNER accepted bid item Work.

1. Include as part of each bid item, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not mentioned as part of the bid item.

B. Accepted bid items are subject to the same terms and conditions as other Work of the Contract Documents.

C. OWNER reserves the right to accept bid items for a period of ninety days after bid opening date.

D. Schedule: A schedule of bid items is included at the end of this Section. The Contract Documents referenced in the schedule identify necessary requirements to complete the Work described as specified for each bid item.

3.03 SCHEDULE OF BID ITEMS: (See the Bidding Documents for Additional Information)

A. Alternate Bid Item 1: **{ describe each bid item in these sections and make reference to all appropriate sections, Drawings, model numbers, Etc.}**

B. Alternate Bid Item 2:

C. Alternate Bid Item 3:

D. Alternate Bid Item 4:

E. Alternate Bid Item 5:

END OF SECTION

SECTION 01 2513

PRODUCT PROCEDURES FOR SUBSTITUTION AND "OR EQUAL"

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes administrative and procedural requirements for handling requests for substitutions and "or equal" submitted pursuant to Article 6.14 of the General Conditions.

1.02 RELATED REQUIREMENTS

A. Section 01 3229: Project Forms.

B. Section 01 3300: Submittal Procedures.

C. Section 01 6000: Product Requirements.

D. Section 01 7700: Contract Closeout.

1.03 APPLICATION

A. OAR will review CONTRACTOR proposed changes in products or materials required by the Contract Documents.

1. 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:

   a. Revisions to the Contract Documents requested by OAR or ARCHITECT.

   b. Specified options of products included in the Contract Documents.

   c. Substitutions requested on a "or equal" basis.

2. "Or Equal": OAR will consider requests for "or equal" if submitted within the time indicated in Article 6.14 of the General Conditions.

1.04 SUBMITTALS

A. Transmit submittals as described in related Sections for each request for substitution or “or equal”.

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 or “or equal” 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.

3. If required, OAR and ARCHITECT will request additional information or documentation for evaluation.

4. ARCHITECT will review requests for substitutions and “or equals” and provide a recommendation to OAR.

5. If ARCHITECT accepts proposed substitutions or “or equals” OAR will forward submittals to the OWNER’s Maintenance and Operations Technical Unit for review. OAR will notify CONTRACTOR of acceptance or rejection of the substitution.

6. Where a proposed substitution or “or equal” 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.

7. CONTRACTOR submittal and ARCHITECT review of Shop Drawings, Product Data, material lists or Samples do not constitute an acceptable or valid request for substitutions or “or equals”.

2. PART 2 - PRODUCTS (Not used)

3. PART 3 - EXECUTION

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 3229: 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 3229. 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 2973

SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Procedure for submission of a certified Schedule of Values for review and approval by the OAR.

1.02 RELATED REQUIREMENTS

A. Section 01 2100: Allowances.

B. Section 01 2300: Alternates (Bid Items).

C. Section 01 2976: Progress Payment Procedures.

D. Section 01 3113: Project Coordination.

E. Section 01 3213: Construction Schedule.

E. Section 01 3229: Project Forms.

F. Section 01 3300: Submittal Procedures.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 PREPARATION

A. Upon receipt of the Notice of Intent to Award, CONTRACTOR shall commence preparation of a Schedule of Values in accordance with the form included in Section 01 3229.

B. CONTRACTOR shall coordinate the preparation of a Schedule of Values with preparation of the Construction Schedule as set forth in Section 01 3213. The corresponding values from the specification division totals on cost loaded schedule shall match with the approved Schedule of Values.

C. Include the following Project identification on a certified Schedule of Values:

1. Project name and location.

2. Project Number.

3. Contract #.

4. CONTRACTOR name.

5. Date of Submittal.

D. The Schedule of Values shall be in tabular form with separate columns and shall include the following items:

1. Related Specification Section and Division.

2. Description of Work.

3. Name of Subcontractor, manufacturer or supplier.

4. Dollar value, quantity and unit of measure of each line item.

5. Percentage of Contract amount to nearest one-hundredth percent, adjusted to total 100 percent.

E. Round amounts to the nearest whole dollar; the total shall equal the Contract Amount.

F. Provide a breakdown of the Contract Amount in enough detail acceptable to OAR to facilitate continued evaluation of Application for Payment and progress reports. Coordinate with the Project Manual table of content and Schedule of Values form under Section 01 3229. Provide line items for subcontract amounts, where appropriate.

G. Provide separate line items for items in the Schedule of Values for total installed value of that part of the Work.

H. Provide separate line item for labor and material when required by the OAR.

I. 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 except the amounts shown as separate line items as indicated under Schedule of Values form under Section 01 3229.

J. Temporary facilities and other cost items that are not direct cost of actual work-in-place shall be shown as separate line items as indicated under Schedule of Values form under Section 01 3229.

K. An approved certified Schedule of Values shall serve as the basis for the monthly certified Application for Payment.

L. If at any time, OWNER determines, in its reasonable discretion, that the schedule of Values does not approximate the actual cost being incurred by CONTRACTOR to perform the Work, CONTRACTOR shall prepare, for OAR approval, a revised Schedule of Values, which then shall be used as the basis for future progress payments. Without changing the Contract Amount, OWNER reserves the right to require CONTRACTOR:

1. To increase or decrease amounts within the line items in the Schedule of Values; and,

2. To conform the price breakdown to OWNER accounting practice.

3.02 SUBMITTAL

A. CONTRACTOR shall submit five certified copies of a Schedule of Values for review and approval by the OAR at least 14 days before the first Application for Payment.

B. OAR will review and if necessary, return the submitted Schedule of Values with summary comments noting items not in compliance with the requirements of the Contract Documents. CONTRACTOR shall revise the submitted Schedule of Values and return five copies within three days of receipt of summary comments.

C. Signature by OAR shall constitute acceptance of the submitted Schedule of Values.

D. An approved copy of the Schedule of Values by OAR will be transmitted to CONTRACTOR, and Inspector.

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 2100: Allowances.

B. Section 01 2300: Alternates (Bid Items).

C. Section 01 2973: Schedule of Values.

D. Section 01 3213: Construction Schedule.

E. Section 01 3229: Project Forms.

F. 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 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 4525: Testing, Adjusting, and Balancing for HVAC.

F. 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

PROJECT MEETINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies administrative and procedural requirements for Project meetings, including but not limited to, the following:

1. Job start meeting.
2. Pre-installation conferences.
3. Progress meetings.
4. Meetings as required by OAR.

1.02 RELATED REQUIREMENTS

A. Section 01 1216: Phasing of the Work.

B. Section 01 3113: Project Coordination.

C. Section 01 3213: Construction Schedule.

D. Section 01 3229: Project Forms.

E. Section 01 3300: Submittal Procedures.

PART 2 – PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 JOB START MEETING

A. In accordance with General Conditions Article 2.6, OAR will schedule a job start meeting before starting the Work, at a time and date determined by OAR. Meeting shall be held at the Project site or another location as determined by OAR. Meeting will be held in order to review responsibilities, procedures, and other administrative requirements contained within the Contract Documents.

B. Authorized representatives of OWNER, INSPECTOR, ARCHITECT, CONTRACTOR and other parties shall attend the meeting. All participants at the

meeting shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda items shall include significant items which could affect progress of the Work, including, but not limited to the following:

1. Preliminary Construction Schedule.

2. Critical work sequencing.

3. Designation of responsible personnel.

4. Identification of OAR.

5. Procedures for processing field decisions.

6. Request for Proposal.

7. Request for Clarification.

8. Construction Directive and Change Order.

9. Procedures for processing Applications for Payment.

10. Prevailing wages.

11. Submittal and review of Shop Drawings, Product Data, material lists, and Samples.

12. Preparation of project record documents.

13. Use of the Project site and/or premises.

14. Parking availability.

15. Office, work, and storage areas.

16. Equipment deliveries and priorities.

17. Safety procedures.

18. First Aid.

19. Security.

20. Housekeeping.

21. Working hours.

22. Contract Compliance Officer.

23. Insurance Services including OCIP.

24. Environmental Health and Safety.

25. Substantial Completion, Administrative Closeout and Contract Completion requirements and procedures.

26. Procedures for Mandatory Dispute and Claim Resolution.

27. Storm Water Pollution Prevention Plan (SWPPP).

28. CEQA Compliance.

D. OAR shall prepare and issue meeting minutes to attendees and interested parties no later than five calendar days after the meeting date.

3.02 PRE-INSTALLATION CONFERENCES

A. CONTRACTOR shall coordinate and conduct pre-installation conferences at the Project site as required by related Sections of the Contract Documents.

B. CONTRACTOR, manufacturers, and fabricators involved in or affected by the installation and its coordination or integration with other pre-ceding and/or subsequent installations of Work shall attend the meeting. CONTRACTOR shall advise OAR, INSPECTOR, and ARCHITECT of scheduled meeting dates in order to secure their attendance.

1. CONTRACTOR shall review the progress of construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for the following:

a. Contract Documents.

b. Options.

c. Related Construction Directives and Change Orders.

d. Purchases.

e. Deliveries.

f. Shop Drawings, Product Data, and quality-control samples.

g. Review of mockups.

h. Possible conflicts.

i. Compatibility problems.

j. Time schedules.

k. Weather limitations.

l. Manufacturer's recommendations.

m. Warranty requirements.

n. Compatibility of materials.

o. Acceptability of substrates.

p. Temporary facilities.

q. Space and access limitations.

r. Governing regulations.

s. Safety.

t. Inspecting and testing requirements.

u. Required performance results.

v. Recording requirements.

w. Protection.

2. CONTRACTOR shall record significant discussions and directives received from each conference. CONTRACTOR shall, within three (3) calendar days after the meeting date, distribute the minutes of the meeting to all concerned parties, including but not limited to, OAR, INSPECTOR, and ARCHITECT.

3.03 PROGRESS MEETINGS

A. Progress meetings will be held at the Project site at regular intervals, typically weekly, as determined by the OAR.

B. In addition to representatives of CONTRACTOR, OWNER, and ARCHITECT, each Subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of the Work shall, if requested by OAR, be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude all matters relating to the Work.

C. Failure of CONTRACTOR to be so represented at any progress meeting which is held at a mutually agreed time or for which a written notice is given, shall not relieve CONTRACTOR from abiding by any and all OAR determinations or directives issued at such meeting.

D. OAR will review and correct or approve minutes of the previous progress meeting and will review other significant items affecting progress. Topics for discussion as appropriate to the status of the Project include but are not limited to:

1. Interface requirements.
2. Construction Schedule.
3. Sequence and coordination.
4. Status of submittals / RFCs.
5. Deliveries.
6. Off-site fabrication.
7. Access.
8. Site utilization.
9. Temporary Construction Facilities and Controls.
10. Hours of work.
11. Hazards and risks.
12. Housekeeping.
13. Quality of materials, fabrication, and execution.
14. Unforeseen conditions.
15. Testing and Inspection.
16. Defective Work.
17. Construction Directive.
18. Request for Proposal.
19. Change Order Proposals and Change Orders.
20. Documentation of information for payment requests.

21. Application for Payment.

22. Other items as required or as brought forth..

23. Initial Notice of Start of Issue, Event, Condition, Circumstance, or Cause of Perceived Delay, Disruption, Interference, Hindrance, Acceleration. (Article 12.2.1 of the General Conditions).

24. Final Notice of End of Issue, Event, Condition, Circumstance, or Cause of Perceived Delay, Disruption, Interference, Hindrance, Acceleration (Article 12.2.2 of the General Conditions).

25. Storm Water Pollution Prevention.

26. CEQA Compliance.

E. No later than three (3) calendar days after each progress meeting, OAR will prepare and distribute minutes of the meeting to each present and absent party. Include a brief summary, in narrative form, of progress, decisions, directives, actions taken, and all other issues since the previous meeting and report.

1. Schedule Updating: CONTRACTOR shall revise the Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized, and issue the revised schedule at the next scheduled progress meeting.

3.04 ADDITIONAL MEETINGS

A. OAR, upon giving notice to the intended parties and without further obligation, may require additional meetings to discuss Work and/or Project related activities.

3.05 OWNER'S RIGHT TO RECORD

A. CONTRACTOR agrees on behalf of itself and all its subcontractors that the OWNER may audiotape or videotape any meetings, training and any work at any time during the Project

END OF SECTION

SECTION 01 3213
CONSTRUCTION SCHEDULE

PART 1 - GENERAL

1.01 SECTION INCLUDES

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 OAR in monitoring progress.
4. Aid in assessing the impact of any changes to the Contract.
5. Provide justification for progress payments.

1.02 RELATED REQUIREMENTS

A. Section 01 1100: Summary of Work.

B. Section 01 1216: Phasing of the Work.

C. Section 01 2300: Alternates (Bid Items).

D. Section 01 2973: Schedule of Values.

E. Section 01 2976: Progress Payment Procedures.

F. Section 01 3113: Project Coordination.

G. Section 01 3300: Submittal Procedures.

H. Section 01 4523: Testing and Inspection.

I. Section 01 4525: Testing, Adjusting, and Balancing for HVAC.

J. Section 01 5000: Construction Facilities and Temporary Controls.

K. Section 01 7700: Contract Closeout.

L. Section 01 7836: Warranties.

PART 2 – PRODUCTS

2.01 SCHEDULING SOFTWARE

A. CONTRACTOR shall utilize Primavera Scheduling Software (P6) to employ the Critical Path Method (CPM) in the development and maintenance of the construction schedule. If the version of Primavera Scheduling Software (P6) used is greater than Version 15.1, the CONTRACTOR shall save & export schedules in

Version 15.1 before submitting to OWNER for review. 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 OAR. When schedule calculations are performed, the "Retained Logic" setting shall be used. CONTRACTOR shall use the zero "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 years direct experience using Primavera Project Planner. Scheduler will cooperate with OAR and shall be available on site for monitoring, maintaining and updating schedules in a timely manner. OAR has the right to refuse to accept the Scheduler based upon a lack of experience as required by this Section or based on lack of on-site performance and timeliness of schedule submittals. If OAR does not accept the proposed Scheduler, CONTRACTOR shall within one week of disapproval, propose another scheduler who meets the experience requirements stated above.

B. CONTRACTOR shall submit two color originals and three copies of all bar charts, reports and/or other required schedule data as outlined in this Section. CONTRACTOR shall electronically deliver the schedule file in its original format at the time of submittal.

C. CONTRACTOR shall attend a pre-construction scheduling conference with OAR within 7 days after Notice of Award. Contractor shall then develop and submit the Preliminary Construction Schedule within 14 days after Notice of Award. .

D. CONTRACTOR shall submit the Proposed Baseline Schedule no later than thirty days from the Notice to Proceed (or as stipulated in the milestones under Section 01 1219 Phasing of the Work Appendix A).

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 interim 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 one) during the first three months of the job until the complete Baseline Schedule is approved by the OAR.

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 NTP such as mobilization, preparation of submittals, specified review periods, procurement items, fabrication items, milestones, and detailed construction activities.

C. Upon OAR'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, site access, submittals, and permits.

E. Submit Bar Charts, Tabular Reports, a Cost flow Histogram, Electronic Data, and Plots in accordance with Article 3.04-L.

F. If the project is of a short duration and it would be more beneficial for the CONTRACTOR to forego the preliminary 90 day schedule, then upon CONTRACTOR request and OAR written Approval, the CONTRACTOR may go straight into development of the Baseline Schedule for the entire project. This will need to be implemented expeditiously in order to not impede the processing of the monthly pay applications. Approval of the Baseline schedule and first monthly update is precedent of the monthly pay application.

3.03 SCHEDULE OF VALUES

A. CONTRACTOR shall cost load activities in the Construction Baseline Schedule and allocate costs to the cost accounts of all activities. The cost accounts shall match the CSI sections listed in the Table Of Contents of the Specifications. The format shall be coordinated with Specification Section 01 2973 (Schedule of Values), Specification Section 01 3229 (Project Forms), and Specification Section 01 2976 (Progress Payment Procedures).

B. Submit a computer generated report from the Construction Baseline Schedule using the P6 scheduling software. The report shall contain the following data for each activity: Cost Account Number (by CSI section), 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 section. This 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. If OAR determines that the costs are front loaded and/or the distribution of costs is unreasonable, CONTRACTOR shall revise accordingly and resubmit the Schedule of Values within five (5) days for OAR review.

3.04 BASELINE SCHEDULE CPM NETWORK

A. No later than thirty days from the Notice to Proceed (or as stipulated in the milestones under Section 01 1219 Phasing of the Work Appendix A), 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 section in accordance with Article 3.03, resource loading of manpower, and other information as set forth in this Section.

1. The Proposed Baseline Schedule shall include all Milestones stipulated in Specification Section 01 1219, Phasing of the Work, Appendix A, 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 NTP, Milestones, submittals, coordination drawings, re-submittals, procurement of materials and equipment, manufacturing, fabrication & delivery, owner furnished contractor installed items (OFCI), access restrictions, work restrictions, phased occupancy, testing, start-up, and contract closeout activities. The Proposed Baseline Schedule shall allow a period for OAR and ARCHITECT to review each submittal, as required by Section 01 3300 and other sections which require additional time for OWNER reviews and deferred submittal reviews by Division of the State Architect (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 in accordance with Article 3.04-J, applicable laws, transportation, traffic, air quality, noise, or any other applicable regulatory requirements, regulations or collective bargaining agreements pertaining to labor.

5. The Proposed Baseline Schedule shall include an activity with a minimum review period of one hundred days for all Deferred Approvals required by DSA. In addition, as a predecessor to this activity, a separate 18 day OWNER review period shall be included in the Proposed Baseline Schedule.

6. CONTRACTOR shall not use any float suppression techniques such as preferential sequencing or logic, special hidden lag time between activities or milestones, float absorption activities, or unjustifiable over-estimating of activity durations in preparing the Proposed Baseline Schedule. Finish Milestones should be constrained to a "Finish on or before" constraint. No "Zero Free Float" constraints, No "Early" Constraints, and No "Mandatory Finish" constraints shall be utilized.

7. 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 fifteen (15) working days unless approved by the OAR. Non-construction activities such as procurement, delivery, or submittal activities are exempted. CONTRACTOR will need to perform their due-diligence to make sure that the activity man-power loading and activity durations are directly integrated.

8. 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 (by trade), equipment requirements, anticipated 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 days from the date of order to delivery to the Project site.

C. At the OAR'S 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 similar factors.

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

1. Activity ID numbers shall consist of a built-in intelligence scheme. Following OAR 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. At a minimum, activity codes specified in Article 3.04-G shall be applied to each activity. This is at the activity level and is different than WBS coding structure.

4. Cost accounts (in CSI Master 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 OAR'S request, furnish a written explanation for each lead or lag relationship and each constrained date. Unjustifiable leads, lags, and constraints will result in OAR'S 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 Specification Section 01 1219, Phasing of the Work, Appendix A, shall be placed on a calendar with seven days per week. No holiday or non work-day restrictions are permitted on this calendar. Within the schedule software, the CONTRACTOR shall not use Primavera Global Calendars from past projects, but rather shall use project specific calendars created for this specific contract. The Calendar coding shall be transferable and compatible with the OWNER calendars as to not distort any start/finish dates and "total float" values upon schedule re-calculation.

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 (for example: mobilization, submittals, procurement/fabrication, construction, milestones, etcetera.)
AREA	2	Area or Building (for example: Bldg A, Building B, Courtyard, Athletic Fields, Street Work, etcetera.)
STAG	2	Stage (for example: Foundations, Superstructure, Exterior, Interior, Roof, Floor Number etcetera.)
SBST	2	Substage (a specific area within a stage such as: main electrical room, kitchen, room number, etcetera.)
RESP	7	Responsible Party (subcontractor and/or trade)
DIV	2	CSI Division
SPEC	5	CSI Specification Section number

1. OAR 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 Specification Section 01 1219, Phasing of the Work, Appendix A, in which Work or portions thereof are required to start and complete in accordance with the Contract Documents.

1. Where the term completion or similar terms are used in regards to a Milestone, it shall be construed to mean all portions of the Work in the indicated phase, area, and zone are complete and acceptable to OAR. Where the term 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, or zone is required to be commenced.
2. A Proposed Baseline Schedule extending beyond the Milestones or Contract Time will not be acceptable.
3. Finish Milestones shall be constrained with "Finish on or before" type constraints in accordance with the dates stipulated in Specification Section 01 1219, Phasing of the Work, Appendix A.
4. In the P6 scheduling software, prior to opening the project, click the "dates" tab and place a "must finish by" date to match the Contract Completion Milestone date stipulated in Specification Section 01 1219, Phasing of the Work, Appendix A.
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 available to the project.
6. Milestones shall be placed on a calendar with seven days per week. No Holiday or non work-day 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 it is shown to be on the longest path from beginning to end.

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.

Table 2: Cumulative Calendar Days "Rain Day Impact Allowance":

January	6	July	0
February	5	August	0
March	5	September	1
April	4	October	1
May	1	November	3
June	0	December	5

1. When inclement weather at the Project site impacts Critical Path activities, CONTRACTOR may provide the OAR 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 percent 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 OAR'S independent confirmation of the amount of rainfall and impact, OAR will authorize CONTRACTOR to reduce the duration of the Rain Day Impact Allowance by one day.

2. 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 OAR 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. On projects that have multiple phases with defined start & finish dates, the cumulative rain impact allowance may be split up (pro-rated) into their designated phases upon OAR Approval.

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 OAR. If OAR finds that the costs are front loaded and the distribution of costs is unreasonable, CONTRACTOR shall re-distribute the costs and resubmit the revised Schedule of Values within five days for OAR backcheck.

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 sections listed in the Table of Contents of the Specifications. The format shall be coordinated with Specification Section 01 2973 (Schedule of Values), Specification Section 01 3229 (Project Forms), and Specification Section 01 2976 (Progress Payment Procedures). All cost-loaded activities shall roll-up to their designated CSI sections and shall be the basis for the data reported in

the Schedule of Values (Section 01 2973), Project Forms (Section 01 3229), and Progress Payment Procedures (Section 01 2976).

3. Submit computer generated 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 section), Cost/Resource Account Description, Cost/Resource Account Budget, Cost to Date, Cost this Period, and Cost at Completion. Total Costs shall be organized and totaled by CSI section.

4. Submit a Cost Flow Histogram in accordance with Article 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. Unless otherwise noted, bar charts and reports shall be on 8 ½ by 11 paper and bound.

1. Color 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 Substage. (The network shall be organized to show continuous flow of all activities from left to right). CONTRACTOR is reminded that during the monthly schedule update process, even the activities that have already been completed need to be shown in this “all activities” bar chart report.

   c. Activities sorted by Responsibility.

   d. Summary level of all activities sorted by craft/trade and area.

   e. Critical Path (Longest Path). The network shall be organized to show continuous flow of all critical activities on the longest path from left to right (sorted by early start).

2. 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 11” by 17” 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. Man Power Histogram

a. Submit a planned man-power graphic bar histogram produced from the scheduling software on 11" by 17" 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. In addition, provide a summary excel table of average crew sizes and peak crew sizes broken down by trade/subcontractor. CONTRACTOR will need to perform their due-diligence to make sure that the activity man-power loading is realistic and adequate based on material /labor cost estimates.

5. Provide a written narrative as required by Article 3.04.B.8.

6. Electronic data: Provide an electronic file in its original format of the Schedule. The electronic P6 files shall be saved in "XER" type format.(version 15.1)

7. Plots: Produce a color bar chart on E-size paper (30 by 42-inch) organized (at a minimum) by project, area, stage, and substage.

M. OAR 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. OAR will review the Proposed Baseline Schedule for accuracy, reasonableness, and conformance with the Contract Documents and shall provide comments within ten days of receipt. Within five days after receiving OAR comments, CONTRACTOR shall both incorporate changes to address OAR concerns and resubmit the Proposed Baseline Schedule for OAR backcheck. This process will continue until the Proposed Baseline Schedule is accepted as the Baseline Schedule. Once accepted by OAR, 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 Articles 3.04 and 3.05 respectively) shall be the basis for consideration and analysis of requests for time extensions and CONTRACTOR progress payments.

N. OAR acceptance of the Baseline Schedule or CONTRACTOR'S failure to identify or include an 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 OAR, CONTRACTOR shall copy the Approved Baseline file to a new name, status the activities with actual as-built data through the end of the month & 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 OAR. Each Monthly Schedule Update shall be submitted con-currently with the Monthly Pay

Application no later than the fifth day of the succeeding month in accordance with Article 14 of the General Conditions.

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 OAR. No new activities shall be added (except for the addition of new activities for every re-submittal and re-review required) or unless authorized by the OAR.

2. Once the schedule is statused in accordance with Article 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. Prior to submission of the Monthly Schedule Update, CONTRACTOR shall review and validate that all remaining activities along with their schedule relationships are still accurate based on the actual work flow in the field. If CONTRACTOR chooses to modify logic or add activities (other than out-of-sequence corrections), it shall be done in accordance with Article 3.07 for OAR Review & Approval. CONTRACTOR shall also submit a comparison report between the previous monthly schedule update and the current monthly update that will document the over-all changes (i.e. comparison software such as "Digger", or "Schedule Analyzer", etc,).

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 OAR in writing.

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

5. The Data Date for the Monthly Schedule Updates shall be the first day of the succeeding month. At a minimum, three days prior to the submission of the Monthly Schedule Update, CONTRACTOR shall meet in person with OAR 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 Cost Histogram that overlays the planned cost curve from the Baseline Schedule, against the monthly cumulative

"cost to date" curve, and against the remaining activities 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.

   h. Revisions: the standard schedule comparison report that compares the current update to the previous update shall be submitted to help document any variances/changes. However this comparison report will not be accepted by OWNER in lieu of the above written narrative requirements outline above.

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, reports, a cost flow histogram, man-power histogram, written narrative, electronic data, and plots in accordance with Article 3.04-L.

10. Submit a cost-loaded report (progressed monthly) produced from the scheduling software that displays all of the activities organized by the CSI section cost/resource accounts. This report shall be in compliance with Article 3.04-K, Section 01 2973 (Schedule of Values), Section 01 3229 (Project Forms), and Section 01 2976 (Progress Payment Procedures).

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

1. The Four-Week Rolling Schedule shall be based on the most recent OAR Accepted Monthly Schedule Update. It shall include weekly updates to all construction, submittal, fabrication and procurement, and separate work contract activities. CONTRACTOR shall ensure that it accurately reflects the current progress of the Work.

2. CONTRACTOR shall discuss at the weekly Progress meeting the actual dates and any variances to critical or near critical activities.

3. Upon request by OAR, CONTRACTOR shall provide the Four-Week Rolling Schedule in electronic format.

4. If the Four-Week Rolling Schedule indicates activities are behind schedule, CONTRACTOR shall provide a Recovery Schedule in accordance with Article 3.06.

5. If the CONTRACTOR chooses to provide a Four-Week Rolling Schedule in a greater level of detail (by trade/subcontractor) outside of the monthly contractual P6 schedule database, then upon CONTRACTOR REQUEST and OAR written approval, the CONTRACTOR may proceed as long as the detailed activities roll-up to the contractual P6 monthly schedule updates. These detailed activities will need to be linked to the overall Substantial Completion date as to properly forecast whether the project is ahead or behind schedule during the weekly Progress Meetings. The Four-Week Rolling Schedule must accurately reflect the work that is going on during the current week and must accurately reflect what will happen in the next three weeks.

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 Articles10 and 12 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 OAR under Article 3.05 B.

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 written 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 OAR, the Monthly Schedule Update described above shall become a weekly requirement (at no additional cost to OWNER) to provide a greater degree of focus on the timely completion of the Work. These Updates shall be submitted to OAR every Monday morning. When CONTRACTOR is deemed by OAR to be back on schedule, CONTRACTOR may revert to submitting the schedule monthly.

E. CONTRACTOR'S progress payment may not be processed until OAR 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 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. No time extensions will be granted nor delay damages paid under contract until all available float is used and the CONTRACTOR obtains a Time Extension Request approval from the OAR in accordance with Article 3.07 in its entirety. 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 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 or 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 10 and 12 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, etcetera, in the Schedule Fragnet and will evaluate if the adverse impact arose from events described by Articles 10 and 12 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. 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 this Section and Articles 10 and 12 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 OAR within the stipulations outlined in Article 12 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 OWNER'S review comments and resubmitted. If the forecast logic and activity tasks cannot be agreed to then the pre-delay schedule outlined in Article 3.07-C 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 of this Section will be included as part of the bid price.

B. Preparation, revising, maintenance, and compliance with this Section and Section 01 2973 is an integral part of the Contract Documents and is specified to have a minimum value equal to 2 percent of the original Contract Amount or $150,000, whichever is less. This amount shall be proportionally cost loaded into two activities in both the Proposed Baseline Schedule and the Schedule of Values described in Section 01 2973. One activity for the "Baseline Schedule" and the other activity for the "Monthly Schedule Update Process" as follows:

1. CONTRACTOR may allocate twenty percent (20 percent) of the total cost and place in the "Baseline Schedule" activity. It can then be billed against when the OAR accepts the Proposed Baseline Schedule as the Baseline Schedule.

2. The remaining eighty percent (80 percent) may be cost loaded into the "Monthly Schedule Update Process" activity. This amount may be billed in equal monthly increments. The amount of those increments is determined by dividing the remaining cost by the total number of months in the Contract Time. Payment of these incremental amounts is contingent upon OAR acceptance of CONTRACTOR Monthly Schedule Updates, Recovery Schedules, Four-Week Rolling Schedules, Fragnets, Time Impact Analysis, and the updated Log of Required Submittals.

3. The CONTRACTOR shall anticipate in their base contract scope that numerous Fragnets and written time impact analyses will be required during the duration of the project with the Monthly Schedule Updates. Requests for extra scheduling services will not be considered until the CONTRACTOR demonstrates that all of the costs stipulated in Article 3.08-B has been expended.

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

B. In such an event, OWNER will require, and CONTRACTOR shall participate and provide requested information to ensure the resulting Milestones Schedule accurately reflects CONTRACTOR's plan to execute the Work in compliance with the Contract Documents. If it becomes necessary for OWNER to recommend logic 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 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 are subject to review and acceptance by OWNER. OWNER retains the right, including, but not limited to Article 14 of the General Conditions, to withhold progress payments in whole or part until CONTRACTOR submits a Monthly Schedule Update acceptable to OWNER. If a Monthly Schedule Update is "Rejected" due to the OWNER not receiving a satisfactory schedule that accurately reflects the on-going work activities, the OWNER will mandate a separate meeting with the CONTRACTOR and approved Scheduler to remedy the non-conformance. If after the 2nd consecutive month the OWNER still has to "Reject" the monthly Schedule update due to non-conformance, then the CONTRACTOR'S Scheduler will need to be replaced at no additional cost to the OWNER. CONTRACTOR shall within one week of disapproval, propose another Scheduler who meets the experience requirements stated in this Section.

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 / FINAL AS-BUILT SCHEDULE

A. Prior to Contract Completion of the Work, CONTRACTOR shall submit a final as-built schedule, and a time-scaled network diagram reflecting the actual dates of all activities. This shall be submitted prior to the final application of payment and prior to the request to release retention.

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.

[1] Application for Payment (Multiple Projects Form) is available from the OAR.

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 3300

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Administrative and procedural requirements for submittals required for the Work, including but not limited to; Shop Drawings, Product Data, Samples, material lists, and quality control items.

B. Throughout the Contract Documents, the minimum acceptable quality of materials, fabrication, and execution have been defined by the name and catalog number of a manufacturer and by reference of recognized industry standards.

C. To ensure that specified products are furnished and installed in accordance with the design intent, procedures have been established for submittal of design data and for its review by ARCHITECT, OAR and others.

1.02 RELATED REQUIREMENTS

A. Section 01 1216: Phasing of the Work.

B. Section 01 2513: Product Substitution Procedures.

C. Section 01 2973: Schedule of Values.

D. Section 01 2976: Progress Payment Procedures.

E. Section 01 3113: Project Coordination.

F. Section 01 3213: Construction Schedule.

G. Section 01 3229: Project Forms.

H. Section 01 4523: Testing and Inspection.

I. Section 01 4525: Testing, Adjusting, and Balancing for HVAC.

J. Section 01 5000: Construction Facilities and Temporary Controls.

K. Section 01 7123: Field Engineering.

L. Section 01 7329: Cutting and Patching.

M. Section 01 7416: Storm Water Pollution Prevention.

N. Section 01 7700: Contract Closeout.

O. Section 01 7836: Warranties.

PART 2 – PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 PROCEDURES

A. CONTRACTOR is required to review and approve every submittal and shop drawing prior to transmittal and delivery to ARCHITECT. Should CONTRACTOR determine a submittal contains errors, or does not meet the requirements of the contract, CONTRACTOR shall immediately return the submittals and shop drawings to the producer and expedite the corrections prior to transmitting the submittal to ARCHITECT. Submittals shall not be used by CONTRACTOR to request clarifications or submit questions. CONTRACTOR will affix stamp to each submittal certifying CONTRACTOR has performed, at minimum, the following:

1. Verified the submittal is complete in all respects and follows the requirements of the Contract Documents without variance.

2. Confirmed that no substitutions have been included. If substitutions are included, CONTRACTOR shall eliminate them from the submittal and process them in accordance with Section 00 7000 General Conditions Article 6.14.

3. Identified any variances from the requirements of the Contract Documents and confirmed that the identified variance meets, but does not exceed the allowable limitations or tolerances as defined in these specifications.

4. Verified that all submitted materials, dimensions and tolerances are compatible with existing or planned conditions of the Work in order to erect, fabricate, or install the submitted assembly in conformance with the requirements of the Contract Documents.

5. Coordinated and verified that the dimensions match CONTRACTOR measured field or installation conditions.

6. Coordinated and verified that the products of separate manufacturers required within any field produced assembly are compatible in all respects for such assembly.

7. Packaged together all related submittals or shop drawings where such is necessary for a comprehensive ARCHITECT review.

B. CONTRACTOR shall package each submittal appropriately for transmittal and handling. Transmittal format shall be as required by OWNER. CONTRACTOR shall transmit and deliver six sets of each submittal or re-submittal to ARCHITECT, two of which shall be returned to CONTRACTOR. Some specifications may require additional copies be provided. CONTRACTOR shall provide the OWNER additional copies as specified or as requested by OAR. ARCHITECT will not accept submittals received from sources other than from CONTRACTOR.

C. After ARCHITECT'S review, ARCHITECT will transmit submittals to OAR and OAR shall further distribute to CONTRACTOR, INSPECTOR and others as required. Work shall not commence, unless otherwise approved by OAR, until approved submittals are transmitted to CONTRACTOR.

D. CONTRACTOR shall clearly identify any deviations from the Contract Documents on each submittal. Any deviation not so noted even though stamped reviewed is not acceptable.

E. CONTRACTOR shall coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities requiring sequential activity.

F. Timing of Submittals:

1. In accordance with General Conditions, CONTRACTOR shall submit to ARCHITECT, with copy of transmittal to the OAR, those Shop Drawings, Product Data, diagrams, materials lists, Samples and other submittals required by the Contract Documents.

2. The scheduling of submittals shall be sequenced to support the progress of the Work, and shall be:

a. Submitted sufficiently in advance of construction, fabrication or installation in order to allow time for transmittal, review, modification, correction, (and resubmission and re-review when required.)

b. Phased with adequate time between submittals in order to allow for proper review by the ARCHITECT without negative impact to the Milestones Schedule.

3. CONTRACTOR shall coordinate submittal of related items and ARCHITECT reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received by ARCHITECT.

4. CONTRACTOR shall revise, update and submit submittal schedule to ARCHITECT and OAR on the first of each month, or as required by OAR.

5. CONTRACTOR shall allow in the Construction Schedule, at least sixteen days for ARCHITECT review following ARCHITECT receipt of submittal. For mechanical, plumbing, electrical, low voltage, fire sprinklers, door and hardware, and other submittals requiring joint review with OAR, CONTRACTOR shall allow a minimum of eighteen days following ARCHITECT receipt of submittal. Deferred approval items shall be allowed additional time for DSA review.

6. No adjustments to the Contract Time or Milestones will be authorized because of a failure to transmit submittals to ARCHITECT sufficiently in advance of the Work to permit review and processing or where CONTRACTOR fails to provide ARCHITECT submittals on related items.

7. In case of product substitution, Shop Drawing preparation shall not commence until such time as OWNER accepts or rejects the proposed substitution in accordance with the procedures described in the General Conditions.

G. If required, resubmit submittals in a timely manner. Resubmit as specified for initial submittal but identify as such. Review times for re-submitted items shall be as per the time frames for initial submittal review.

H. Shop Drawing preparation shall not commence until such time as CONTRACTOR receives Product Data acceptance.

I. ARCHITECT will stamp each submittal with a uniform, action stamp. ARCHITECT will mark the stamp appropriately to indicate the action taken, as follows:

1. Final Unrestricted Release: When ARCHITECT marks a submittal “Reviewed” the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.

2. Final-But-Restricted Release: When ARCHITECT, or authorized agent, marks a submittal "Reviewed as Noted," the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.

3. Returned for Re-submittal: When ARCHITECT, or authorized agent, marks a submittal "Rejected, Revise and Resubmit," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat as necessary to obtain different action mark. In case of multiple submittals covering same items of Work, CONTRACTOR is responsible for any time delays, schedule disruptions, out of sequence Work, or additional costs due to multiple submissions of the same submittal item. Do not use, or allow others to use, submittals marked "Rejected, Revise and Resubmit" at the Project site or elsewhere where Work is in progress.

4. Other Action: Where a submittal is for information or record purposes or special processing or other activity, ARCHITECT, or authorized agent, will return the submittal marked "Action Not Required ".

3.02 SHOP DRAWINGS

A. Shop Drawings are original drawings prepared by CONTRACTOR, Sub-contractor, supplier, or distributor illustrating some portion of Work by showing fabrication, layout, setting, or erection and shall not be based on reproduced Contract Documents or copied standard information.

B. Produce Shop Drawings to an accurate scale that is large enough to indicate all pertinent features and methods. Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 24 by 36 inches.

C. Shop Drawings shall include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings. Include the following information:

1. Dimensions.

2. Identification of products and materials included by sheet and detail number.

3. Compliance with specified standards.

4. Notation of coordination requirements.

5. Notation of dimensions established by field measurement.

D. Provide a space of approximately 4 by 5 inches on the label or beside the title block on Shop Drawings to record CONTRACTOR and ARCHITECT review, and the action taken. Include the following information on the label for processing and recording action taken:

1. Project name.

2. Date.

3. Name and address of ARCHITECT.

4. Name and address of CONTRACTOR.

5. Name and address of Subcontractor.

6. Name and address of supplier.

7. Name and address of manufacturer.

8. Name and title of appropriate Specification section.

9. Drawing number and detail references, as appropriate.

E. Unless otherwise agreed to or indicated in individual Specification sections, submit a sufficient number of sets to allow for adequate distribution to CONTRACTOR, Sub-Contractor, supplier, manufacturer and fabricators plus four (4) sets (two sets to be retained by ARCHITECT, one set to the INSPECTOR and one set to OAR).

3.03 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of Work or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, wiring diagrams, schedules, illustrations, or performance curves.

1. Mark each copy to show or delineate pertinent materials, products, models, applicable choices, or options. Where Product Data includes information on several products that are not required, clearly mark copies to indicate the applicable information. Include the following information:

a. Manufacturer's printed recommendations.

b. Compliance with trade association standards.

c. Compliance with recognized testing agency standards.

d. Application of testing agency labels and seals.

e. Notation of dimensions verified by field measurement.

f. Notation of coordination requirements.

g. Notation of dimensions and required clearances.

h. Indicate performance characteristics and capacities.

i. Indicate wiring diagrams and controls.

2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed by CONTRACTOR.

C. Required Copies and Distribution: Same as denoted in Article 3.02.E.

3.04 SAMPLES

A. Procedure:

1. Submit Samples of sufficient size, quantity, cured and finished and physically identical to the proposed product or material. Samples include partial or full sections or range of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches denoting color, texture, and/or pattern.

a. Mount or display Samples in the manner to facilitate review of qualities indicated. Include the following:

1) Specification section number and reference.

2) Generic description of the Sample.

3) Sampling source.

4) Product name or name of manufacturer.

5) Compliance with recognized standards.

6) Availability and delivery time.

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

a. Where variations in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least three (3) multiple units that show the approximate limits of the variations.

b. Refer to other Specification sections for requirements for Samples that illustrate materials, fabrication techniques, assembly details, connections, operation, and similar construction characteristics.

c. Refer to other sections for Samples to be returned to CONTRACTOR for incorporation into the Work. Such Samples must be undamaged at time of installation. On the transmittal indicate special requests regarding disposition of Sample submittals.

d. Samples not incorporated into the Work, or otherwise not designated as Owner property, remain the property of CONTRACTOR and shall be removed from the Project site prior to Substantial Completion.

3. Color and Pattern: Whenever a choice of color or pattern is available in a specified product, submit accurate color chips and pattern charts to OAR for review and selection.

4. Number Required: Submit six, minimum, of each. Two will be returned to CONTRACTOR.

B. When specified, erect field Samples and mock-ups at the Project site to illustrate products, materials, fabrications, or execution and to establish standards by which completed Work shall be judged.

C. Maintain sets of Samples, as returned, at the Project site, for quality comparisons throughout the course of the Work. Sample sets may be used to obtain final acceptance of the Work associated with each set.

3.05 QUALITY CONTROL SUBMITTALS

A. Submit quality control submittals, including design data, certifications, manufacturer's field reports, and other quality control submittals as required under other sections of the Contract Documents.

B. When other sections of the Contract Documents require manufacturer's certification of a product, material, or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.

C. Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the represented company.

D. Requirements for submittal of inspection and test reports are specified in other sections of the Contract Documents.

END OF SECTION

SECTION 01 3546

INDOOR AIR QUALITY PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. CONTRACTOR's requirements and actions to ensure that the building and the mechanical system are free of Volatile Organic Compounds (VOCs), moisture, dust, mold, and microbes prior to achieving Substantial Completion.

2. CONTRACTOR requirements for temporary construction ventilation, dust protection, preconditioning of materials, protection of materials, sequencing, and duct protection.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 01 1216 - Phasing of the Work.

3. Section 01 4525 - Testing, Adjusting, and Balancing for HVAC.

4. Section 01 5000 - Construction Facilities and Temporary Controls.

5. Section 01 6000 - Product Requirements.

6. Section 23 3000 - Air Distribution.

7. Section 23 8000 - Heating, Ventilating, and Air Conditioning Equipment.

C. Referenced Standards:

1. ASHRAE 62.1, Ventilation for Acceptable Indoor Air Quality.

2. ASHRAE 52.2, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

D. VOC-Emitting Materials. Related Sections:

1. Section 06 1000 - Rough Carpentry.

2. Section 06 1733 - Wood I-Joists.

3. Section 06 1813 - Glued Laminated Beams.

4. Section 06 2000 - Finish Carpentry.

5. Section 06 4000 - Architectural Woodwork.

6. Section 07 9200 - Joint Sealants.

7. Section 09 2900 - Gypsum Board.

8. Section 09 6513 - Rubber Base.

9. Section 09 6516 - Resilient Sheet Flooring.

10. Section 09 6813 - Tile Carpeting.

11. Section 09 9000 - Painting and Coating.

12. Section 09 9643 - Chemical-Resistant Coatings.

E. VOC-Emitting Furnishings and Equipment. Related Sections:

1. Section 06 4000 - Architectural Woodwork.

2. Section 10 1100 - Visual Display Units.

3. Section 10 2113 - Plastic Toilet Compartments.

4. Section 12 2116 - Window Blinds (Instructional Spaces).

5. Section 12 3553 - Laboratory Casework – manSection 12 5613 - Folding Tables and Benches.

6. Section 12 6100 - Fixed Audience Seating.

7. Section 12 6613 - Telescoping Bleachers.

F. Porous and Fibrous Materials. Related Sections:

1. Section 07 2100 - Thermal Insulation.

2. Section 09 5113 - Acoustical Panel Ceilings.

3. Section 09 6813 - Tile Carpeting.

1.02 SUBMITTALS

A. CONTRACTOR shall develop and submit to the OAR for review and approval a Construction Indoor Air Quality (IAQ) Plan using the blank form provided after the end of this Section. Plan shall be submitted within 120 days of Notice to Proceed

(NTP). Implementation of the approved IAQ Plan shall be included in the project Construction Schedule.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 QUALITY CONTROL

A. CONTRACTOR shall conduct inspections to confirm that measures proposed in the Construction IAQ Plan are followed during construction and shall report on the progress of the Plan during the progress meetings described in Section 01 3119: Project Meetings.

3.02 PROJECT CONDITIONS

A. During construction, prior to Substantial Completion and Building Flush Out, systems designed with particle filters shall not be operated at any time without filters in place. Filters used during construction shall have a minimum rating of MERV 8. Following construction completion, replace filters per Section 23 8000, Heating, Ventilating, and Air Conditioning Equipment.

B. Following completion of building envelope maintain continuous Temporary Construction Ventilation of interior areas where VOC-Emitting Materials and VOC-Emitting Furnishings and Equipment, identified in Paragraphs 1.01.D and 1.01.E of this Section, areas are installed.

1. Temporary Construction Ventilation may be supplied via the building's HVAC system and shall comply with the following requirements:

a. Return air grilles shall be sealed or temporary MERV 8 air filters shall be installed.

b. Provide MERV 8 air filters to filter the outside air.

c. Provide a minimum of three air changes per hour of outside air while maintaining the building interior temperature between 60 degrees F and 85 degrees F with the relative humidity not to exceed 60 percent.

2. The Temporary Construction Ventilation specified requirements for building interior temperature and/or relative humidity may be exceeded only when the building HVAC unit is operating at 100 percent capacity.

3. Temporary Construction Ventilation may be supplied via temporary ducts and fans, sufficient to provide no less than three air changes per hour and exhausted directly to the outside/outdoors while maintaining the building

interior temperature between 60 degrees F and 85 degrees F with the relative humidity not to exceed 60 percent.

4. Maintain continuous Temporary Construction Ventilation for a minimum period of 72 hours after installation of the VOC-Emitting Materials unless otherwise indicated elsewhere in these Specifications.

C. Temporary Construction Ventilation shall be provided for post-building-flush-out, post-occupancy touch-up, or punch list activities involving VOC-Emitting materials. Touch-up activities involving VOC-Emitting Materials shall not occur when students or staff are present.

D. Prior to installation, allow VOC-Emitting Furnishings and Equipment, identified in Paragraph 1.01.E of this Section, to off-gas in dry, well-ventilated space for 14 calendar days.

1. Remove containers and packaging to maximize off-gassing of VOCs.

2. Precondition products in ventilated warehouse or other ventilated building. Preconditioning at the project site is acceptable, provided that Temporary Construction Ventilation and Sequencing measures are taken as described in Paragraph 3.02.B and Article 3.03 of this Section.

3. Products requiring preconditioning include, at a minimum, VOC-Emitting Furnishings and Equipment that contain vinyl or other flexible plastics, resins, adhesives, foam rubber, and fiberboards with urea-formaldehyde binders. Products bearing CHPS-approval as low- emitting materials GREENGUARD Certification, Indoor Advantage Gold Certification, Green Label Plus Certification, or other OWNER-approved certification shall be excluded from this preconditioning requirement.

3.03 SEQUENCING

A. Where VOC-Emitting Materials identified in Paragraph 1.01.D of this Section are applied on-site, apply the VOC-Emitting Materials prior to installation of any Porous and Fibrous Materials identified in Paragraph 1.01.F of this Section. Maintain the continuous Temporary Construction Ventilation requirements described above for a period of 72 hours before installation of porous and fibrous materials.

1. Where this sequencing requirement is not possible, protect porous materials with polyethylene vapor retarders. Tape polyethylene edges to insure a complete seal. Maintain continuous ventilation per temporary construction ventilation requirements described above for a period of 72 hours before removing polyethylene.

B. Completion: Complete interior finish material installation prior To Building Flush-Out as described in Paragraph 3.05.C of this Section.

3.04 PROTECTION

A. Moisture Protection:

1. Protect materials specified in Paragraphs 1.01.D, 1.01.E and 1.01.F of this Section from water intrusion or penetration.

2. Weatherproof enclosures shall be temporarily constructed to store and protect the materials from moisture sources.

3. Materials shall be covered to protect them from rain and other moisture sources and, if resting on the ground, shall use spacers to allow air to circulate between the ground and the materials.

4. Materials including porous or fibrous materials with visible mold and microbial growth shall not be installed.

   a. Non-porous materials with minor visible mold and microbial growth shall be decontaminated.

   b. Structural lumber showing visible signs of mold shall be removed from the project site or be decontaminated, per specification Section 06 1000 - Rough Carpentry, prior to installation.

B. Duct Protection:

1. Seal ducts during transportation and delivery, per Section 23 3000, Air Distribution.

2. Seal ducts during construction to prevent accumulation of dust and debris. If seals must be removed for temporary construction ventilation purposes, they shall be resealed upon conclusion of the required ventilation period. Remove seals prior to HVAC system start-up.

3. During dust producing activities in enclosed buildings, such as drywall installation and finishing, sanding, cutting, or grinding, CONTRACTOR shall turn HVAC ventilation system off and protect HVAC system supply and return openings from dust infiltration. Separate dust-producing activities from the rest of the construction area using plastic sheathing. Provide temporary ventilation.

3.05 CLEANING

A. Just prior to Substantial Completion, vacuum carpeted and soft surfaces with a Green Label certified vacuum.

B. Duct Cleanliness:

1. Before shipment to site ensure ducts are clean and duct openings protected with a self-adhering film, as specified On Section 23 3000, Air Distribution.

2. Just prior to Substantial Completion and prior to using any ducts to circulate air, ensure that the ducts are free of dust and dirt.

C. Building Flush-Out:

1. Building Flush-Out procedures of this Section supersede those described those of Section 01 4525: Testing, Adjusting, and Balancing of HVAC.

2. At construction completion, prior to occupancy and with all interior finishes installed, replace filtration media with new per HVAC equipment schedule and perform a building flush-out. Flush-out shall supply a total air volume of 14,000 cubic feet of outdoor air per square foot of floor area while maintaining an internal temperature of at least 60 degrees Fahrenheit and relative humidity no higher than 60%.

3. If OWNER elects to partially use and/or occupy the Work prior to completion of the flush-out, the space may be occupied following delivery of a minimum of 3,500 cubic feet of outdoor air per square foot of floor area. Once the space is occupied, it shall be ventilated at a minimum rate of 0.30 cubic feet per minute (cfm) per square foot of outside air. During each day of the flush-out period, ventilation shall begin a minimum of 3 hours prior to occupancy and continue during occupancy. These conditions shall be maintained until a total of 14,000 cubic feet per square foot of outside air has been delivered to the space.

4. During building flush-out, when required to perform touch-up or punch list activities involving VOC-Emitting Materials as described in Article 1.01 of this Section, extend Building Flush-Out by a minimum of four days continuously after the touch-up or punch list activities at the maximum tempered outside air rate for 24 hours per day in the space where the touch-up or punch list activities occurred.

5. If Continuous Construction Ventilation is not possible, non-continuous flush-out shall total an equivalent of air as described in Paragraph 3.05-C.2 above.

6. Return ventilation system to normal operation following flush-out period to minimize energy consumption.

END OF SECTION

CONSTRUCTION INDOOR AIR QUALITY (IAQ) PLAN

Contractor shall complete and submit this Plan to the OAR no later than one hundred twenty (120) days after receipt of Notice to Proceed.

GENERAL CONTRACTOR:

Name: _____ Title: _____

Telephone: _____ Fax: _____

Email: _____

I have read and understood and will implement the following Construction IAQ Plan.

Signature: _____ Date: _____

I. CONSTRUCTION VENTILATION (Per paragraphs 3.02.A through C)

List project materials requiring Construction Ventilation per Part 1 of this Section. Attach additional sheet if necessary. Circle the following Temporary Construction Ventilation approach to be used.	
3.02.B	Ventilation will be supplied via building's HVAC system. • ___ Return air grilles are sealed. Exhaust is provided via open windows or doors. OR: • Return air grilles are used for exhaust. HVAC will provide a minimum 35 percent outside air. Air filters with a minimum MERV rating of 8 will be provided at return air grilles. • Building HVAC will be turned off during dust generating activities.
3.02.B.3	Ventilation will be accomplished via open windows, temporary ducts, and 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. • HVAC system will provide make-up air. 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 72 hours after completion of installation of VOC-emitting materials. • Filters used during Construction Ventilation will be replaced prior to Substantial Completion

II. PRECONDITIONING (Per paragraph 3.02.D)

List project materials requiring Preconditioning per Part 1 of this Section. Attach additional sheet 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. See paragraph 3.02.B above. ☐ Ventilation will be accomplished via open windows, temporary ducts, and temporary fans. See paragraph 3.02.B.3 above.
Required	• Containers and packaging will be removed prior to Preconditioning. • Preconditioning will occur for fourteen (14) continuous days prior to installation

III. SEQUENCING (Per Article 3.03)

List project porous and fibrous materials requiring Sequencing consideration per Part 1 of this Section. Attach additional sheet 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 to Substantial Completion

IV. PROTECTION (Per Article 3.04)

List project materials requiring Protection per Part 1 of this Section. Attach additional sheet if necessary.	
Required	• Weatherproof enclosures shall be temporarily constructed to store and protect the materials from moisture sources. Materials shall be covered from rain and other moisture sources and if resting on the ground, use spacers 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 with visible microbial growth shall be decontaminated prior to installation. Lumber exhibiting a minor amount of "lumberyard mold" need not be discarded. • Temporary ventilation shall be provided during dust producing activities. See Item I Construction Ventilation above. Supply air diffusers and return air grilles shall be covered. • Ducts shall be sealed during transportation, delivery, and construction.

END OF CONSTRUCTION INDOOR AIR QUALITY PLAN

SECTION 01 4213

ABBREVIATIONS, SYMBOLS AND ACRONYMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. List of abbreviations, symbols, and acronyms of societies, institutes, and associations generally appearing in the Contract Documents.

1.02 RELATED REQUIREMENTS

A. Division 01 - General Requirements

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 ABBREVIATIONS

ac	Alternating current
amp	ampere
C	Degrees Centigrade, Celsius
Cat 6	Category 6, unshielded twisted pair cabling
CFC	Chlorofluorocarbon
cfh	Cubic feet per hour
cfm	Cubic feet per minute
cm	Centimeter
Co.	Company
Corp.	Corporation
d	Penny
db.	Decibel
DB	Dry bulb
dc	Direct current
ePTZ	Digital Pan Tilt Zoom
F	Degrees Fahrenheit
fpm	Feet per minute
FPS	Frames per Second
ft	Foot or feet

GA	Gage
gph	Gallons per hour
gpm	Gallons per minute
HP	Horsepower
Hz	Hertz
ID	Inside Diameter
Inc.	Incorporated
IP	Internet Protocols
IR light	Infrared light
Kbps	Kilobits per Second
KHz	Kilohertz
Kip	thousand pounds
Ksf	Thousand pounds per square foot
Ksi	Thousand pounds per square inch
Kv	Kilovolt
KVA	Kilovolt amperes
KW	Kilowatt
KWH	Kilowatt hour
LED	Light Emitting Diode
LF	Linear foot
Lb(s)	Pound(s)
LCD	Liquid Crystal Display
Lux	A standard unit of illumination measurement
Max	Maximum
MBH	1000 BTUs per hour
MHz	Mega hertz
mil	Thousandth of an inch
Min	Minimum
mm	Millimeter
mph	Miles per hour
NA	Not Applicable
NIC	Not in Contract
OC	On Center
OD	Outside Dimension
oz.	Ounce
PCF	Pounds per cubic foot
pH	Acidity-alkalinity balance

PoE	Power Over Ethernet – A standard for providing power over network cable
psf	Pounds per square foot
psi	Pounds per square inch
psig	Pounds per square inch, gage
PTS	Pan–Tilt–Zoom
PVC	Polyvinylchloride
QoS	Quality of Service
RF	Radio frequency
rpm	Revolutions per minute
SDK	Software Development Kit
SF	Square foot
SIP	Session Initiation Protocol
SMA	Software Maintenance Agreement
SS	Stainless Steel
SSL	Secure Sockets Layer
SSM	Server Software Module
SY	Square yard
TCP	Transmission Control Protocol
TLS	Transport Layer Security
UI	User Interface
Unicast	Communication between a single sender and single receiver on network
UPnP	Universal Plug and Play
V	Volts
VBR	Variable Bit Rate
VMS	Video Management System
W	Watts
WB	Wet bulb
WDR	Wide dynamic range

3.02 SYMBOLS

#	Number or pound
'	Foot or feet
"	Inch(es)
%	Percent
◦	Degree (Angle or Temperature)

3.03 ACRONYMS

AA	The Aluminum Association, Inc
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ABMA	American Boiler Manufacturers Association
ACI	American Concrete Institute
ACS	Access Control System
AEC	Automatic Echo Cancellation
ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines
AFF	Above Finish Floor
AGC	Automatic Gain Control
ALPR	License Plate Recognition
AGA	American Gas Association
AGC	Automatic Gain Control
AGCIH	American Conference of Governmental Industrial Hygienists
AI	Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Movement and Control Association, Inc.
ANI	Automatic Number Identification
ANSI	American National Standards Institute
APA	APA – The Engineered Wood Association
API	Application Programming Interface
ARI	Air-Conditioning and Refrigeration Institute
ARS	Automated Route Selection
ARP	Address Resolution Protocol
ATSC	Advanced Television Systems Committee
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATBCB	Architectural & Transportation Barriers Compliance Board
AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers Association

AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BBS	Backbone Switch
BGP	Border Gateway Protocol
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Institute of America
BICSI	Building Industry Consulting Services, International
BRI	Basic Rate Interface
BOOTP	Bootstrap Protocol
BTU	British thermal unit
CAL/OSHA	California Occupational Safety and Health Administration
CAC	Call Admission Control
CAS	Channel Associated Signaling
CAT 5e	Category 5e
CBC	California Building Code
CCR	California Code of Regulations
CCK	Complementary Code Keying
CDR	Call Detail Record
CEC	California Electrical Code
CESM	Compact Edge Switch-Managed
CFR	Code of Federal Regulations
CIF	Common Intermediate Format
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CLI	Command Line Interface
CLID	Calling Line Identification
CMAS	California Multiple Award Schedule
CMC	California Mechanical Code
CNG	Comfort Noise Generation
CNID	Calling Party Name Identification
CQC	California Quality Control (CMA Standards)
Codec	Coder/Decoder
COP	Coefficient of performance
COS	Class of Service
CPC	California Plumbing Code
CRA	California Redwood Association
CSA	Client Software Application

CRI	Carpet and Rug Institute
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standards, U.S. Department of Commerce
CS	Communications Server
CSFM	California State Fire Marshal
CSI	Construction Specifications Institute
CTIOA	Ceramic Tile Institute of America
CTI	Cooling Tower Institute
DHCP	Dynamic Host Configuration Protocol
DHI	Door and Hardware Institute
DHCP	Dynamic Host Configuration Protocol
DGM	Dynamic Graphical Map
DNS	Domain Name System
DSA	Division of the State Architect
DTV	Digital Television
DSS	Direct Station Selection
DTMF	Dual Tone Multiple Frequency
DVD	Digital Video Disc
EER	Energy efficiency ratio
EIA	Electronic Industries Alliance
EIS	Electronic Image Stabilization
ESM	Edge Switch-Managed
E&M	Ear and Mouth
FAT	Field Acceptance Testing
FEP	Front End Processor
FEP	Fluorinated Ethylene Propylene
FPS	Frames per Second
FTP	File Transfer Protocol
FXS	Foreign Exchange Station
EPA	Environmental Protection Agency
ETL	ETL Testing Laboratories
FCC	Federal Communication Commission
FDA	Food and Drug Administration
FECC	Far End Camera Control
FPS	Frames per Second
FM	Factory Mutual
FPS	Frames per Second
FS	Federal Specifications

FTP	File Transfer Protocol
FXO	Foreign Exchange Office
FXS	Foreign Exchange Station
GA	Gypsum Association
GANA	Glass Association of North America
GBIC	Gigabit Interface Converter
GUI	Graphical User Interface
GigE	Gigabit Ethernet
HMMA	Hollow Metal Manufacturer's Association
HPVA	Hardwood Plywood & Veneer Association
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol over SSL
HVAC	Heating, Ventilation, and Air Conditioning
IACS	International Annealed Copper Standards
IAMPO	International Association of Plumbing and Mechanical Officials
IC	Intercom
ICBO	International Conference of Building Officials
ICEA	Insulated Cable Engineers Association
ICMP	Internet Control and Message Protocol
ID	Identifier
IDF	Intermediate Distribution Frame
IEEE	Institute of Electrical & Electronic Engineers, Inc.
IDS	Intrusion Detection System
IEC	International Electro technical Commission
IES	Illuminating Engineering Society
IMI	International Masonry Institute
IOR	Inspector of Record
IP	Internet Protocol
IP Router	Internet Protocol Router
IPVC	Internet Protocol Video Conferencing
IPX	Internetwork Packet Exchange
IRI	Industrial Risk Insurers
ISDN	Integrated Services Digital Network
ISO	International Organization for Standardization
ISA	Industry Standard Architecture
ISDN	Integrated Services Digital Network
ISM	Intermediate Switch-Managed (Fiber Switch)
ISMS	Integrated Security Monitoring and Management System
ISP	Internet Service Provider

ITD	OWNER, Information Technology Division
ITU	International Telecommunication Union
IVR	Interactive Voice Response
JPEG	Joint Photographic Experts Group (image format)
Kbps	Kilobits per Second
LAN	Local Area Network
LCD	Liquid Crystal Display
LDC	Local Distribution - Cabinet
LDF	Local Distribution Frame
LED	Light Emitting Diode
LIU	Light Interconnection Unit
MAC	Media Access Control
MAN	Metropolitan Area Network
MBR	Maximum Bit Rate
MCU	Multipoint Conference Unit
MDF	Main Distribution Frame
MDF-BBS	Main Distribution Frame Backbone Switch
MIB	Management Information Base
MIC	Message Integrity Check
MLD	Multicast Listener Discovery
MLSFA	Metal Lath/Steel Framing Association
MPOE	Main Point of Entry
MPEG	Moving Picture Experts Group
MP-BGP	Multi-Protocol Border Gateway Protocol
MOS	Mean Opinion Scale
MSS	Manufacturers Standardization Society of the Valve & Fittings Industry.
NAAMM	National Association of Architectural Metal Manufacturers
NAT	Network Address Translation
NAT-PT	NAT Protocol Translation
NAS	Network Attached Storage
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NCMA	National Concrete Masonry Association
NEBB	National Environmental Balancing Bureau
NEBS	Network Equipment Building System
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association

NEC	National Electrical Code
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NIC	Network Interface Card
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NMP	Simple Network Management Protocol
NOFMA	National Oak Flooring Manufacturers Association
NPCA	National Paint and Coatings Association
NPDES	National Pollutant Discharge Elimination System
NRCA	National Roofing Contractors Association
NSF	National Sanitation Foundation
NTP	Network Time Protocol
NTSC	National Television System Committee
NTMA	National Terrazzo & Mosaic Association
NTSC	National Television System Committee
NUSIG	National Uniform Seismic Installation Guidelines
NWMA	National Woodwork Manufacturers Association
OAR	OWNER Authorized Representative
OC-3	Optical Carrier Level-3 (~155 Mbps)
OEHS	Office of Environmental Health and Safety (LAUSD's)
OFNR	Optical Fiber Non-Conductive Riser
OFNP	Optical Fiber Non-Conductive Plenum
OID	Object Identifier
OPX	Off Premise Extension
OSHA	Occupational Safety & Health Administrations
OSI	Open Systems Interconnection
OSPF	Open Shortest Path First
OTDR	Optical Time Domain Reflectometer.
ONVIF	Open Video Interface Forum
OWAN	OWNER's Wide Area Network
OWNER	Los Angeles Unified School District
PA	Public Address
PABX	Private Auxiliary Branch Exchange
PA/IC	Public Address/Intercommunications
PAL	Phase Alternating Line

PAT	Port Address Translation
PBX	Private Branch Exchange
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PCM	Pulse Code Modulation
PDI	Plumbing and Drainage Institute
PEI	Porcelain Enamel Institute
PHB	Per Hop Behavior (DiffServ)
PIC	PBX Integration Card
PIM	Protocol-Independent Multicast
PING	Packet Internet Groper
PINX	Private Integrated Services Network Exchange
PIP	Picture in Picture
PMO	Project Management Office
PoE	Power-over-Ethernet
POP	Point of Presence
POTS	Plain Old Telephone System
PRI	Primary Rate Interface
PS	Product Standard, U.S. Department of Commerce
PSIP	Program and System Information Protocol
PSTN	Public Switched Telephone Network
PZM	Pressure Zone Microphone
QCIF	Quarter CIF – See CIF
QoS	Quality of Service
QSIG	Q-Signaling
RADIUS	Remote Access Dial-In User Service
RIP	Routing Information Protocol
RIPng	Routing Information Protocol Next Generation
RIS	Redwood Inspection Service
RMON	Remote Network Monitoring
RMON2	Remote Network Monitoring Version 2
SAN	Storage Area Network
SCAQMD	South Coast Air Quality Management District
SCSI	Small Computer System Interface
SDEI	Steel Deck Institute
SDI	Steel Door Institute
SFM	State Fire Marshal

SFP	Small Form-factor Pluggable transceiver
SFP+	Enhanced Small Form-factor Pluggable transceiver
SFPA	Southern Forest Products Association
SIF	Source input format (NTSC)
SIP	Session Initiation Protocol
SIGMA	Sealed Insulating Glass Manufacturers Association
SJI	Steel Joist Institute
SLC	Small Learning Community
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SMDI	Simple Message Desk Interface
SMI	Structure of Management Information
SMTP	Simple Mail Transfer Protocol
SMPTE	Society of Motion Picture and Television Engineers
SNA	Systems Network Architecture
SNMP	Simple Network Management Protocol
SSH	Secure Shell
SSID	Service Set Identifier
SSL	Secure Socket Layer
SSPC	Steel Structures Painting Council
S/P DIF	Sony/Philips Digital InterFace
SWI	Steel Window Institute
TEHO	Tail End Hop Off
TCA	Tile Council of America
TCP	Transmission Control Protocol
TFTP	Trivial File Transfer Protocol
TIA	Telecommunications Industry Association
TKIP	Temporal Key Integrity Protocol
TLS	Transport Layer Security
TOS	Type of Service
UBPPA	Uni-Bell PVC Pipe Association
UCI	Uniform Construction Index
UFAS	Uniform Federal Accessibility Standards
UL	Underwriters' Laboratories, Inc.
UM	Unified Messaging
UPS	Uninterruptible Power Supply
UPnP	Universal Plug and Play
URL	Uniform Resource Locator

USDA	United State Department of Agriculture
UTC	Coordinated Universal Time
UTP	Unshielded Twisted Pair
UPS	Uninterruptible Power Supply
USP	Unified Security Platform
USW	Unified Web Client
VAD	Voice Activity Detection
VBR	Variable Bit Rate
VLAN	Virtual Local Area Network
VM	Voice Mail
VSS	Video Surveillance System
VoD	Video on Demand
VFD	Vacuum Fluorescent Display
VTC	Video Teleconference
WAN	Wide Area Network
WDR	Wide dynamic range
WLAN	Wireless Local Area Network
WCLIB	West Coast Lumber Inspection Bureau
WDMA	Window and Door Manufacturers Association
WWPA	Western Wood Products Association

END OF SECTION

SECTION 01 4523

TESTING AND INSPECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Testing and inspection services to meet requirements of the California Building Code (CBC) and the Division of the State Architect (DSA).

B. Related Requirements:

1. Section 03 2000 – Concrete Reinforcing.
2. Section 03 3000 – Cast-in-Place Concrete.
3. Section 04 2200 – Concrete Unit Masonry.
4. Section 06 1000 – Rough Carpentry.
5. Section 06 1733 – Wood I Joist.
6. Section 06 1813 – Glue Laminated Beams.
7. Section 31 2319 – Excavation Fill for Structures.

1.02 REFERENCES

A. American Concrete Institute (ACI):

1. ACI 318 – Building Code Requirements for Structural Concrete and Commentary.

B. American Institute of Steel Construction (AISC):

1. AISC 360 – Specification for Structural Steel Buildings.
2. AISC 341 – Seismic Provisions for Structural Steel Buildings.

C. ASTM International (ASTM):

1. ASTM A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.

2. ASTM A370 – Standard Test Methods and Definitions for Mechanical Testing of Steel Products.

3. ASTM A706 – Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.

4. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

5. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.

6. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

7. ASTM C1140 - Standard Practice for Preparing and Testing Specimens from Shotcrete Test Panels.

8. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms.

9. ASTM C1604 - Standard Test Method for Obtaining and Testing Drilled Cores of Shotcrete.

10. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments.

11. ASTM E488 - Standard Test Methods for Strength of Anchors in Concrete Elements.

12. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing.

13. ASTM E605 - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members.

14. ASTM E1444 - Standard Practice for Magnetic Particle Testing.

15. ASTM F606 - Standard Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, Direct Tension Indicators, and Rivets.

D. Association of the Wall and Ceiling Industry (AWCI):

1. AWCI Technical Manual 12-B - Standard Practice for the Testing and Inspection of Field Applied Thin Film Intumescent Fire-Resistive Materials; an Annotated Guide.

E. American Welding Society (AWS):

1. AWS D1.1 – Structural Welding Code.

2. AWS D1.4 – Structural Welding Code – Reinforcing Steel.

3. AWS D1.8 – Structural Welding Code – Seismic Supplement.

F. Division of the State Architect (DSA) Interpretation Regulations (IR):

1. DSA IR 17-2 – Nondestructive Testing (N.D.T.) of Welds.

2. DSA IR 17-3 – Structural Welding Inspection.

3. DSA IR 17-8 – Sampling and Testing of High Strength Bolts, Nuts and Washers.

4. DSA IR 17-9 – High Strength Bolting Inspection.

5. DSA IR 17-10 – Sampling, Testing and Tagging of Reinforcing Bars.

6. DSA IR 17-11 – Identification, Sampling and Testing of Threaded Steel Anchor Bolts and Anchor Rods.

7. DSA IR 22-3 – Open Web Steel Joists and Joist Girders.

8. DSA IR 23-4 – Metal-Plate-Connected Wood Trusses.

9. DSA IR-23-8 – Manufactured Wood-Chord-Metal-Web Trusses.

1.03 REGULATORY REQUIREMENTS

A. Laboratories performing testing shall have DSA's Laboratory Evaluation and Acceptance Program approval prior to providing material testing or special inspection services.

B. Tests of materials and inspections shall be in accordance to Section 4-213 through 4-219 of the California Building Standards Commission's, California Administrative Code.

C. Required material testing, inspections and special inspections are indicated on the DSA approved DSA-103, Listing of Structural Tests & Special Inspections (T&I List). OAR will provide CONTRACTOR copy of DSA-103.

1.04 TESTS

A. OWNER will contract with a DSA approved testing laboratory to perform the testing indicated on the Contract Documents, including the Tests and Special Inspections (T&I) list.

B. Selection of material to be tested shall be by the Testing Laboratory and not by CONTRACTOR.

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

D. OWNER will select, and directly reimburse, the Testing Laboratory for costs of all DSA required tests and inspections; however, the Testing Laboratory may be reimbursed by CONTRACTOR for such costs as specified or noted in related sections of the Contract Documents.

E. The Testing Laboratory is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.

F. The Testing Laboratory shall not perform any duties of CONTRACTOR.

G. CONTRACTOR shall provide an insulated curing box with the capacity for twenty concrete cylinders and will relocate said box and cylinders as rapidly as required in order to provide for progress of the Work.

1.05 TEST REPORTS

A. Test reports shall include all tests performed, regardless of whether such tests indicate the material is satisfactory or unsatisfactory. Samples taken but not tested shall also be reported. Records of special sampling operations, when and as required, shall also be reported. Reports shall indicate the material (or materials) was sampled and tested in accordance with requirements of CBC, Title 24, Parts 1 and 2, as indicated on the Contract Documents. Test reports shall indicate specified design strength and specifically state whether or not the material (or materials) tested comply with the specified requirements.

1.06 VERIFICATION OF TEST REPORTS

A. Each Testing Laboratory shall submit to the Division of the State Architect, in duplicate, a verified report covering all tests required to be performed by that agency during the progress of the Work. Such report, covering all required tests, shall be furnished prior to Substantial Completion and/or, when construction on the Work is suspended, covering all tests up to the time of Work suspension.

1.07 INSPECTION BY OWNER

A. OWNER, and its representatives, shall have access, for purposes of inspection, at all times 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. OAR shall have the right to reject materials and/or workmanship deemed defective Work and to require correction. Defective workmanship shall be corrected in a satisfactory manner and defective materials shall be removed from the premises and legally disposed of without charge to OWNER. If CONTRACTOR does not correct such defective 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 defective Work and proceed in accordance with related Articles of the Contract Documents.

C. CONTRACTOR is responsible for compliance to all applicable local, state, and federal regulations regarding codes, regulations, ordinances, restrictions, and requirements.

1.08 PROJECT INSPECTOR

A. A Project Inspector will be employed by OWNER in accordance with requirements of Title 24 of the California Code of Regulations with their duties specifically defined therein. Additional DSA Special Inspectors may be employed and assigned to the Work by OWNER in accordance with the requirements of the CBC and DSA.

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

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

1.09 STRUCTURAL TESTS AND SPECIAL INSPECTIONS

A. Soils:

1. General: Periodic inspection by Geotechnical Engineer for verification of the following construction activities in conformance to CBC Table 1705A.6:

a. Site has been prepared properly prior to placement of controlled fill and/or excavations for foundations.

b. Foundation excavations are extended to proper depth and have reached proper material.

c. Materials below footings are adequate to achieve the design bearing capacity.

2. Compacted Fills: Testing and inspections shall be in conformance to Table 1705A.6:

a. Geotechnical Engineer will continuously verify the use of proper materials and inspect lift thicknesses, placement, and compaction during placement of fill.

b. Testing Laboratory under the supervision of the Geotechnical Engineer will:

1) Perform qualification testing of fill materials.

2) Test the compaction of fill.

3. Driven Deep Foundations (Piles): Testing and inspections shall be in conformance to Table 1705A.7:

a. Continuous inspections by Geotechnical Engineer:

1) Verify pile materials, sizes and lengths comply with the requirements.

2) Inspect driving operations and maintain complete and accurate records for each pile.

3) Verify locations of piles and their plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and record any pile damage.

b. Testing Laboratory under the supervision of the Geotechnical Engineer will determine capacities of test piles and conduct additional load tests as required.

c. Steel piles: Tests and inspections will be as indicated on paragraphs below for structural steel.

d. Concrete piles and concrete filled piles: Tests and inspections will be as indicated on paragraphs below for concrete.

4. Cast-in-place Deep Foundations (Piers): Continuous inspections by Geotechnical Engineer in conformance to Table 1705A.8:

    a. Inspect drilling operations and maintain complete and accurate records for each pier.

    b. Verify placement locations and plumbness, confirm element diameters, bell diameters (if applicable), lengths, and embedment into bedrock (if applicable). Record concrete or grout volumes.

    c. Confirm adequate end strata bearing capacity.

    d. Concrete Piers: Tests and inspections will be as indicated on paragraphs below for concrete.

5. Retaining Walls:

    a. Continuous inspections by Geotechnical Engineer:

        1) Placement, compaction and inspection of soil per CBC Section 1705A.6.1 for fills supporting foundations.

        2) Segmental retaining walls; inspect placement of units, dowels, connectors, etc.

    b. Concrete Retaining Walls: Provide tests and inspections as indicated on paragraphs below for concrete.

    c. Masonry Retaining Walls: Provide tests and inspections as indicated on paragraphs below for masonry.

B. Concrete:

1. Cast in Place Concrete: Inspection and testing in conformance to CBC Table 1705A.3:

    a. Inspection of reinforcement, including prestressing tendons and verification of placement, per ACI 318, sections 25.2, 25.2, 25.5.1 through 26.5.3.

    b. Reinforcing bar welding: Inspect per AWS D1.4, ACI 318 26.5.4.

        1) Verification of weldability of reinforcing bars other than ASTM A706.

        2) Inspect single-pass fillet welds, maximum 5/16”.

3) Inspect all other welds.

c. Inspect anchors cast in concrete per ACI 318, section 17.8.2.

d. Inspect anchors post-installed in hardened concrete members:

1) Continuous inspection of adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads, per ACI 318, section 17.8.2.4.

2) Mechanical anchors and adhesive anchors, not defined in previous paragraph, per ACI 318, section 17.8.2.

e. Design Mix:

1) Verify use of required mix, per ACI 318, chapter 19 and sections 26.4.3 and 26.4.4.

2) Batch Plant Inspection: The quality and quantity of materials used in transit-mixed concrete and in batched aggregates shall be continuously inspected as required by CBC section 1705A.3.2. If approved by DSA, batch plant inspection may be reduced to periodic if plant complies with CBC section 1705A3.3.1, item 1, and requires first batch inspection, weightmaster, and batch tickets.

f. Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete, per ASTM C172, ASTM C31, ACI 318, sections 26.4.5 and 26.12.

g. Inspect concrete and shotcrete placement for proper application techniques, per ACI 318, section 26.4.5.

h. Verify maintenance of specified curing temperature and techniques per ACI 318 sections 26.4.7 through 26.4.9 and CBC section 1908.9.

i. Inspect prestressed concrete for:

1) Application of prestressing forces, per ACI 318 section 26.9.2.1

2) Grouting of bonded prestressing tendons per ACI 318 section 26.9.2.3.

j. Inspection of erection of precast concrete members per ACI 318 chapter 26.8.

k. Verify in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs per ACI 318 section 26.10.1.b.

l. Sampling and testing of reinforcing steel per ASTM A370, DSA IR 17-10 and CBC section 1910A.2. CONTRACTOR shall submit mill certificate indicating compliance with requirements for reinforcement, anchors, ties, and metal accessories.

2. Prestressed Concrete: In addition to the tests and inspections required for concrete listed above, the following tests and inspections will performed:

a. Testing Laboratory will test prestressing tendons and anchorages per CBC section 1910A.3 and ASTM A370.

b. Special Inspector will check the materials, equipment, tensioning procedure and inspect placement of prestressing tendons and construction, per CBC section 1705A.3.4.

c. Special Inspector will verify in-situ adequate concrete strength prior to stressing tendons.

d. Continuous inspection by Special Inspector of application of prestressing forces and grouting of bonded prestressing tendons, per CBC section 1705A.3.4.

3. Precast Concrete: In addition to the tests and inspections required for concrete listed above, the following tests and inspections will performed:

a. Continuous inspection by Special Inspector of fabrication of precast concrete members.

b. Inspection of erection of precast concrete members per ACI 318, chapter 26.8.

4. Shotcrete: In addition to the tests and inspections required for concrete listed above, the following tests and inspections will performed:

a. Continuous inspection by Special Inspector of placement of shotcrete per ACI 318 section 26.4.5.

b. Testing Laboratory will test strength of shotcrete in accordance to ASTM C1140 and ASTM C1604.

5. Post-installed Anchors:

   a. Special Inspector will inspect installation of post-installed anchors in hardened concrete members as required by CBC table 1705A.3, item 4.

      1) Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads, per ACI 318, section 17.8.2.4.

      2) Mechanical anchors and adhesive anchors not defined above, per ACI 318, section 17.8.2.

   b. Testing Laboratory will test post-installed anchors in conformance to CBC section 1905A and ASTM E488.

C. Structural Masonry:

1. Material Verification and Testing:

   a. Sampling and testing of reinforcing steel per ASTM A370, DSA IR 17-10 and CBC section 1910A.2. CONTRACTOR shall submit mill certificate indicating compliance with requirements for reinforcement, anchors, ties, and metal accessories.

   b. Submit manufacturer's certificate of compliance for masonry units, mortar and grout materials. Test masonry units, mortar and grout (unit strength method).

   c. Testing Laboratory will test masonry prisms in conformance with ASTM C1314.

   d. Special Inspector will verify proportions of site-prepared, premixed or preblended mortar and grout, per ASTM C780.

   e. Testing Laboratory will test core-drilled samples in conformance with CBC 2114.6.2.

2. Inspection:

   a. Special Inspector will continuously inspect preparation of prisms per ASTM C1314.

   b. Special inspector will verify size, location and condition of dowels and construction supporting masonry.

c. Special inspector will verify size specified size, grade and type of reinforcement.

d. Special inspector will verify weldability of reinforcing bars other than ASTM A706. Special inspector to inspect reinforcing bar welding: Inspection to be in conformance with AWS D1.4, ACI 318 26.5.4.

e. Special inspector will inspect placement of reinforcement, connectors, masonry units and construction of mortar joints.

f. Special inspector will verify protection of masonry during cold weather temperature (temperature below 40^{o} F) or hot weather (temperature above 90^{o} F).

g. Special inspector will inspect type, size and location of anchors and all other items to be embedded in masonry, including other details of anchorage of masonry to structural members, frames and other construction.

h. Special inspector will inspect grout space prior to grouting and placement of grout.

3. Post-installed Anchors in Masonry:

a. Special inspector will inspect anchors cast in concrete per ACI 318, section 17.8.2.

b. Special inspector will inspect anchors post-installed in hardened concrete members:

1) Continuous inspection of adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads, per ACI 318, section 17.8.2.4.

2) Mechanical anchors and adhesive anchors, not defined in previous paragraph, per ACI 318, section 17.8.2.

c. Testing Laboratory will test post-installed anchors in conformance to CBC section 1905A and ASTM E488.

D. Structural Steel:

1. Special inspector will verify that all materials are properly marked in conformance with AISC 360, Section 3.3 and applicable ASTM standards.

a. Mill certificates indicating material properties that comply with requirements.

b. Materials, sizes, types and grades complying with requirements.

2. Testing Laboratory will test unidentified materials in conformance with ASTM A370.

3. Special inspector will examine seam welds of HSS shapes in conformance with DSA IR-17-3.

4. Special inspections and non-destructive testing of structural steel elements shall be in conformance to CBC section 1705A.2.1.

E. High Strength Bolts:

1. Special inspector will verify identification markings and manufacturer's certificates of compliance conform to ASTM standards specified in the Contract Documents, per DSA IR 17-9.

2. Testing Laboratory will test high-strength bolts, nuts and washers in conformance with ASTM F606, ASTM A370 and DSA IR 17-8.

3. Special inspector will inspect bearing-type ("snug tight") bolt connections in conformance with AISC 360, section M2.5 and DSA IR 17-9.

4. Special inspector will inspect slip-critical bolt connections in conformance with AISC 360, section M2.5.

F. Welding:

1. Verification of Materials, Equipment and Welders:

a. Special inspector will verify weld filler material identification markings per AWS designation listed on the Contract Documents and the WPS.

b. Special inspector will verify material manufacturer's certificate of compliance.

c. Special inspector will verify WPS, welder qualifications and equipment in conformance to DSA IR 17-3.

2. Shop Welding: Special inspector will inspect the following, per CBC 1705A.2.1, AISC 360 (and AISC 341, as applicable) and DSA IR 17-3:

a. Groove, multi-pass fillet welds larger than 5/16", plug and slot welds.

b. Single-pass fillet welds equal or less than 5/16".

c. Inspect welding of stairs and railing systems.

d. Verification of reinforcing steel weldability.

e. Welding of reinforcing steel, per AWS D1.4.

3. Field Welding: Special inspector will inspect the following, per CBC 1705A.2.1, AISC 360 (and AISC 341, as applicable) and DSA IR 17-3:

a. Groove, multi-pass fillet welds larger than 5/16", plug and slot welds.

b. Single-pass fillet welds equal or less than 5/16".

c. End welded studs (ASTM A108) installation, including bend test.

d. Floor and roof deck welds.

e. Welding of structural cold-formed steel.

f. Welding of stairs and railing systems.

g. Verification of reinforcing steel weldability.

h. Inspect welding of reinforcing steel.

4. Non-Destructive Testing: Testing Laboratory will test perform ultrasonic and magnetic particle testing in conformance to AISC 360 section N5.5, AISC 341 appendix Q5.2, AWS D1.1, AWS D1.8, ASTM E543, ASTM E1444, ASTM E164 and DSA IR 17-2.

G. Steel Joists and Trusses: Continuous inspection, special inspector will verify size, type and grade for all chord and web members as well as connectors and weld filler material, verify joist profile, dimensions and chamber (if applicable); verify all weld locations, lengths and profiles; mark or tag each joist, in conformance with CBC section 2207.1 and DSA IR 22-3.

H. Fire-Proofing:

1. Spray Applied:

a. Project inspector will examine structural steel surface conditions, inspect application, take samples, measure thickness, and verify

compliance of all aspects of application with Construction Documents, in conformance with CBC sections and ASTM E.605.

b. Testing Laboratory will test bond strength in conformance with ASTM E605, per CBC section 1705A.14.6.

c. Testing Laboratory will test density in accordance with ASTM E605, per CBC section 1705A.14.5.

2. Intumescent Fire-Resistant Coatings: Special inspector will inspect and test in accordance with AWCI 12-B, per CBC section 1705A.15.

I. Anchor Bolts, Anchor Rods and Other Steel:

1. Testing Laboratory will sample and test not readily identifiable anchor bolts and anchor rods in accordance with DSA IR 17-11.

2. Testing Laboratory will sample and test not readily identifiable threaded rod not used for foundation anchorage per procedures noted in DSA IR 17-11.

J. Prefabricated Wood Structural Elements:

1. Special inspector will continuously inspect fabrication of glued-laminated timber in accordance with CBC section 1704A2.5.

2. Special inspector will continuously inspect fabrication of manufactured open-web trusses in accordance with CBC 1704A2.5 and DSA IR 23-4.

3. Special inspector will continuously inspect fabrication of manufactured metal plate connected trusses in accordance with CBC 1704A2.5 and DSA IR 23-8.

PART 2 – PRODUCTS (Not used).

PART 3 – EXECUTION (Not used).

END OF SECTION

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 2013: HVAC Piping.
12. Section 23 3000: Air Distribution.
13. Section 23 3813: Kitchen Ventilation System.
14. Section 23 5000: Central Heating Equipment
15. Section 23 6416: Oil Lubricated Centrifugal Water Chillers.
16. Section 23 6418: Oil Free Centrifugal Water Chillers.

17. Section 23 6423: Scroll Water Chillers.

18. Section 23 6426: Rotary-Screw Water Chillers.

19. Section 23 6428: Air-Cooled Rotary Screw Chillers.

20. Section 23 6500: Cooling Towers.

21. Section 23 8000: Heating, Ventilating and Air Conditioning Equipment.

22. Section 28 3149: Carbon Monoxide Detection and Alarm Systems.

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 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. Laboratory Hoods.

16. Heat Exchangers.

17. Chillers.

18. Cooling Towers.

19. Boilers.

20. Chilled water, heating hot water and cooling tower 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, 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 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 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.

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 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.

Q. 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.

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 deflection and velocity in inches per second.

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 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. 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 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.

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 1.5 times design static pressure. All ducts shall demonstrate 5 percent leakage maximum (per CBC).

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 percent 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, 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.

k. 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 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 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.

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 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. Cooling Towers:

1. Test and balance water flows, balance tower cells, and flows between towers.

2. Test and record temperature profiles for water and airside operation.

3. Outside Climatic Conditions: Outside air dry bulb (DB) temperature, wet bulb (WB) temperature, and atmospheric conditions, during temperature profile runs.

D. 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 temperature, WB temperature, and atmospheric conditions, during temperature profile runs.

E. 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.

F. 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.

G. 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.

H. 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.

I. Steam Heating Systems:

1. Heating Coils: Steam pressure at coils, cfm, coil pressure drop, entering and leaving air dry bulb temperatures.

2. Boilers:

a. Steam pressure, temperature, and quantity of feed-water (see Testing and Adjusting procedures).

b. Make, type, serial number, and rated capacity.

c. Flue gas temperature at boiler outlet ahead of back-draft diverter.

d. Percent carbon dioxide in flue gas.

e. 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 3.09, A, 1, 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 Sub-paragraph 3.09.A.1, 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 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 temporary controls to be provided, maintained, relocated, and removed by CONTRACTOR.

B. Temporary office furnishings and office equipment.

C. Project signage.

1.02 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 the 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 OAR.

C. CONTRACTOR provided facilities are to be in place and available for OWNER use and occupancy within (Insert Number of Days) 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.

1.03 SUBMITTALS

A. Temporary Utilities: Submit to OAR reports of tests, inspections, meter readings, certifications, permits and similar procedures performed on temporary utilities.

B. Project Signage / Banner: Submit to OAR for review and approval.

1. Shop Drawings: Elevation showing the text, OWNER sign and color of project signage, jointing, fittings and location of grommets.

2. Certification: Submit certification attesting fabric is certified as flame retardant, in accordance to NFPA 701, Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

1.04 PROJECT IDENTIFICATION SIGNAGE AND BANNERS

A. Provide the following project identification information:

1. **"**Your School Bond Funds at Work".

2. "Providing Safe, Updated, and New School Facilities for 21st Century Learning".

3. "Construction Anticipated to Start in 2025".

4. $XXX Million Investment.

5. "Creates an Estimated XXX Jobs.

6. Name of LAUSD School Superintendent.

7. Alphabetical listing of Board of Education Members.

8. Name of the Architect/Engineer.

9. Name of CONTRACTOR.

10. Name of DESIGN-BUILD TEAM.

B. Project Sign:

1. CONTRACTOR shall furnish and install **[ ]** Project Signs on the Project site at a location established by OAR. For graphical layout refer to Appendix A. OAR will provide the information to be posted on the sign. A draft of the proposed sign shall be submitted to OAR for review and approval before fabrication.

2. Sign shall be direct printed on an aluminum sheet 0.08 thick, adhered to a 3/4 inch thick exterior grade plywood. Electronic file of graphic shall have a minimum resolution of 150 dpi at two feet by four feet. Provide posts, bracing and perimeter framing with intermediate backing not to exceed two feet on center. Size: eight feet wide by four feet high. Size of building rendering shall be approximately six feet wide by three feet high.

C. Banners:

1. CONTRACTOR shall furnish and install [ ] Banners on the Project site at a location established by OAR. For graphical layout refer to Appendix A. OAR will provide the information to be posted on the sign. A draft of the proposed sign shall be submitted to OAR for review and approval before fabrication.

2. Products of the following manufacturers form the basis for design and quality intended: 3M, MACtac North America, or equal, and shall meet the following requirements:

a. Flame retardant, heavy duty durable vinyl material, super smooth, minimum 16 ounces per layer.

b. Banners shall be cut with accurate angles and straight edges. Edges of banner shall be heat welded on four sides without causing fabric separation or otherwise damaging the work.

c. Banners shall have on both sides a clear, permanent, anti-graffiti coating that shall be durable and last a minimum of two years. Cleaning or removal of graffiti shall not cause damage to the anti-graffiti coating or image, or cause it to flake, yellow, bubble, peel or fade.

d. Ink used in the printing process shall be of the highest quality OEM inks and have integral UV protective components.

e. Banners shall be provided with ½ inch diameter grommets along the top and the bottom edges, spaced not more than 30 inches on center. Grommets shall be 4 inches, minimum, from the edges of the banner. Tie wire to fence / barricade.

D. No other signs shall be displayed without approval of OAR. 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.

E. CONTRACTOR shall remove Project Identification Signage at Substantial Completion of the Work.

1.05 TEMPORARY UTILITIES

A. 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.

B. CONTRACTOR shall furnish, install and pay for all necessary permits, inspections, move ins/out, temporary lines, connections and fees, extensions and distribution, metering devices and use charges, deliveries/pickups, rentals, storage, transportation, taxes, labor, insurance, bonds, material, equipment and all other miscellaneous items for the temporary utility systems. CONTRACTOR shall pay to utility companies for the consumption of the following temporary utility services:

1. Temporary Water service.

2. Temporary Electrical service.

3. Temporary Gas service.

4. Temporary Telephone and Data.

C. Maintain, extend and/or relocate temporary utility systems as rapidly as required in order to provide for progress of the Work.

1. Water distribution piping and outlet devices shall be of the size and required flow rates in order to provide service to all areas of the Project site.

2. 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.

   a. Provide 20 foot candles minimum lighting levels inside building(s) and 5 foot candles outside for safety and security.

   b. Ensure welding equipment is supplied by electrical generators.

3. Provide temporary Heating, Ventilation and Air Conditioning. OWNER will not accept utilization of the permanent HVAC system for temporary HVAC until Substantial Completion. CONTRACTOR shall maintain manufacturer required levels of room and/or space temperature, humidity and ventilation necessary to install products, materials and/or systems, cure materials, disperse humidity, remove fumes, and prevent accumulation of dust, irritants, or gases.

4. Provide temporary phone, data service and distribution to Project site temporary offices.

D. Upon Substantial Completion of the Work, remove temporary systems, devices and appurtenances.

1.06 TEMPORARY OFFICES

A. CONTRACTOR shall provide Project Site temporary office facilities for his own use, and in addition shall provide and maintain a minimum of one **{insert trailer size} {new}** construction trailer on the Project site for use by OWNER for the duration of the Work. Construction trailer shall be accessible by OWNER and/or INSPECTOR on a 7 day a week 24-hour basis. CONTRACTOR shall provide the necessary materials and labor to provide the trailer with access for disabled persons on request by the OAR. Trailer shall include, at a minimum, the following:

1. Conference room with a table and adequate seating for twelve.

2. One bathroom.

3. An open work area with devising partitions as required by OWNER.

4. Two enclosed, separate offices with windows and lockable doors.

B. Trailer shall be furnished with two exterior entrance doors with one located in a separate office. Each door shall be furnished with 'Smart Key' technology on both the dead bolt and cylinder lock. Provide six keys for each locking device. Exterior doors and windows shall be provided with exterior mounted burglar bars. Windows shall be provided with operable window shades. Security of trailer and contents is a continuous obligation of CONTRACTOR and shall be equipped with local sounding security system.

C. Trailer shall have ample headroom, 8-foot minimum, and shall be lighted, heated, ventilated, and air-conditioned. Provide an electrically chilled bottled water fountain of 5-gallon capacity. Purified water shall be supplied in 5-gallon containers, delivered weekly, with four spares on hand after each re-supply visit. As an option, CONTRACTOR may maintain a minimum of two 24 500ml bottles cases of purified water in owner trailer throughout the duration of the project.

D. The separate offices shall each be approximately 120 square feet in size and shall be furnished with a minimum of four 120 volt single phase convenience outlets with one 4' long multi-outlet power strip (such as Legrand Model #PM48C) at each outlet location as well as one telephone jack and one data/LAN outlet. The conference room shall be approximately 200 square feet in size and shall be furnished with a minimum of eight 120 Volt single phase convenience outlets with one telephone jack and one data/LAN outlet.

E. CONTRACTOR shall coordinate floor plan and location of electrical, telephone, data outlets with OAR prior to ordering and delivering the trailer.

F. 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.

G. CONTRACTOR shall remove waste bin trash from OAR'S trailer, vacuum OAR'S trailer floors and/or mop OAR'S trailer floors once per week. Provide trailer with bathroom paper goods, soap, broom, mop and doormats.

H. Trailer shall remain property of CONTRACTOR. CONTRACTOR shall remove such property upon Substantial Completion of Work or as otherwise determined in writing by OAR.

NOTE TO OAR: FURNISHINGS FOR LARGE PROJECTS SHOULD BE NEW, FOR SMALLER PROJECTS, USED.

1.07 FURNISHINGS

A. CONTRACTOR shall provide **{new}** furnishings in the following quantities, shall set in rooms and shall position as directed by OAR upon delivery:

NOTE TO OAR: TASK CHAIRS, MEETING CHAIRS DESKS AND FOLDING TABLES SHALL BE SPECIFIED AS "NEW" ON CONSTRUCTION PROJECTS OVER TWO MILLION DOLLARS IN COST. THESE ITEMS SHALL REMAIN DISTRICT PROPERTY AND SHALL BE OFFERED FIRST TO THE SCHOOL. REMAINING FURNITURE DOES NOT NEED TO BE NEW, BUT IN GOOD CONDITION. ON PROJECTS LESS THAN $2 MILLION, ALL FURNITURE CAN BE USED, AND WILL REMAIN CONTRACTOR'S PROPERTY. EDIT ACCORDINGLY.

1. **{Insert quantity}** rolling mid-back task chairs, with arms, Allseating Inertia Mesh Back Basic Synchro Tilt 77089-T2-FM-NSBL-LH-BKN-OG17 Gray Mesh, Gray Matters Enviroleather, warranty 24/7 lifetime, or equal, shall be provided new and shall remain as OWNER's property.

2. **{Insert quantity}** padded meeting chairs, Allseating 77054-NA-GM-FM-NGRY-FV-ARIVR, Gray Matters Enviroleather, warranty 24/7 lifetime, or equal shall be provided new and shall remain as OWNER's property.

3. **{Insert quantity}** desks, 30 by 66 by 30 inches: Haworth Adaptables WURA-3066-LJSC H-AE Graphite worksurface, Haworth Reside Adjustable Hoop Leg ZKH2-3000-PNFD TR-J Graphite (2 per desk), Haworth X Series Pedestal JPMH-24-SJ B/B/F TR-J Graphite (2 per desk), lifetime warranty, or equal, shall be provided new and shall remain as OWNER's property.

4. **{Insert quantity}** metal bookcases, three shelf, 41 by 34 by 12 inches; HON Brigade or equal (Similar to Staples Cat.# 793638; Item: 1598509/ Model: HS42ABCL).

5. **{Insert quantity}** resin folding tables, 29 by 30 by 72 National Public Seating BT3072, 10 year warranty, or equal, shall be provided new and shall remain as OWNER's property.

6. **{Insert quantity}** four drawer, legal size lateral filing cabinet. HON 500 series or equal. (Similar to Staples Item: 342892/Model: HON584L).

7. **{Insert quantity}** four drawer, legal size lateral filing cabinet. HON 320 series or equal. (Similar to Staples Item: 904583/Model: HH324CPP).

8. **{Insert quantity}** five (5) shelf storage/supply cabinet of approximately 78-inch high by 36-inch wide by 24-inch deep, furnished with locking doors, Sandusky or equal. (Similar to Staples Cat. # 880049/Model: SA4R362478-07).

9. Provide and install **{insert quantity}** "Plan-Hold" wall-mounted 42-inch wide plan racks with 36 individual plan holders each.

10. Provide and install **{insert quantity}** large white board in one conference room, 48 by 72 inches, Quartet melamine dry-erase board or equal. (Similar to Staples Cat. # 789834/Model: S538).

11. Provide and install **{insert quantity}** large tack board in the other conference room, 48 by 72 inches, Quartet cork bulletin board or equal. (Similar to Staples Cat. # 789842/Model: QRT2308).

12. Provide and install **{insert quantity}** combination tack/white boards, 36 by 48 inches, one in each office, Quartet or equal. (Similar to Staples Cat. # 518886/Model: S554).

NOTE TO OAR: REVISE PARAGRAPH BELOW ON LARGE PROJECTS WHERE NEW FURNITURE IS USED AND THE SCHOOL PRINCIPAL WOULD LIKE TO KEEP IT, OR BE DELIVERED TO A DIFFERENT DISTRICT FACILITY.

B. Unless otherwise noted in this Section, furniture shall remain property of CONTRACTOR. CONTRACTOR shall remove such property upon Substantial Completion of Work or as otherwise determined in writing by OAR.

1.08 TELEPHONE & DATA AND TRANSMISSION LINES

A. Provide LAN and phone connectivity to all equipment specified below from the point of connection (POC) to equipment, including, but not limited to all cabling, jacks, patch panel, and patch cables as required to connect all of the equipment listed in this section to the LAN. Cabling shall be CAT 6 or better.

B. Provide **{Quantity}** separate phone lines, one dedicated fax line and **{Quantity}** phone instruments each with speakerphone, intercom, conference call, flash,

redial, call hold and voice mail. Each phone instruments shall have a 4-line or more capacity/selectivity. Provide supporting terminal blocks and any required switch, router, power supplies, and amplifiers.

C. Provide business class Broadband data service. Broadband data service is defined as a minimum of 200 Mbps download.

D. Provide, install, and maintain the following specified equipment:

1. Cisco ISR 4331 capable of providing wireless Internet access. Smartnet will be provided for the entirety of the project to cover the networking equipment.

2. Cisco Small Business unmanaged switch with enough capacity to provide a wired Ethernet connection to each device in the office capable of using one.

E. Provide, install, configure and maintain **{Quantity}** laptop docking station.

NOTE TO OAR: THE PRINTER/COPIER LISTED BELOW SHOULD ONLY BE USED ON LARGE PROJECTS. FOR SMALLER PROJECTS EDIT PARAGRAPHS BELOW AND REPLACE WITH A SMALLER DEVICE.

F. Printer/Copier/Scanner/Fax: Provide, install, configure and maintain for network connectivity one HP LaserJet MFP M880z+ (or latest HP equivalent model at time of bid) with the following features and accessories:

1. B/W and Color.

2. Speed:

a. Copy: 46 ppm.

b. Scan: 70 ppm.

c. Print: 46 ppm.

3. Network capable.

4. Finisher with collation and one position stapling (minimum A2W80A HP LaserJet Stapler/Stacker).

5. Three paper trays integral with the equipment including 8 ½ by 11, 8 ½ by 14 and 11 by 17.

6. Additional 3500 sheet paper feed pedestal or drawer.

7. 2 GB Image Memory, 160 GB hard disk drive.

8. 600 by 600 dpi.

9. Zoom, Reduction and enlargement from 25 percent to 400 percent.

10. Embedded Print Controller with minimum 166 Mhz processor and 10/100 BaseT Network Interface Card.

11. 1Fax specifications: See standard for MFP model.

12. Maintenance: CONTRACTOR shall repair and service machine as necessary. Repair calls shall be responded to within 24 hours of placement.

13. Supplies: CONTRACTOR shall provide THE FOLLOWING:

    a. All toner supplies and consumables, including enough supplies to maintain two spares of each color toner.

    b. All staples and other printer-related consumables, including enough supplies to maintain one spare staple cartridge.

G. CONTRACTOR shall be responsible for maintaining all transmission lines, equipment and related devices. If equipment and/or transmission equipment becomes inoperable and downtime exceeds two days, CONTRACTOR shall replace and/or provide equivalent interim equipment.

H. CONTRACTOR shall employ an experienced and qualified MCSE certified Network Administrator, who shall be responsible to set up and service the LAN equipment and appurtenances provided in OWNER trailer, so as to maintain the equipment in continuous operation. Service response shall be within one day of incident.

I. Electronic/office equipment shall be new at the commencement of the project.

1.09 TEMPORARY STORAGE UNITS

A. CONTRACTOR shall provide secure and waterproof storage units for the temporary storage of furniture, equipment and other items requiring protection.

B. Walls, roof and doors shall be a minimum of 16-gauge steel with floors of 1 inch tongue and groove hardwood or ¾ inch minimum exterior type plywood. The undercarriage shall be designed to accommodate forklift blades 42-inch to 60-inch long. There shall be doublewide swing out lockable doors at one end equipped with waterproof gaskets.

C. CONTRACTOR shall be responsible for delivery charges and will install the storage unit in an appropriate area.

D. 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.

E. 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.

1.10 TEMPORARY SANITARY FACILITIES

A. 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.

B. 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.

C. CONTRACTOR employees shall not use school toilet facilities.

D. 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.

E. CONTRACTOR will contain their breaks and lunch periods to the areas designated by OAR 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.

1.11 TEMPORARY SECURITY FENCE / BARRICADE

A. CONTRACTOR shall install temporary Project site security barricade(s) indicated on Drawings or as required for safety and as specified herein. New or used material may be furnished. Security of Project site and contents is a continuous obligation of CONTRACTOR.

B. Unless otherwise indicated or specified, security fence shall be constructed of 8-foot high chain link fencing with an 8-foot high windscreen. Space posts not to exceed ten feet on centers. Posts shall be of following nominal pipe dimensions: terminal, corner, and gatepost 2 ½-inch, line posts 2-inch. Chain link fence shall be not less than #13 gauge, 2-inch mesh, and in one width. Posts, fence and accessories shall be galvanized and as follows:

1. Shall be set in the earth a depth of 24-inch with soil firmly compacted around post, unless required otherwise in writing by OAR.

2. Fence fabric shall be attached to posts with #14 gauge tie wire at 16 inches on center. A #6 gauge steel tension wire with turnbuckles shall be installed at top and bottom of barricade fencing. Wire tie fabric to tension wires at 18" centers.

3. Windscreen shall be attached to fence fabric and steel tension wires at 18-inch centers with a minimum of #14 gauge tie wire. Windscreen shall be maintained and all rips, tears, missing sections shall be corrected upon notification by OAR.

4. Chain link fencing shall be free from barbs, icicles or other projections resulting from galvanizing process. Fence having such defects will be replaced even if it has been installed.

5. Gates shall be fabricated of steel pipe with welded corners and bracing as required. Fence and fabric to be attached to frame at 12-inch centers. Provide all gate hardware of a strength and quality to perform satisfactorily until barricade is removed upon Substantial Completion of the Work. Each gate shall have a chain and padlock. Provide two gate keys to OAR. At Substantial Completion of the Work, remove barricade from Project site, backfill and compact fence footing holes. Existing surface paving that is cut into or removed shall be patched and sealed to match surrounding areas.

6. At CONTRACTOR'S expense and without limitation remove 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.

1.12 OTHER TEMPORARY ENCLOSURES AND BARRICADES

A. Provide lockable, temporary weather-tight enclosures at openings in exterior walls to create acceptable working conditions, to allow for temporary heating and for security.

B. Provide protective barriers around trees, plants and other improvements designated to remain.

C. 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.

D. 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 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.

E. CONTRACTOR shall be responsible for cleaning up all areas adjacent to the construction 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.

F. 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.

1.13 TEMPORARY STORAGE YARDS

A. CONTRACTOR shall fence and maintain storage yards in an orderly manner.

B. Provide storage units for materials that cannot be stored outside.

C. 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.

1.14 TEMPORARY DE-WATERING FACILITIES AND DRAINAGE

A. 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. CONTRACTOR shall maintain the Work, Project site and related areas free of water.

B. For temporary drainage and de-watering facilities and operations directly associated with new buildings, additions or other construction activities, comply with Divisions 01 and 33 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.

1.15 TEMPORARY PROTECTION FACILITIES INSTALLATION

A. CONTRACTOR shall not change over from using temporary facilities and controls to permanent facilities until Substantial Completion, except as permitted by OAR.

B. 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. CONTRACTOR shall adequately supervise welding operations, combustion type temporary heating and similar sources of fire ignition.

C. 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.

D. 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 OAR. 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.

E. With approval of OAR 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.

F. 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.

1.16 TEMPORARY SECURITY AND SAFETY MEASURES

A. During performance of the Work in existing facilities and/or on a Project Site occupied by students, 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.

B. During performance of the Work in existing facilities or on a Project site occupied by students and where temporary barriers or partitions are not physically feasible, CONTRACTOR shall provide an employee meeting the requirements of

Education Code Section 45125.2.(2) to continually supervise and monitor all employees of CONTRACTOR and Subcontractor. For the purposes of this Section, CONTRACTOR employee shall be someone whom the Department of Justice has ascertained has not been convicted of a violent or serious felony as listed in Penal Code Section 667.5(c) and/or Penal Code Section 1192.7(c). To comply with this Section, CONTRACTOR shall have his employee submit his or her fingerprints to the Department of Justice pursuant to Education Code Section 45125.1(a).

C. Penal Code Sections 290 and 290.4 commonly known as "Megan's Law", require, among other things, individuals convicted of sexually oriented crimes, to register with the chief of police where the convicted individual resides or with a county sheriff or other law enforcement officials. CONTRACTOR shall check its own employees and require each Subcontractor to check its employees and report to CONTRACTOR if any such employees are registered sex offenders. CONTRACTOR shall check monthly during the life of the Contract to ascertain this information and report same to OAR. Before starting the Work, and monthly thereafter during the life of Contract, CONTRACTOR shall notify OWNER in writing if any of its employees and/or if any Subcontractor's employees is a registered sex offender. If so, CONTRACTOR shall proceed in accordance with paragraph B above.

D. 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.

E. 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.

1.17 TEMPORARY ACCESS ROADS AND STAGING AREAS

A. 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 on-site 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.

B. Temporary access roads are to be installed and maintained by CONTRACTOR to all areas of the Project site.

C. CONTRACTOR will be permitted to utilize existing facility campus roads as designated by OAR. CONTRACTOR shall only utilize those entrances and exits as designated by OAR and CONTRACTOR shall observe all traffic regulations of OWNER.

D. CONTRACTOR shall maintain roads and walkways in a clean condition including removal of debris and/or other deleterious material on a daily basis.

1.18 DIRECTIONAL SIGNAGE AND ADVERTISEMENT POSTING

A. CONTRACTOR shall provide and install signage to provide directional, identification, and contact information to construction personnel and visitors as follows and as reviewed by OAR.

1. For construction traffic control/flow at entrances/exits, and as designated by OAR.

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.

B. OWNER has established a program authorizing vendors to post advertisements and billboards along the perimeter of project site. CONTRACTOR shall provide access and shall allow advertising signage to be placed on top of temporary, perimeter, security barricade and/or fences.

1.19 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.

1.20 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.

1.21 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 OAR.

1.22 WASTE DISPOSAL

A. 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.

1.23 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.

1.24 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 workday, the foreman, project manager, superintendent of CONTRACTOR and/or Subcontractors shall visit the 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 Paragraph B below.

B. By the end of each workday, CONTRACTOR shall submit to OAR and INSPECTOR 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 01 3229 and 01 7416 certifying CEQA Mitigations and Storm Water Pollution Prevention (SWPP) compliances.

1.25 FIELD OFFICE SUPPLIES

A. CONTRACTOR shall provide the initial supply of field office supplies to OAR in the quantities listed as set forth below in Table A. If specified in Section 01 2100

– Allowances, CONTRACTOR shall provide additional supplies as required by OAR. CONTRACTOR shall not deduct the costs of the Initial Field Office Supplies (as shown in Table A) from the Allowance for the monthly replenishment of OWNER field office supplies listed in Section 01 2100 – Allowances. CONTRACTOR shall deliver all of the initial field office supplies to OWNER Field Offices within fourteen days from the date established in the Notice to Proceed.

B. CONTRACTOR may utilize different suppliers as the specified information is only to establish the required quantities and minimum levels of quality.

C. Replenishment of Field Office Supplies: If an Allowance is identified in Section 01 2100 – Allowances for the periodic replenishment of OWNER field office supplies. OWNER shall submit requests for replenishment of field office supplies to CONTRACTOR from those listed in Table 'A' below. CONTRACTOR shall provide a monthly accounting of items being requested, cumulative cost of replenishment of Field Office supplies previously ordered, and balance of allowance remaining. Upon Substantial Completion of the Work, CONTRACTOR shall file a Change Order Proposal crediting OWNER for any remaining balance or unspent portion of the Allowance. This Allowance specifically excludes the initial supplies listed in Table 'A' below and is to be used exclusively for the monthly replenishment of OWNER field office supplies. Supplies are to be delivered to OWNER'S trailer within twenty-four hours of OWNER'S request.

D. Postage and Delivery Costs: CONTRACTOR shall provide postage and delivery services for OWNER generated materials in quantities and/or frequencies as requested by OWNER. The cost for these services shall be deducted from the Allowance identified in Section 01 2100 – Allowances for the periodic replenishment of OWNER field office supplies. This allowance is for the OWNER'S use only. Postage and delivery costs for CONTRACTOR generated materials are the responsibility of the CONTRACTOR and shall not be charged to this allowance, regardless of whether the postage and/or delivery of CONTRACTOR generated materials resulted from a request and/or direction from OWNER.

E. 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 from the Allowance for the periodic replenishment of OWNER field office supplies identified in Section 01 2100.

Table A

ITEM	DESCRIPTION	UNIT	QUANTITY	SUPPLIER/ITEM NUMBER
Three Ring Binders – 3-inch	N/A	Each	{ **SPECIFY** }	Staples / 823526-54
Three Ring Binders – 2-inch	N/A	Each	{ **SPECIFY** }	Staples / 816199-54
Three Hole Punch	N/A	Each	{ **SPECIFY** }	Staples / 893844

Two Hole Punch	N/A	Each	{ **SPECIFY** }	Staples / 506261-54
File Organizer	N/A	Each	{ **SPECIFY** }	Staples / 120162-54
Calculator	Canon WS-1400H	Each	{ **SPECIFY** }	Staples / 342763
Flash Drive	2 GB	2	{ **SPECIFY** }	
Wastebasket	N/A	Each	{ **SPECIFY** }	Staples / 125039-54
Digital Camera	5 megapixel	Each	1	
Camera Flash Memory with reader for computer	5 GB	Each	1	
Camera Batteries and Rechargeable Batteries with charger	Appropriate to Camera	Each	1	
Cordless Phone with Answering Machine	AT&T Dect 6.0	Each	1	Staples / 1148831
Surge Suppressors	N/A	Each	{ **SPECIFY** }	Staples / IM1RA1696
Flashlight	N/A	Each	{ **SPECIFY** }	Staples / 222397
Batteries	N/A	4/Lot	{ **SPECIFY** }	Staples / 318956-54
Clipboard	N/A	3/Lot	{ **SPECIFY** }	Staples / 450422-54
8-inch Cast Iron Shears	N/A	Each	{ **SPECIFY** }	Staples / 421040-54
First Aid Kit	N/A	Each	1	Staples / 503979-54
Journal	N/A	Each	{ **SPECIFY** }	Staples / 217695-54
Pens (blue, green and red)	N/A	12/Lot	{ **SPECIFY** }	Staples / 441884-64
Pencils	N/A	48/Lot	{ **SPECIFY** }	Staples / 711382-54
Pencil Sharpener	1900	1	{ **SPECIFY** }	Staples / 330250-54
Mouse Pad	N/A	Each	{ **SPECIFY** }	Staples / 382955-64
Date Received Stamp	N/A	Each	1	Staples / 920274-54
Colored Pencils	N/A	12/Lot	{ **SPECIFY** }	Staples / 317297-54
Markers	N/A	12/Lot	{ **SPECIFY** }	Staples / 932675
Telephone Message Book	N/A	Each	{ **SPECIFY** }	Staples / 194506
Wall Calendar	PM233-28	Each	{ **SPECIFY** }	Staples / 527861-54
Steno Pad	N/A	12/Lot	{ **SPECIFY** }	Staples / 163485-64
Legal Pad	N/A	12/Lot	{ **SPECIFY** }	Staples / 163865-64
Post Its	N/A	12/Lot	{ **SPECIFY** }	Staples / 130005-64
File Folders – 8-1/2 by 11	N/A	50/Lot	{ **SPECIFY** }	Staples / 831099-54
File Folders – 8-1/2 by 14	N/A	50/Lot	{ **SPECIFY** }	Staples / 831057-54
Tape / Dispenser	N/A	Each	{ **SPECIFY** }	Staples / 211540-54
Highlighters	N/A	12/Lot	{ **SPECIFY** }	Staples / 167031
Rubber Bands	N/A	Each	{ **SPECIFY** }	Staples / 808634
Push Pins	N/A	Each	{ **SPECIFY** }	Staples / 480118-54
Dry Erase Board	S537	Each	{ **SPECIFY** }	Staples / 518928-54
Binder Clip – Medium	N/A	24/Lot	{ **SPECIFY** }	Staples / 831602-54
Binder Clip - Large	N/A	12/Lot	{ **SPECIFY** }	Staples / 831610-54
Stapler	818	Each	{ **SPECIFY** }	Staples / 504308
3 Pocket Wall File	N/A	Each	{ **SPECIFY** }	Staples / 730523-54
Heavy Duty Stapler	415	Each	1	Staples / 386312-54
Heavy Duty Staples	SW1-35312	Each	1	Staples / 504191-54
Hanging File Folder	8-1/2 x 11	25/Lot	{ **SPECIFY** }	Staples / 116806-54
Hanging File Folder	8-1/2x14	25/Lot	{ **SPECIFY** }	Staples / 163352-54
File Folder Labels	5266	750/Lot	{ **SPECIFY** }	Staples / 287292-54
Fax Notes	N/A	12/Lot	{ **SPECIFY** }	Staples / 210625-64
Paper Clips	N/A	Each	{ **SPECIFY** }	Staples / 480108-54
Paper Clips	N/A	Each	{ **SPECIFY** }	Staples / 480109-54
Poster Kit - State	CA	Each	1	Staples / 1183148
Poster Kit - Federal	US	Each	1	Staples / 935983-54

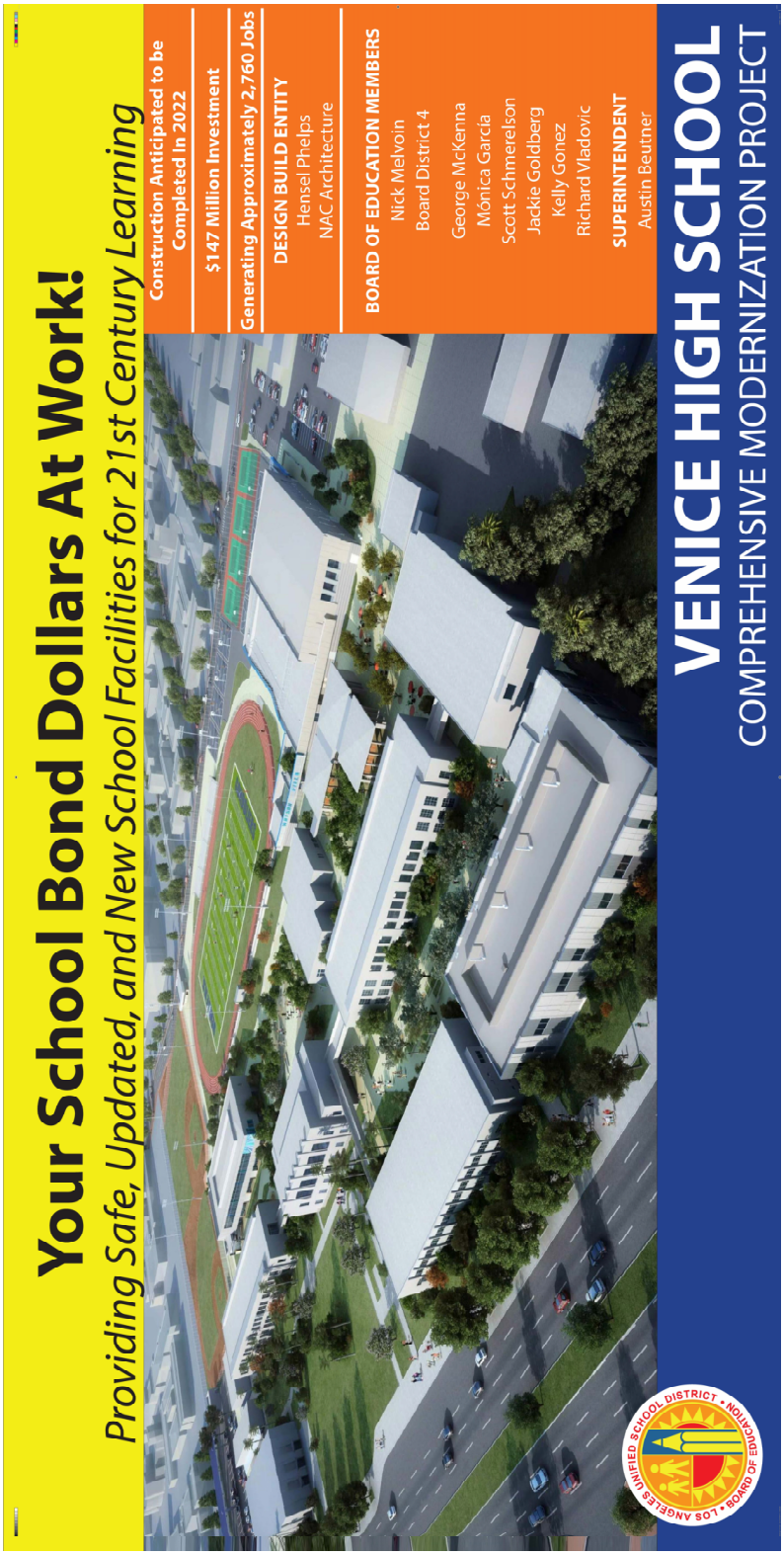
Broom	N/A	Each	1	Staples / 256600
Fire Extinguisher	First Alert	Each	{ **SPECIFY** }	Staples / 238774-54
Copy Paper	8-1/2 x 11	5000/Case	{ **SPECIFY** }	Staples / 122374-69
Copy Paper	8-1/2 x 14	500/Ream	{ **SPECIFY** }	Staples / 122598-69
Copy Paper	11 x 17	500/Ream	{ **SPECIFY** }	Staples / 238105-69
Hardhats	White	Each	{ **SPECIFY** }	Fiber Metal Model E-2 Ratchet knob full range size adjustment
Safety Glasses	Clear and/or Tinted	Each	{ **SPECIFY** }	Crews Storm Series
Safety Vests, Zipper Front	Hi Vis Lime Yellow	Each	{ **SPECIFY** }	Aramak Wearguard Item DEF-1085

PART 2 – PRODUCTS – Not Used

PART 3 – EXUTION – Not Used

END OF SECTION

APPENDIX A



END OF APPENDIX A

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 7123

FIELD ENGINEERING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Layout of the work

2. Verification of work

a. OWNER reserves the right to verify any work that INSPECTOR deems necessary.

b. Other sections that require Surveyor to verify or measure installed work and related item. Surveyor shall perform such verifications or measurements at CONTRACTOR'S expense. CONTRACTOR shall furnish a certification, signed by both Surveyor and CONTRACTOR, to INSPECTOR.

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.

1.02 SURVEY CONTROLS

A. Vertical Control shall use same benchmark used in the preparation of topographic survey. When Work consists of both on-site and off-site and benchmarks differ, an equation shall be indicated on Drawings.

B. Horizontal control for existing structures shall be the property line.

1.03 LAYOUT OF WORK

A. All work related to staking shall be by a Land Surveyor, or Civil engineer, registered with the State of California to perform land surveying and employed by CONTRACTOR.

B. Before commencement of Work, surveyor shall locate all reference points and benchmarks to be used for vertical and horizontal control.

C. Surveyor shall lay out entire Work, set grades, lines, levels, control points, elevations, grids and positions.

1.04 RECORD DOCUMENTS

A. Maintain complete and accurate log of all control and survey documentation as work progresses.

B. Record, by coordinates, 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 sewer manholes.

C. Indicate reference and control points on record drawings. The basis of elevation shall be one of the established benchmarks.

D. Upon Substantial Completion, obtain and pay for reproducible plans. Deliver plans to OAR. Clearly indicate all differences between original drawings and completed work within specified tolerances.

1.05 SUBMITTALS

A. Surveyor: Shall submit name, address and license number to OWNER, including any changes as they occur.

B. Field notes: Upon request by OAR, submit copies of cut sheets, coordinate plots, data collector printouts, marked-up construction staking plans and other documentation as available to verify accuracy of field engineering work during and at completion of project. Submittals to OWNER must be signed and sealed by Surveyor and counter-signed by CONTRACTOR

C. Statement of Compliance: CONTRACTOR shall submit a statement of certification signed and sealed by Surveyor, counter-signed by CONTRACTOR indicating compliance with grades and alignment of construction plans at rough grade, fine grade and top of rock stages. INSPECTOR shall approve survey submittals for each stage of construction prior to proceeding with work

D. Upon Substantial Completion, CONTRACTOR shall obtain and pay for reproducible survey drawings (or “As Built”).

E. Completed record drawings shall be signed and certified as correct and within specified tolerances by licensed surveyor. Originals and two sets of blueprints shall be submitted to OWNER.

PART 2-PRODUCTS – NOT USED

PART 3-EXECUTION

3.01 PREPARATION

A. Pre-mark areas of excavation in accordance with the requirements of "Dig-Alert". Request locators 2 days before commencing excavation.

B. Before commencing Work, establish all horizontal and vertical reference points used in Contract Documents according to existing field conditions.

C. Preserve established reference lines and benchmarks.

D. Differentiate school and city datum as applicable.

E. Relocate bench marks that may interfere with Work.

F. Reset and re-establish reference marks damaged or lost during construction.

3.02 SURVEY REQUIREMENTS GENERAL

A. Establish a minimum of two permanent horizontal and vertical control points on Project site, remote from construction area, referenced to data established by control points.

B. Indicate reference points, relative to benchmark elevation, on record drawings.

C. 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.

D. Calculate and layout proposed finished elevations and intermediate controls as required to provide smooth transitions between spot elevations indicated on Drawings.

E. Provide stakes and elevations for grading, fill, and topsoil placement.

F. 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 asphaltic concrete (AC) surfaces at key locations such as beginning-of-curve (BC), end-of-curve (EC), grade breaks, corners or angle points in sufficient number to demonstrate the Work complies with the intent of the Contract Documents.

G. Provide horizontal and vertical control for batter boards for drainage, utility, and other on-site structures as required.

H. 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.

I. 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 of a foot. Building pad tolerance will be plus or minus 0.1 of a foot.

J. Establish a minimum of two permanent horizontal and vertical control points on Project site, remote from building area, referenced to data established by survey control points.

K. Mark boundaries for rights-of-way dedications and easements for utilities prior to making location of buildings and utilities.

L. Layout all lines, elevations and measurements needed for construction or installation of buildings, grading, paving utilities according to the following:

1. Identify site boundary, property lines.

2. Provide working benchmarks.

3. Set stakes for Bottom of Excavated Plane (B.E.P.).

4. Set gridlines, radii, working points etcetera, for foundation.

5. Set and verify building pad elevations.

6. Set finish floor elevations.

7. Stake location and elevations for exterior ramps and stairs.

8. Set gridlines, radii, working points, etcetera, for all floors of multi-story buildings.

9. Set storm drain and sanitary sewer inverts and other utilities as needed at 5-foot off-set from building lines.

10. For new facilities, establish permanent onsite Benchmark with 2-inch diameter brass disk. Location of Benchmark to be determined by OWNER.

3.03 SURVEY REQUIREMENTS FOR GRADING

A. Provide grade stakes and elevations as follows:

1. Removal limits (cut lines).

2. Rough grade staking: 60-foot maximum grid plus additional stakes at grade changes and pertinent locations. Flag all grade changes including ridges, flow lines and grade breaks.

3. Fine grade for top of dirt: 30-foot maximum grid plus additional stakes at grade changes and pertinent locations. Flag all grade changes including ridges, flow lines and grade breaks.

4. Verify fine grade for top of rock: 30-foot maximum grid plus additional stakes at grade changes and pertinent locations. Flag all grade changes including ridges, flow lines and grade breaks.

5. Finish grade marks on all buildings, structures and at pertinent locations

6. Finish grades and offsets for all concrete work, utilities, landscape areas, and structures.

7. Provide controls and baselines for playground striping.

8. Offsite improvements: set grades and provide grade sheets as required by local authorities.

B. Provide a minimum of two permanent horizontal and vertical control points onsite, remote from building area, referenced to data established by survey control points.

3.04 SURVEY REQUIREMENTS FOR UTILITIES

A. Locate “wet” utility lines and provide vertical control proportionate to slope of line as required for accurate construction. “Dry” utilities shall have adequate horizontal and vertical control layout supplied by others.

B. Prior to back-filling trench, survey and record invert and flow line elevations. Survey and record top of curb and flow line elevations on finished surfaces at key locations (such as Back of Curbs, grade breaks, corners or angle points) in sufficient number to demonstrate Work complies with intent of Contract Documents.

C. Provide horizontal and vertical control for batter boards for drainage, utility, and other on-site structures as required.

1. Set grades for vaults one inch higher than adjacent surrounding design grades, unless noted otherwise.

D. Leave all trenches open until required inspection is completed.

3.05 SURVEY REQUIREMENTS FOR STRUCTURES

A. Furnish building corner offsets as required to adequately locate building pads. Provide cut and fill stakes within building pad perimeter adequate to control both over excavation and re-compaction and final sub-grade elevation of building pad.

B. Submit a certification signed by surveyor confirming elevations and locations of improvements are in conformance with Contract Documents. Statement shall include survey notes for finish floor and building pad, showing actual measured elevations on completed sub-grade, recorded to nearest 0.01 of a foot. Building pad tolerance will be plus or minus 0.1 of a foot.

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.

H. Section 01 4525 - Testing, Adjusting, and Balancing of HVAC.

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 7416
STORM WATER POLLUTION PREVENTION PLAN
FOR PROJECTS WITH LAND DISTURBANCE OF ONE ACRE OR MORE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Storm water permitting and certification in compliance with state and local regulations, including payment of application and annual fees and electronic filing, through SMARTS website.
2. Preparation, implementation, upkeep and monitoring of Storm Water Pollution Prevention Plan (SWPPP).
3. Control runoff and pollutants from the site during construction activities.

B. Related Requirements:

1. Division 01 – General Requirements.
2. Section 33 4000 – Storm Drainage Utilities.

1.02 ACRONYMS AND DEFINITIONS

BMP	Best Management Practice.
CAN	Corrective Action Notice.
CASQA	California Stormwater Quality Association.
COI	Change of Information.
DWQ	Division of Water Quality.
CGP	NPDES General Permit for Storm Water Discharges Associated with Construction Activities.
ELAP	Environmental Laboratory Accreditation Program.
LARWQCB	Los Angeles Regional Water Quality Control Board.
LRP	Legally Responsible Person (OWNER).
NOI	Notice of Intent.
NOT	Notice of Termination.
NPDES	National Pollutant Discharge Elimination System.
OEHS	LAUSD Office of Environmental Health and Safety.
PRDs	Permit Registration Documents, including NOI, Risk Assessment, Site Map, SWPPP, Annual Fee, Signed Certification Statements.

RISK LEVEL As defined by CGP.

QSD Qualified SWPPP Developer.

QSP Qualified SWPPP Practitioner.

QPE Qualifying Precipitation Event, is any weather pattern that is forecast to have a 50% or greater Probability of Precipitation (PoP) and a Quantitative Precipitation Forecast (QPF) of 0.5-in or more within a 24-hr period.

SMARTS Storm Water Multiple Application and Report Tracking System (smarts.waterboard.ca.gov).

SWPPP Storm Water Pollution Prevention Plan.

SWRCB State Water Resources Control Board.

TMDL Total Maximum Daily Load, calculation of pollutant allowable for site specific water bodies.

WPCD Water Pollution Control Drawings.

WDID Waste Discharge Identification Number.

1.03 SWPPP REQUIREMENTS

A. CONTRACTOR shall assign a QSD and QSP, who shall be in responsible charge of Work of this Section.

B. Prior to start of Construction, CONTRACTOR shall:

1. Submit QSD and QSP qualifications.

2. Incorporate SWPPP activities into the Project Schedule.

3. Develop new SWPPP or update SWPPP if provided by ARCHITECT to reflect CONTRACTOR's proposed construction staging, phasing, schedule and other construction activities. SWPPP shall be certified by QSD.

4. Complete the following on the SMARTS website under project application started by OWNER LRP. CONTRACTOR shall provide SMARTS user name to OAR/LRP in order to be linked to the application.

   a. NOI forms.

   b. Upload SWPPP certified by QSD.

   c. Risk Level Calculation.

   d. Post Construction Water Balance Calculation provided by ARCHITECT (Attachment "B" Section 33 4000).

5. Inform OAR/LRP to review and certify the NOI application and PRDs on SMARTS at least 10 days prior to soils disturbance.

6. Submit NOI fee statement along with payment to SWRCB at least 7 days prior to start of construction to obtain a WDID number.

7. Secure and pay for deposits, permits and inspection fees to local jurisdiction, if required.

8. Inform CONTRACTOR and Subcontractors personnel on the BMP procedures to prevent pollutants from entering the storm drain system, before they start construction activities.

C. During Construction:

1. Implement, install and maintain BMPs. Ensure that BMPs are designed to protect all exposed portions of the site.

2. Retain copy of the SWPPP, monitoring records, and PRD on site until Substantial Completion.

3. Conduct and document storm water pollution prevention training of CONTRACTOR site personnel and provide records of training to OAR. See Attachment "D" for sample training log. Keep personnel informed of the SWPPP changes.

4. Monitor the Project Site per the CGP requirements.

   a. Conduct site inspection of pollution prevention controls and provide Site Monitoring Reports per the CGP and SWPPP. Prepare and maintain, at the Project site, a log of each inspection using Site Monitoring Report forms (Attachment “A”, at the end of this Section. Inspections shall include, at a minimum:

      1) At least weekly.

      2) Within 72 to 120 hours prior to a QPE.

      3) Within 96 hours after the last 24 hour period with 0.25 inches or more precipitation.

      4) At least once each 24 hours during extended storm events.

      5) Conduct quarterly non-storm water inspections (Attachment “C”).

   b. Conduct sampling and reporting as directed by CGP and outlined in the SWPPP Construction Site Monitoring Plan.

   c. Precipitation forecast information shall be obtained from the National Weather Service Forecast Office (http://www.srh.noaa.gov/).

5. Participate in quarterly SWPPP inspections with representative from OWNER’s OEHS. Correct CAN items issued by OEHS.

6. Non-compliance with the CGP and Unauthorized Discharges shall be reported to OAR immediately, who will notify OEHS.

7. Provide verification annually that construction activities are in compliance with SWPPP. Submit Annual Report Compliance Certification (Attachment “B”) to OAR and complete Annual Report on SMARTS by

July 15 of each year, for review and certification. Annual Report will be certified by OWNER's LRP.

8. Maintain, Report, and update SWPPP and PRDs on the SMARTS website, including items listed below.

   a. Upload SWPPP amendments.

   b. Complete Ad-Hoc Reports for all sampling events. Non-Visible, Effluent Monitoring, TMDL updates and Exceedance Results must be reported electronically by deadlines per CGP.

   c. Provide COI in SMARTS to reflect changes to construction site area, schedule, and risk level. COI shall be submitted to OAR/LRP for certification.

9. Pay annual fees related to the CGP up until the date of Substantial Completion.

10. Pay fines and penalties from regulatory agencies against OWNER due to CONTRACTOR'S non-compliance with storm water regulations. OWNER shall recover costs of fines and penalties by appropriate OWNER assessment. Review of the SWPPP and inspection log by OAR shall not relieve CONTRACTOR from liabilities arising from non-compliance of storm water pollution regulations.

11. Update Post Construction BMP Installation and Maintenance Log and complete Maintenance Plan, provided by ARCHITECT, to reflect 'actual products installed (See Attachment "A" Section 33 4000 Storm Drainage Utilities). Markup Site Plan, Appendix 2 of Attachment "A" of Section 33 4000 to reflect 'As-Builts' conditions.

D. At Substantial Completion:

1. Provide SWPPP, Site Monitoring Reports, and record documents to OAR.

2. Handover the maintenance log and maintenance plan to OAR. OWNER will maintain prevention controls left in place.

3. Conduct Post-Construction BMP training of OWNER personnel.

4. Notify OAR to schedule a meeting with OEHS to confirm Substantial Completion of SWPPP.

5. Submit to OAR Substantial Completion Certification that the Project has met all of the conditions of the CGP (Attachment "B"). Post-construction storm water operation and management plan as mentioned in the compliance certifications shall be in place at Substantial Completion.

6. Prepare the final Annual Report and NOT to terminate permit coverage. Submit NOT electronically with required attachments through the SMARTS system. NOT will be certified by the OWNER's LRP.

7. OWNER Maintenance and Operations will maintain prevention controls left in place after CONTRACTOR receives Substantial Completion.

E. Project Inspector and OEHS Inspector will conduct inspection and examination of the SWPPP.

1.04 SUBMITTALS

A. Submit the following:

1. Qualifications and experience of QSD and QSP for OWNER's review and acceptance.

2. Electronic files of SWPPP updated and certified by QSD.

3. NOI application to OAR/LRP for review and certification through SMARTS.

4. NOI fee statement along with payment to SWRCB.

5. Documentation in accordance with CGP requirements for SWPPP, including:

a. BMP material quality, grade, type as specified in the CASQA BMP Handbook.

b. Electronic Copies of weekly and quarterly inspections, annual reports, compliance certifications, and test results.

c. Proof of filing with the Water Board; copies of PRDs and all attachments.

d. Training records of CONTRACTOR site personnel.

e. BMP implementation schedule.

f. WPCD revisions.

B. SWPPP Closeout Documents: At Substantial Completion provide one hard copy and electronic files of the documents listed below to OAR. OAR will forward records electronically to OWNER Supervising Civil Engineer for retention period of three years.

1. Copy of SWPPP and PRDs, including NOI, Monitoring Program, Inspection Records, Annual Reports, Compliance Certifications, and supporting documents.

2. Updated and signed SWPPP amendments and amendment log.

3. Storm and non-storm water sampling records and test results, including Noncompliance Reports, when limits are exceeded.

4. Training Records for CONTRACTOR and OWNER personnel.

5. Maintenance records for post construction BMP, per Appendix 4 of Attachment "A" of Section 33 4000.

6. Updated Post-Construction Storm Water Management Plan to reflect 'As-Builts' conditions.

7. Notice of Termination.

8. Signed Substantial Completion Certification that the Project has met all of the conditions of the CGP.

1.05 QUALITY ASSURANCE

A. Comply with the following regulatory requirements:

1. National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Lands Disturbance Activities; ORDER NO. 2022-0057-DWQ; NPDES NO. CAS000002, adopted by the State Water Resources Control Board.

2. Regulations of the California Environmental Protection Agency, State Water Resources Control Board; Los Angeles Regional Water Control Board, and local ordinances.

3. CASQA Stormwater Best Management Practice Handbook for Construction Activity (BMP Handbook), current adopted edition.

4. Local jurisdiction stormwater management (SWPPP) and erosion control ordinances.

B. Qualifications: CONTRACTOR's QSP/QSD shall meet the following qualifications:

1. Current certification as a CASQA Qualified SWPPP Practitioner/Developer.

2. Two years minimum experience in erosion and sediment control and knowledgeable in the requirements of SWPPP, Best Management Practices and GCP.

1.06 STORAGE AND PROTECTION

A. Provide proper storage of materials and equipment to prevent rain and storm water runoff to come in contact with pollutants, such as soil stabilizers, paint or fluids from vehicles.

1.07 TRAINING OF OWNER PERSONNEL

EDIT NOTE: REVISE PARAGRAPH BELOW, INCLUDING NUMBER OF HOURS FOR TRAINING AS APPLICABLE TO PROJECT. DELETE PARAGRAPH IF NOT APPLICABLE TO PROJECT.

A. Training of Owner's personnel shall include 8 hours of on-site overview and maintenance of the following Post Construction BMPs:

1. Bioretention Facilities, Planter Boxes and Proprietary Biotreatment Devices.

2. Vegetated Swales, Vegetated Filter Strips and Green Roofs.

3. Sand Filters and Cartridge Media Filters.

4. Infiltration Trenches, Dry Wells, Proprietary Infiltration Devices and Permeable Pavement.

5. Hydrodynamic Devices and Catch Basin Inserts.

B. Training of Owner's personnel on the Post Construction BMPs shall be per Section 33 4000, Storm Drainage Utilities.

1.08 ATTACHMENTS

A. The following attachments are included at the end of this Section:

1. Attachment "A" - Site Monitoring Report.

2. Attachment "B" - Compliance Certification and Checklist.

3. Attachment "C" – Quarterly Non-Storm Water Form.

4. Attachment "D" – Sample LAUSD Construction Storm Water Training Form.

B. The following attachments are included at the end of Section 33 4000:

1. Attachment "A" - Post-Construction Storm Water Management Plan.

2. Attachment "B" – Post-Construction Water Balance Calculator.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide quality, grade and type of materials as specified in the CASQA BMP Handbook.

B. Provide and have available on-site during construction activities a non-stormwater sampling kit suitable for obtaining storm water and non-stormwater quality grab samples. Kit shall include containers and preservatives appropriate for the pollutants known or expected to be in the stormwater. Required sampling equipment shall be adequate to capture and transport samples to a local ELAP State certified water testing lab.

C. Provide a rain gauge on site to record readings during site inspections.

PART 3 – EXECUTION

3.01 IMPLEMENTATION

A. Install perimeter controls prior to starting work at the Project site.

B. Implement BMPs as specified in the SWPPP to contain on-site storm water on the Project site. Provide storm drain inlet protection. Do not drain on-site water directly into the storm drain without proper BMPs in place. If an Active Treatment System

(ATS) is used, comply with the design storm specified in the CGP (10-year, 24-hour event)

C. Prevent pollutant discharges into the storm drain system. Prevent storm water from coming into contact with pollutants, such as material spills, or leakage from storage tanks, waste containers or transfer areas. In the event contamination is found CONTRACTOR shall immediately notify OAR who will contact the OEHS.

D. Protect exposed dirt, such as stockpiles, landscaping areas, and hillsides.

E. Properly manage non-storm water discharges such as ground water, broken utility lines and fire hydrant testing per CGP requirements.

F. Adjust BMP's locations and layouts in accordance to construction progress to assure compliance to regulations.

G. Conduct inspections of pollution prevention controls and provide Site Monitoring Report to OAR immediately if pollutants are discharged into the site runoffs. CONTRACTOR shall sample and remediate contaminated water.

H. Upon Substantial Completion: Maintain and leave post-construction storm water pollution prevention controls in place and remove those that are not needed as determined by the QSD and OAR.

3.02 SWPPP CLOSEOUT

A. Verify the following prior to Substantial Completion of SWPPP:

1. Elements of the SWPPP have been completed.
2. Final stabilization of site, as defined by the GCP, has been demonstrated.
3. There is no potential for construction related storm water pollutants to be discharged into site runoff.
4. Construction related equipment and temporary BMPs have been removed from site.
5. Rubbish, debris, and waste materials have been removed and legally disposed of off the Project site.
6. OEHS CAN items have been closed and signed-off.
7. Post-Construction BMP Maintenance Plan has been established.

END OF SECTION

_____ OWNER Project Number	**Los Angeles Unified School District** **As OWNER** ATTACHMENT "A" **STORM WATER POLLUTION PREVENTION SITE MONITORING REPORT**	STATE OF CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

School Name: _____ _____
Project Description: Contract Number

I. Type of Examination: (Use one form for each type of examination):

☐ Prior to Anticipated Storm Event ☐ After Actual Storm Event ☐ Weekly

Date Examined: _____

II. Check the response for each SWPPP question below:

	YES	NO
1. Do you have an updated Storm Water Pollution Prevention Plan (SWPPP) and a BMP Handbook on the Project site?	☐	☐
2. Does your SWPPP incorporate an up-to-date erosion control plan?	☐	☐
3. Is the erosion control installed per plan?	☐	☐
4. If the Work is at a stage where the erosion control plan can not be constructed, is the erosion control at the Maximum Extent Practicable for the stage you are in?	☐	☐
5. Did you observe the presence of any floating materials such as oil, grease, pieces of wood, paper, etc., odor, toxics, and/ or sediments?	☐	☐
6. If yes, what is it that you observed? _____		
7. Have the SWPPP revisions been certified by the QSD and uploaded to SMARTS?	☐	☐

III. Check the status of the following items as observed:

	SWPPP Items	Not Applicable	Acceptable	Not Acceptable		Repairs Required	Date Repairs Completed
1.	De-silting Basins (Cleaned)	☐	☐	☐	--	☐	
2.	Water Quality Basin	☐	☐	☐	--	☐	
3.	Silt Fences	☐	☐	☐	--	☐	
4.	Hay bales/ Check dams/ Sandbags	☐	☐	☐	--	☐	
5.	Berms and Dikes	☐	☐	☐	--	☐	
6.	Sand/Gravel Inlet	☐	☐	☐	--	☐	
7.	Slope Protection - Polymer and Mulch	☐	☐	☐	--	☐	
8.	Vegetation / Re-vegetation	☐	☐	☐	--	☐	
9.	Dust Control	☐	☐	☐	--	☐	
10.	Surface Erosion	☐	☐	☐	--	☐	
11.	Slope Instability	☐	☐	☐	--	☐	
12.	Storage	☐	☐	☐	--	☐	
13.	Disposal	☐	☐	☐	--	☐	
14.	Spills	☐	☐	☐	--	☐	
15.	Clean-up	☐	☐	☐	--	☐	
16.		☐	☐	☐	--	☐	
17.		☐	☐	☐	--	☐	

IV. Describe any problems or required repairs checked above and the necessary actions needed:

Item	Description of Problem or Required Repair	Action Needed

Examination Performed by CONTRACTOR:

_____ _____

By (Print Name and Title) Date

Verified by Inspector:

_____ _____

By (Print Name and Title) Date

Detailed Storm Water Quality Construction Site Inspection Checklist

ATTACHMENT "A" (Cont.)

GENERAL INFORMATION				
Project Name				
Project Number	LAUSD Ref. No.			
Contractor				
Inspector's Name				
Inspector's Title				
Signature				
Date of Inspection				
Inspection Type (Check Applicable)	❒ Prior to forecast rain ❒ 24-hr intervals during extended rain		❒ After a rain event ❒ Other Weekly or Quarterly	
Season (Check Applicable)	❒ Rainy		❒ Non-Rainy	
Storm Data	Storm Start Date & Time:		Storm Duration (hrs):	
	Time elapsed since last storm (Circle Applicable Units)	Min. Hr. Days	Approximate Rainfall Amount (inches)	

PROJECT AREA SUMMARY AND DISTURBED SOIL AREA (DSA) SIZE		
Total Project Area	_____	Acres
Field Estimate of Active DSAs	_____	Acres
Field Estimate of Non-Active DSAs	_____	Acres

INSPECTION OF BMPs - ATTACHMENT "A" (Cont.)				
BMP	**Yes**	**No**	**N/A**	**Corrective Action**
Preservation of Existing Vegetation				
Is temporary fencing provided to preserve vegetation in areas where no construction activity is planned?				
Location:				
Location:				
Location:				
Location:				
Erosion Control				
Does the applied temporary erosion control provide 100% coverage for the affected areas?				
Are any non-vegetated areas that may require temporary erosion control?				
Is the area where erosion controls are used required free from visible erosion?				
Location:				
Location:				
Location:				
Location:				
Temporary Linear Sediment Barriers (Silt Fence, Fiber Rolls, Sandbag Barriers, etc.)				
Are temporary linear sediment barriers properly installed, functional and maintained?				
Are temporary linear sediment barriers free of accumulated litter?				
Is the built-up sediment less than 1/3 the height of the barrier?				
Are cross barriers installed where necessary and properly spaced?				
Location:				
Location:				
Location:				
Location:				
Location:				
Storm Drain Inlet Protection				
Are storm drain inlets internal to the project properly protected?				
Are storm drain inlet protection devices in working order and being properly maintained?				
Location:				
Location:				
Location:				
Location:				

INSPECTION OF BMPs - ATTACHMENT "A" (Cont.)				
BMP	**Yes**	**No**	**N/A**	**Corrective Action**
Location:				
Sediment Basins				
Are basins designed in accordance with the requirements of the General Permit?				
Are basins maintained to provide the required retention/detention?				
Are basin controls (inlets, outlets, diversions, weirs, spillways, and racks) in working order?				
Location:				
Location:				
Location:				
Location:				
Stockpiles				
Are all locations of temporary stockpiles, including soil, hazardous waste, and construction materials in approved areas?				
Are stockpiles protected from run-on, run-off from adjacent areas and from winds?				
Are stockpiles located at least 15 m from concentrated flows, downstream drainage courses and storm drain inlets?				
Are required covers and/or perimeter controls in place?				
Location:				
Location:				
Location:				
Location:				
Concentrated Flows				
Are concentrated flow paths protected and free from visible erosion?				
Location:				
Location:				
Location:				
Location:				
Tracking Control				
Is the entrance stabilized to prevent tracking				
Is the stabilized entrance inspected daily to ensure that it is working properly				
Are points of ingress/egress to public/private roads inspected and swept and vacuumed as needed?				
Are all paved areas free of visible sediment tracking or other particulate matter?				
Location:				
Location:				

INSPECTION OF BMPs - ATTACHMENT "A" (Cont.)				
BMP	**Yes**	**No**	**N/A**	**Corrective Action**
Location:				
Location:				
Wind Erosion Control				
Is dust control implemented?				
Location:				
Location:				
Location:				
Location:				
Dewatering Operations				
Are all one-time dewatering operations covered by the General Permit inspected before and as they occur and BMPs implemented as necessary during discharge?				
Is ground water dewatering handled in conformance with the dewatering permit issued by the LARWQCB?				
Is required treatment provided for dewatering effluent?				
Location:				
Location:				
Location:				
Location:				
Vehicle & Equipment Fueling, Cleaning, and Maintenance				
Are vehicle and equipment fueling, cleaning and maintenance areas reasonably clean and free of spills, leaks, or any other deleterious material?				
Are vehicle and equipment fueling, cleaning and maintenance activities performed on an impermeable surface in dedicated areas?				
If no, are drip pans used?				
Are dedicated fueling, cleaning, and maintenance areas located at least 15 m away from downstream drainage facilities and watercourses and protected from run-on and runoff?				
Is wash water contained for infiltration/ evaporation and disposed of appropriately?				
Is on-site cleaning limited to washing with water (no soap, soaps substitutes, solvents, or steam)?				
On each day of use, are vehicles and equipment inspected for leaks and if necessary, repaired?				
Location:				
Location:				
Location:				
Location:				
Waste Management & Materials Pollution Control				

INSPECTION OF BMPs - ATTACHMENT "A" (Cont.)				
BMP	**Yes**	**No**	**N/A**	**Corrective Action**
Are material storage areas and washout areas protected from run-on and runoff, and located at least 15 m from concentrated flows and downstream drainage facilities?				
Are all material handling and storage areas clean; organized; free of spills, leaks, or any other deleterious material; and stocked with appropriate clean-up supplies?				
Are liquid materials, hazardous materials, and hazardous wastes stored in temporary containment facilities?				
Are bagged and boxed materials stored on pallets?				
Are hazardous materials and wastes stored in appropriate, labeled containers?				
Are proper storage, clean-up, and spill-reporting procedures for hazardous materials and wastes posted in open, conspicuous and accessible locations adjacent to storage areas?				
Are temporary containment facilities free of spills and rainwater?				
Are temporary containment facilities and bagged/boxed materials covered?				
Are temporary concrete washout facilities designated and being used?				
Are temporary concrete washout facilities functional for receiving and containing concrete waste and are concrete residues prevented from entering the drainage system?				
Do temporary concrete washout facilities provide sufficient volume and freeboard for planned concrete operations?				
Are concrete wastes, including residues from cutting and grinding, contained and disposed of off-site or in concrete washout facilities?				
Are spills from mobile equipment fueling and maintenance properly contained and cleaned up?				
Is the site free of litter?				
Are trash receptacles provided in the yard, field trailer areas, and at locations where workers congregate for lunch and break periods?				
Is litter from work areas collected and placed in watertight dumpsters?				
Are waste management receptacles free of leaks?				
Are the contents of waste management receptacles properly protected from contact with storm water or from being dislodged by winds?				
Are waste management receptacles filled at or beyond capacity?				
Location:				
Location:				
Location:				
Location:				
Temporary Water Body Crossing or Encroachment				

INSPECTION OF BMPs - ATTACHMENT "A" (Cont.)				
BMP	**Yes**	**No**	**N/A**	**Corrective Action**
Are temporary water body crossings and encroachments constructed appropriately?				
Does the project conform to the requirements of the 404 permit and/or 1601agreement?				
Location:				
Location:				
Location:				
Location:				
Illicit Connection/ Discharge				
Is there any evidence of illicit discharges or illegal dumping on the project site?				
If yes, has the Owner/Operator been notified?				
Location:				
Location:				
Location:				
Location:				
Discharge Points				
Are discharge points and discharge flows free from visible pollutants?				
Are discharge points free of any significant sediment transport?				
Location:				
Location:				
Location:				
Location:				
SWPPP Update				
Does the SWPPP and Project Schedule adequately reflect the current site conditions and contractor operations?				
Are all BMPs shown on the Erosion Control Plans installed in the proper location(s) and according to the details in the SWPPP?				
Location:				
Location:				
Location:				
Location:				
General				
Are there any other potential concerns at the site?				
Location:				
Location:				
Location:				

INSPECTION OF BMPs - ATTACHMENT "A" (Cont.)				
BMP	**Yes**	**No**	**N/A**	**Corrective Action**
Location:				
Storm Water Monitoring				
Does storm water discharge directly to a water body listed in the General Permit as impaired for sediment/sedimentation or turbidity?				
If yes, were samples for sediment/sedimentation or turbidity collected pursuant to the sampling and analysis plan in the SWPPP?				
Did the sampling results indicate that the discharges are causing or contributing to further impairment?				
If yes, were the erosion/sediment control BMPs improved or maintained to reduce the discharge of sediment to the water body?				
Were there any BMPs not properly implemented or breaches, malfunctions, leakages or spills observed which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water?				
If yes, were samples for non-visually detectable pollutants collected pursuant to the sampling and analysis plan during rain events?				
If sampling indicated pollution of the storm water, were the leaks, breaches, spills, etc. cleaned up and the contaminated soil properly disposed of?				
Were the BMPs maintained or replaced?				
Were soil amendments (e.g., gypsum, lime) used on the project?				
If yes, were samples for non-visually detectable pollutants collected pursuant to the sampling and analysis plan in the SWPPP?				
If sampling indicated pollution of the storm water by the use of the soil amendments, is there a contingency plan for retention onsite of the polluted storm water?				
Did storm water contact stored materials or waste and run off the construction site? (Materials not in watertight containers, etc.)				
If yes, were samples for non-visually detectable pollutants collected pursuant to the sampling and analysis plan in the SWPPP?				

_____ OWNER Project Number	**Los Angeles Unified School District** **As OWNER** **ATTACHMENT "B"** **GENERAL CONSTRUCTION** **ACTIVITY STORM WATER PERMIT**	STATE OF CALIFORNIA STATE WATER BOARD WDID NO._____

COMPLIANCE CERTIFICATION

School Name: _____ _____
Project Description: Contract Number

ANNUAL CERTIFICATION

I certify the Project has met the following conditions: All elements of the Storm Water Pollution Prevention Plan are in place; construction materials and equipment maintenance waste have been disposed of properly; and the Project site is in compliance with all local storm water management requirements including erosion/sediment control requirements, and the appropriate use permits have been obtained. The reports have been uploaded to smarts.waterboards.ca.gov system.

CONTRACTOR: _____

Print Name: _____ Title: _____

Signature: _____ Date: _____

SUBSTANTIAL COMPLETION CERTIFICATION

I certify the Project has been completed and the following conditions have been met: All elements of the Storm Water Pollution Prevention Plan have been completed; construction materials and equipment maintenance waste have been disposed of properly; the Project site is in compliance with all local storm water management requirements including erosion/sediment control requirements and the appropriate use permits have been obtained; and a post-construction storm water operation, and management plan is in place.

CONTRACTOR: _____

Print Name: _____ Title: _____

Signature: _____ Date: _____

Los Angeles Unified School District
Facilities Services Division

REPORT DATE

ATTACHMENT "B" (CONT.)

CERTIFICATION CHECK LIST

SITE _____

PROJECT NUMBER _____

IS SWPPP BOOK ONSITE AND UPDATED	[ ] YES	[ ] NO
TRAINING RECORDS	[ ] YES	[ ] NO
CONSTRUCTION SCHEDULE	[ ] YES	[ ] NO
EROSION CONTROL PLAN	[ ] YES	[ ] NO
Property Line Dileanated	[ ] YES	[ ] NO
Active / Inactive Areas	[ ] YES	[ ] NO
Drainage Patterns	[ ] YES	[ ] NO
Discharge Points	[ ] YES	[ ] NO
Sampling Points	[ ] YES	[ ] NO
BMPs with legend	[ ] YES	[ ] NO
Staging Areas, Stockpiles, entrance exit	[ ] YES	[ ] NO
Vehicle Storage, concrete wahsout	[ ] YES	[ ] NO
SIGNED COPY OF NOI ON WALL	[ ] YES	[ ] NO
WEEKLY REPORTS FILED	[ ] YES	[ ] NO
WEATHER REPORTS	[ ] YES	[ ] NO
QUARTERLY NON-STORMWATER (Attachment "C")	[ ] YES	[ ] NO

LATEST DATED:_____

SWPPP AMENDMENTS DOCUMENTED [ ] YES [ ] NO

ANNUAL FEES PAID AND REPORTS FILED LATEST DATED:_____

Data Submitter _____
login _____
SMARTS access _____
OAR _____
login _____

DATE OF LAST OEHS INSPECTION VISIT LATEST DATED:_____
WERE OEHS RECOMMENDATION IMPLEMENTED [ ] YES [ ] NO

CERTIFICATION OF CONTRACTORS QSP

Name _____
Agency _____
Number _____
Expiration Date _____
Email _____
Phone _____

Sampling Kit Lab Name

COMMENTS

OAR NAME	CONTRACTOR NAME
SIGNATURE	SIGNATURE

09/20/2024

Los Angeles Unified School District
Facilities Services Division

Attachment "C"
Quarterly / Annual Non-Stormwater Form

I. WDID NO. _____

II. FACILITY OPERATOR INFORMATION

Facility Name _____ Contact Person _____

Mailing Address _____ Title _____

City _____ State **CA** Zip _____ Phone _____

III. FACILITY SITE INFORMATION

Facility Name _____ Contact Person _____

Location _____ Title _____

City _____ State **CA** Zip _____ Phone _____

IV. PERMIT LANGUAGE

All dischargers are required to conduct quarterly, non-storm water visual inspections. For these inspections, the discharger must visually observe each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources.

CGP Section IV.A describes authorized non-storm water discharges including those from de-chlorinated potable water sources such as: fire hydrant flushing, irrigation of vegetative erosion control measures, pipe flushing and testing, water to control dust, uncontaminated ground water dewatering, and other discharges not subject to a separate general NPDES permit adopted by a region. Additionally, authorized non-storm water discharges must not be used to clean up failed or inadequate construction or post-construction BMPs designed to keep materials onsite.

Authorized non-storm water dewatering discharges may require a permit because some Regional Water Boards have adopted General Permits for dewatering discharges. The General Permit prohibits the discharge of storm water that causes or threatens to cause pollution, contamination, or nuisance.

Non-storm water discharges directly connected to receiving waters or the storm drain system have the potential to negatively impact water quality. The discharger must implement measures to control all non-storm water discharges during construction, and dewatering activities associated with construction. Examples include; properly washing vehicles in contained areas, cleaning streets, and minimizing irrigation runoff.

Non-storm water discharges include a wide variety of sources, including improper dumping, spills, or leakage from storage tanks or transfer areas. Non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

V. <u>DOCUMENT CHECKLIST</u> (Please check each item to verify that the documents are attached)

☐ Did Authorized Discharge take place ☐ Did Unauthorized Discharge take place

☐ Form 2 Attached ☐ Form 3 Attached

☐ Complete Form 1 once a Quarter and prior to fire hydrant testing or other authorized discharges.

Attachment "C" (Cont.)
FORM 1

Structural Best Management Practices Housekeeping for Non-Visible Pollutants	**BMP Conditions E, NM, N/A YES OR NO**	**Actions Taken or BMPs Added**
Drainage Areas		
Free of Floating & Suspended Material		
Free of Sheen/Discoloration		
Free of Turbidity		
Free of Odor		
Construction Materials Storage Areas		
Materials Properly Stored		
Pollutants Covered		
Pollutants Bermed		
Construction Waste Management		
Containment Stockpiled Waste		
Containment Sanitary Facilities		
Containment Waste Watertight Containers		
Vehicle Storage/Fueling/Spill Prevention		
Fueling Procedures/Designated Areas		
Vehicle Storage with Containment		
Spill Kit Onsite		
Concrete Residuals & Washouts Wastes		
Properly Placed Washout		
Secondary Containment		
Landscape Materials		
Stored Away from Flow Lines		
Containment Fertilizers/Soil Amendments		
Secondary Containment Plants		
Observations/Comments:		
E-EFFECTIVE N/M-NEEDS MAINTENANCE N/A-NOT APPLICABLE YES or NO		

Attachment "C" (Cont.)

REPORT – PART A FORM 2 QUARTERLY VISUAL OBSERVATIONS OF AUTHORIZED NON STORM WATER DISCHARGES (NSWDs)

- Quarterly dry weather visual observations are required of each authorized NSWD.
- Observe each authorized NSWD source, impacted drainage area, and discharge location.
- Authorized NSWDs must meet the conditions provided in Section IV.A (pages 23-24) of the General Permit.
- Make additional copies of this form as necessary.

QUARTER: **JULY-SEPT.** DATE: _	**Observers Name:** _ **Title:** **Signature:**	**WERE ANY AUTHORIZED NSWDs DISCHARGED DURING THIS QUARTER?** **YES** ☐ If **YES**, complete Part B of this form. **NO** ☐
QUARTER: **OCT.-DEC.** DATE: _	**Observers Name:** _ **Title:** **Signature:**	**WERE ANY AUTHORIZED NSWDs DISCHARGED DURING THIS QUARTER?** **YES** ☐ If **YES**, complete Part B of this form. **NO** ☐
QUARTER: **JAN.-MARCH** DATE: _	**Observers Name:** _ **Title:** **Signature:**	**WERE ANY AUTHORIZED NSWDs DISCHARGED DURING THIS QUARTER?** **YES**. ☐ If **YES**, complete Part B of this form. **NO** ☐
QUARTER: **APRIL-JUNE** DATE: _	**Observers Name:** _ **Title:** **Signature:**	**WERE ANY AUTHORIZED NSWDs DISCHARGED DURING THIS QUARTER? NO** **YES** ☐ If **YES**, complete Part B of this form. **NO** ☐

Attachment "C" (Cont.)

REPORT
FORM 2 – QUARTERLY VISUAL OBSERVATIONS OR AUTHORIZED NON-STORM WATER DISCHARGES (NSWDs)

DATE/TIME OF OBSERVATION	SOURCE AND LOCATION OF AUTHORIZED NSWD Example: Air conditioner Units on Building C	NAME OF AUTHORIZED NSWD Example: Air conditioner condensate	DESCRIBE AUTHORIZED NSWD CHARACTERISTICS Indicate weather authorized NSWD is clear, cloudy, or discolored, causing staining, contains floating objects or an oil sheen, has odors, etc.		DESCRIBE ANY REVISED OR NEW BMP's AND PROVIDE THEIR IMPLEMENTATION DATE
			At the NSWD Source	At the NSWD Drainage Area and Discharge Location	
_____ _____☐ AM ☐ PM					
_____ _____☐ AM ☐ PM					
_____ _____☐ AM ☐ PM					
_____ _____☐ AM ☐ PM					
_____ _____☐ AM ☐ PM					

Attachment "C" (Cont.)

REPORT – PART A FORM 3 QUARTERLY VISUAL OBSERVATIONS OF UNAUTHORIZED NON STORM WATER DISCHARGES (NSWDs)

- Unauthorized NSWDs are discharges (such as wash or rinse waters) that do not meet the conditions provided in Section IV.A (pages 23-24) of the General Permit.
- Quarterly visual observations are required to observe current and detect prior unauthorized NSWD.
- Quarterly visual observations are required during dry weather and at all facility drainage areas.
- Each unauthorized NSWD source, impacted drainage area, and discharge location must be identified and observed.
- Unauthorized NSWDs that cannot be corrected is in violation of the CGP conditions and may be subject to penalties noted in Section VI.P of the General Permit.
- Make additional copies of this form as necessary.

QUARTER: **JULY-SEPT.** **DATE/TIME OF OBSERVATIONS** ☐ **AM** ☐ **PM** _____	**Observers Name:** _ **Title:** **Signature:**	**WERE ANY AUTHORIZED NSWDs OBSERVED?** **YES** ☐ **NO** ☐ **WERE THERE INDICATIONS OF PRIOR UNAUTHORIZED NAWDS?** **YES** ☐ **NO** ☐ If **YES**, complete Part B of this form.
QUARTER: **OCT.-DEC.** **DATE/TIME OF OBSERVATIONS** ☐ **AM** ☐ **PM** _____	**Observers Name:** _ **Title:** **Signature:**	**WERE ANY AUTHORIZED NSWDs OBSERVED?** **YES** ☐ **NO** ☐ **WERE THERE INDICATIONS OF PRIOR UNAUTHORIZED NAWDS?** **YES** ☐ **NO** ☐ If **YES**, complete Part B of this form.
QUARTER: **JAN.-MARCH** **DATE/TIME OF OBSERVATIONS** ☐ **AM** ☐ **PM** _____	**Observers Name:** _ **Title:** **Signature:**	**WERE ANY AUTHORIZED NSWDs OBSERVED?** **YES** ☐ **NO** ☐ **WERE THERE INDICATIONS OF PRIOR UNAUTHORIZED NAWDS?** **YES** ☐ **NO** ☐ If **YES**, complete Part B of this form.
QUARTER: **APRIL-JUNE** **DATE/TIME OF OBSERVATIONS** ☐ **AM** ☐ **PM** _____ _	**Observers Name:** _ **Title:** **Signature:**	**WERE ANY AUTHORIZED NSWDs OBSERVED?** **YES** ☐ **NO** ☐ **WERE THERE INDICATIONS OF PRIOR UNAUTHORIZED NAWDS?** **YES** ☐ **NO** ☐☐ If **YES**, complete Part B of this form.

Attachment "C" (Cont.)

REPORT
FORM 3 – QUARTERLY VISUAL OBSERVATIONS OR UNAUTHORIZED NON-STORM WATER DISCHARGES (NSWDs)

OBSERVATION DATE (FROM REVERSE SIDE)	**NAME OF UNAUTHORIZED NSWD** Example: Vehicle Wash Water	**SOURCE AND LOCATION OF AUTHORIZED NSWD** Example: NW Corner of Parking Lot	**DESCRIBE UNAUTHORIZED NSWD CHARACTERISTICS** Indicate weather unauthorized NSWD is clear, cloudy, or discolored, causing stains, contains floating objects or an oil sheen, has odors, etc.		**DESCRIBE CORRECTIVE ACTIONS TO ELIMINATE UNAUTHORIZED NSWD AND TO CLEAN IMPACTED DRAINAGE AREAS. PROVIDE UNAUTHORIZED NSWD ELIMINATION DATE**
			AT THE UNAUTHORIZED NSWD SOURCE	**AT THE UNAUTHORIZED NSWD DRAINAGE AREA AND DISCHARGE LOCATION**	
_____ _____☐ AM ☐ PM					
_____ _____☐ AM ☐ PM					
_____ _____☐ AM ☐ PM					
_____ _____☐ AM ☐ PM					
_____ _____☐ AM ☐ PM					

ATTACHMENT "D"
LAUSD CONSTRUCTION STORM WATER TRAINING FORM

CONTRACTOR MAY USE HIS OWN FORM.

MEETING DATE	PROJECT	PROJECT NUMBER

ATTENDANCE-SIGNATURE (Add additional sheets if required)

STORM WATER TOPICS DISCUSSED

SUGGESTIONS / COMMENTS

OAR COMMENTS

OAR SIGNATURE	DATE	CONTRACTOR	DATE

SUGGESTED TOPICS FOR DISCUSSION

[ ] PREPARING FOR A STORM EVENT	[ ] GOOD HOUSEKEEPING	[ ] MAINTENANCE POST BMPS
[ ] MAINTAINING STOCKPILES	[ ] SOURCE CONTROL	[ ] CASQA MANUAL
[ ] DUST CONTROL	[ ] OAR ROLE & RESPONSIBILITY	[ ] SWPPP UPDATING
[ ] TRAINING NEW STAFF	[ ] CONTRACTOR ROLE	[ ] SCHEDULING
[ ] RECORD KEEPING	[ ] FREQUENTLY ASKED QUESTIONS	[ ] PREVENTING FLOODING

END OF ATTACHMENTS

SECTION 01 7418
WATER POLLUTION CONTROL
FOR PROJECTS WITH LAND DISTURBANCE OF LESS THAN ONE ACRE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Control runoff and pollutants from the site during construction activities.
2. Preparation, implementation, and maintenance of construction BMPs.

B. Related Requirements:

1. Division 01 – General Requirements.

1.02 ACRONYMS AND DEFINITIONS

BMP	Best Management Practice.
CAN	Corrective Action Notice.
CASQA	California Stormwater Quality Association.
CGP	NPDES General Permit for Storm Water Discharges Associated with Construction Activities.
DWQ	Division of Water Quality.
LARWQCB	Los Angeles Regional Water Quality Control Board.
NPDES	National Pollutant Discharge Elimination System.
OEHS	LAUSD Office of Environmental Health and Safety.
SWPPP	Storm Water Pollution Prevention.
SWRCB	State Water Resources Control Board.
WPCD	Water Pollution Control Drawing.

1.03 REQUIREMENTS

A. CONTRACTOR shall:

1. Implement, install and maintain BMPs. Ensure that BMPs are designed to protect all exposed portions of the site, including:
    a. Erosion, Sediment, Tracking, and Wind Erosion Control BMPs.
    b. Preservation of natural features, vegetation, soil, and buffers around surface waters.

c. Drainage swales or lined ditches to control stormwater flow.

d. Mulching or hydroseeding to stabilize disturbed soils.

e. Erosion control to protect slopes.

f. Protection of storm drain inlets (gravel bags or catch basin inserts).

g. Perimeter sediment control (perimeter silt fence, fiber rolls).

h. Sediment trap or sediment basin to retain sediment on site.

i. Stabilized construction exits.

2. Implement Good Site Management "Housekeeping" BMPs to manage construction equipment, materials, non-stormwater discharges, and wastes. BMPs that should be considered for implementation as appropriate for each project include, but are not limited to, the following:

a. Dewatering activities.

b. Material handling and waste management.

c. Building materials stockpile management.

d. Management of washout areas (concrete, paints, stucco, etc.).

e. Control of vehicle/equipment fueling to staging area.

f. Vehicle and equipment cleaning performed off site.

g. Spill prevention and control.

3. Incorporate BMP activities into the Project Schedule. Schedule construction activity during dry weather, when possible.

4. Inform CONTRACTOR and Subcontractors personnel on the BMP procedures to prevent pollutants from entering the storm drain system, before the start of construction activities. Keep personnel informed of the BMP implementation process and of changes to the procedures. Provide record to OAR of stormwater topics discussed.

5. Conduct site inspections, at least weekly, of pollution prevention controls and repair or provide additional BMPs as required.

6. Pay fines and penalties from regulatory agencies against OWNER due to CONTRACTOR'S non-compliance with stormwater regulations. OWNER shall recover costs of fines and penalties by appropriate OWNER assessment. Review of the BMPs by OAR shall not relieve CONTRACTOR from liabilities arising from non-compliance of storm water pollution regulations.

B. Project Inspector and OEHS Inspector will conduct inspection and examination of site storm water regulation compliance.

C. At substantial completion, conduct post-construction BMP training of OWNER personnel and submit any post-construction BMP maintenance information.

1.04 SUBMITTALS

A. BMP material quality, grade, type as specified in the CASCA BMP Handbook.

B. Water Pollution Control Drawing (WPCD).

C. BMP Implementation Schedule.

1.05 QUALITY ASSURANCE

A. Comply with the following regulatory requirements:

1. National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Lands Disturbance Activities; ORDER NO. 2022-0057-DWQ; NPDES NO. CAS000002, adopted by the State Water Resources Control Board.

2. Regulations of the California Environmental Protection Agency, State Water Resources Control Board; Los Angeles Regional Water Control Board, and local ordinances.

3. CASQA Stormwater Best Management Practice Handbook for Construction Activity (BMP Handbook) current adopted edition.

4. Local jurisdiction stormwater management (SWPPP) and erosion control ordinances.

1.06 STORAGE AND PROTECTION

A. Provide proper storage of materials and equipment to prevent rain and storm water runoff to come in contact with pollutants, such as soil stabilizers, paint or fluids from vehicles.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Provide quality, grade and type of materials as specified in CASQA Stormwater Best Management Practice, Handbook.

PART 3 – EXECUTION

3.01 IMPLEMENTATION

A. Install perimeter controls prior to starting Work at the Project site.

B. Contain on-site stormwater on the Project site. Provide storm drain inlet protection. Do not drain on-site water directly into the storm drain without proper BMP in place.

C. Prevent pollutant discharges into the storm drain system. Prevent stormwater from coming into contact with pollutants, such as sediment, material spills, or leakage from storage tanks, waste containers or transfer areas. In the event contamination is found CONTRACTOR shall immediately notify OAR who will contact the OEHS.

D. Protect exposed dirt, such as stockpiles, landscaping areas, and hillsides.

E. Properly manage non-stormwater discharges such as ground water, broken utility lines and fire hydrant testing.

F. Adjust BMP's locations and layouts in accordance to construction progress to assure compliance to regulations.

G. Conduct inspections of pollution prevention controls and provide Site Monitoring Report to OAR immediately if pollutants are discharged into the site runoff. CONTRACTOR shall remediate contaminated water.

H. Upon Substantial Completion: Maintain and leave post-construction stormwater pollution prevention controls in place and remove those that are not needed as determined by the OAR.

3.02 CLOSEOUT

A. Verify the following prior to Substantial Completion:

1. Final stabilization of site has been demonstrated.
2. There is no potential for construction related stormwater pollutants to be discharged into site runoff.
3. Construction related equipment and temporary BMP have been removed from site.
4. Rubbish, debris, and waste materials have been removed and legally disposed of off the Project site.
5. OEHS CAN items have been closed and signed-off.
6. Post-Construction BMP Maintenance Plan has been established.

END OF SECTION

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 land fills.

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

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes administrative and procedural requirements for Contract Closeout, including but not limited to, the following:

1. Inspection procedures.
2. Project record documents submittal.
3. Operation and maintenance manual submittal.
4. OWNER orientation and instruction.
5. Final cleaning.

1.02 RELATED REQUIREMENTS:

1. Section 01 2976 - Progress Payment Procedures.
2. Section 01 3213 - Construction Schedule.
3. Section 01 3229 - Project Forms.
4. Section 01 3300 - Submittal Procedures.
5. Section 01 4525- Testing, Adjusting, and Balancing of HVAC.
6. Section 01 5000 - Construction Facilities and Temporary Controls.
7. Section 01 7836 - Warranties.

PART 2 – PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 SUBSTANTIAL COMPLETION

A. Inspection Procedures: On receipt of the Request For Certificate of Substantial Completion, OAR will authorize commencement of inspection. INSPECTOR, OAR, CONTRACTOR and ARCHITECT will inspect the Work.

1. If after inspection of the Work, OAR does not consider the Work substantially complete, OAR will notify CONTRACTOR.

2. If after inspection, OAR considers the Work substantially complete, INSPECTOR shall prepare a comprehensive Punch List of items to be corrected.

a. INSPECTOR may repeat inspection to assure the Work is corrected.

b. Results of the completed inspection will form a partial basis of the requirements for Release of Retention.

3.02 ADMINISTRATIVE CLOSEOUT

A. Re-inspection Procedures: INSPECTOR, OAR, CONTRACTOR and ARCHITECT may inspect the Work upon notice, including final inspection of Punch List items from earlier inspections, has been corrected, except for items whose completion is delayed under circumstances acceptable to OAR.

1. OWNER has the right to preclude CONTRACTOR from Punch List correction and documents submittals after the Contract Completion date; unless OWNER elects to authorize CONTRACTOR to extend Administrative Contract duration. CONTRACTOR will be assessed actual cost for the unsettled items. Withholds amounts exceeding actual costs to correct or to obtain deliverable will be released.

2. If allowed by the OAR, re-inspection will be repeated, but may be assessed against CONTRACTOR if OWNER is subject to additional professional service and or additional costs of inspection.

3.03 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 ARCHITECT, INSPECTOR and OAR reference during normal working hours. Project record document shall be updated on a weekly basis. Prior to submitting each application for payment, secure INSPECTOR and ARCHITECT approval of project record documents.

B. Record Drawings: Maintain a clean, undamaged set of 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 the Drawing that 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. RFC 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 of the project record drawings by ARCHITECT; prepare a final set of project record drawings using reproducible vellum. Submit final set of transparencies to ARCHITECT.

C. Record Specifications: Maintain two complete 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 ARCHITECT for 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 ARCHITECT for OWNER records.

E. Record Samples: Immediately prior to Substantial Completion, CONTRACTOR shall meet with ARCHITECT and OAR at the Project site to determine which Samples are to be transmitted to OWNER for record purposes. Comply with OAR 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 to Architect 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, two to three-inch 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Submit to ARCHITECT for OWNER records. Include the following types of 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 Title 24, Part 1, Sections 4-336 and 4-343.c of the California Building Standards Commission's, California Administrative Code.

3.04 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 OAR.

3.05 FINAL CLEANING

A. General: Related sections of the Contract Documents specify general cleaning during performance of the Work. General cleaning is included in Division 01 Section "Construction Facilities and Temporary Controls".

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for a certificate of Substantial Completion.

a. Remove labels that are not permanent labels.

b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.

c. Clean exposed exterior and interior hard-surfaced finished to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.

d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.

e. Clean the Project site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits.

Rake grounds that are neither paved nor planted to a smooth, even-textured surface.

END OF SECTION

SECTION 01 7836

WARRANTIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes administrative and procedural requirements for warranties, including manufacturers and 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 REQUIREMENTS

A. Section 01 6000 - Product Requirements.

B. Section 01 7329 - Cutting and Patching.

C. Section 01 7700 - Contract Closeout.

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 CONTACTOR of the warranty of the Work incorporating such materials, products, and 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: OAR 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, OAR 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 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 OAR, through the ARCHITECT, for approval prior to final execution.

1. Refer to Divisions 02 through 49 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. Bind warranties and bonds in heavy-duty, commercial-quality, durable three ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8½ by 11 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.

END OF SECTION

SECTION 01 7900

MAINTENANCE AND OPERATIONS STAFF DEMONSTRATION AND TRAINING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Administrative and procedural requirements for training OWNER's personnel.

1. Demonstration of operations of systems, subsystems and equipment.

2. Training in operation and maintenance of systems, subsystems, and equipment.

1.02 RELATED REQUIREMENTS

A. Project Commissioning Plan (CxP).

B. CHPS Best Practices Manual.

C. CAL/OSHA Minimum Ventilation Standard, Title 8, Section 5142.

D. California Building Code, Chapter 12.

E. Division 01 - General Requirements.

F. Division 22 - Plumbing.

G. Division 23 – Heating Ventilating and Air Conditioning.

H. Division 26 - Electrical.

I. Division 27 – Communications.

1.03 SUBMITTALS

A. Submittals, including training modules, require the Commissioning Services Provider's (CxSP) review and OAR acceptance prior to implementation.

B. Instruction Program:

1. Ninety days prior to Startup and Testing, submit a draft outline of the instructional program for demonstration and training, including the training module objectives and outline for each training module, schedule of proposed training dates, training times, length of instruction time and instructors' names

for each training module. Submittal(s) shall be on a CD-ROM in a MS Word 2013 format file. CxSP, OAR and Project Inspector will review and OAR accept, based on their recommendation, CONTRACTOR 's proposed Instruction Program or comment and return to CONTRACTOR for revision and incorporation of comments within 30 days of receipt.

2. Revise and resubmit finalized Instruction Program 45 days prior to Startup and Testing. CxSP, OAR and Project Inspector will review CONTRACTOR's revised Instruction Program and OAR, based on their recommendation, accept or return for further revision and incorporation of unaddressed revisions and/or comments or unacceptable revisions within five days of receipt.

3. Revise and incorporate comments and resubmit to OAR within five days of receipt. CxSP, OAR and Project Inspector will review CONTRACTOR's revised Instruction Program and OAR, based on their recommendation, accept the revised Instruction Program within five days of receipt or require CONTRACTOR to meet with OAR and CxSP within five days of receipt to revise and incorporate unaddressed revisions and/or comments. CONTRACTOR shall be assessed reasonable fees and expenses incurred by CxSP for these meetings.

C. Upon completion of training, submit two complete training manuals for OWNER's use and one CD-ROM including materials in the complete training manual in the Adobe PDF format. Each manual shall contain specific training and instruction manuals and hand-outs for the following designated end-users:

1. School Faculty and Administration.

2. School Plant Manager.

3. OWNER Maintenance and Operations (M&O) Personnel.

D. Qualification Data: Three weeks prior to start of training, CONTRACTOR shall submit Letters of Qualifications and Project Lists for persons and firms providing instruction including:

1. Training Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel and end-users in training program similar to that required for this Project, and who has a record of successful training performance.

2. Training Instructor Qualifications: Instructor shall be factory-authorized service representative, experienced in operation and maintenance procedures and training for each system, subsystem or piece of equipment.

3. References: The name of owner and the name and telephone number of the plant manager and maintenance supervisor on three similar projects for reference.

E. Attendance Record: For each training module, submit the proposed list of participants, sign in sheets and length of instruction time a minimum of 15 days prior to start of training of the module.

F. Evaluations: For each participant and for each training module, submit results and documentation of performance-based tests a minimum of seven days following completion of training of each module.

G. Demonstration and Training Video: CONTRACTOR shall video record each classroom training and demonstration session and submit a copy on CD-ROM or DVD in a format compatible with MS Windows Media Player at end of each training module. CONTRACTOR shall include a copy of manufacturer training video materials presented during training and demonstration session.

1.04 COORDINATION

A. Coordinate instruction schedule with the OAR, CxSP, and OWNER's M&O personnel. Adjust schedule as required to reasonably accommodate the schedules of participants and to minimize disrupting OWNER operations.

B. Coordinate with instructors, including providing notification of scheduled dates, times, length of instruction time and course content.

C. Coordinate content of training modules with content of approved Emergency Manual and Operations and Maintenance Manual. Do not submit instruction program until manual has been reviewed and accepted by the OAR.

1.05 INSTRUCTION PROGRAM

A. Program Structure: Develop instruction program that includes individual demonstration and training modules for the operation, maintenance, minor repair (completion in under two hours) and calibration of systems and components in the system as required by Section 01 9113, Divisions 22, 23 and Division 26 and as specified in Part 3 of this Section, "DEMONSTRATION AND TRAINING".

B. Training Modules: Develop learning objective and teaching outline for each module, specific and as applicable, for the following OWNER personnel:

1. School Faculty and Administration.

2. School Plant Manager.

3. Operations and Maintenance.

C. Include description of specific skills and knowledge that participant is expected to master.

D. For each module, include instruction for the following:

1. Basis of System Design (for OWNER Operations and Maintenance Personnel), Operational Requirements and Criteria, including, but not limited to:

a. System, subsystem and equipment descriptions.

b. Performance and design criteria if CONTRACTOR is delegated design responsibility.

c. Operating standards.

d. Regulatory requirements.

e. Equipment function.

f. Operating characteristics.

g. Limiting conditions.

h. Performance curves.

2. Documentation (for OWNER Operations and Maintenance Personnel and School Plant Manager): Review in detail the following documentation:

a. Emergency manuals.

b. Operations manuals.

c. Maintenance manuals.

d. Project Record Documents.

e. Identification systems.

f. Warranties.

g. Maintenance service agreements and similar continuing commitments.

3. Emergencies (for OWNER Operations and Maintenance Personnel and School Plant Manager): Review, without limitation, 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.

4. Operations (for OWNER Operations and Maintenance Personnel and School Plant Manager): Review, without limitation, 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 system, subsystem or equipment failure.

j. Seasonal and weekend operating instructions.

k. Required sequences for electric or electronic systems.

l. Special operating instructions and procedures.

5. Adjustments (for OWNER M&O Personnel): Review, without limitation, the following as applicable:

a. Alignments.

b. Checking adjustments.

c. Noise and vibration adjustments.

d. Economy and efficiency adjustments.

6. Troubleshooting (for OWNER M&O Personnel): Review, without limitation, the following as applicable:

a. Diagnostic instructions.

b. Test and inspection procedures.

7. Maintenance (for OWNER M&O Personnel and Plant Manager): Review, without limitation, the following, as applicable:

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 preventative maintenance.

f. Procedures for routine maintenance.

g. Instruction on use of special tools.

8. Repairs (for OWNER M&O Personnel): Review, without limitation, the following as applicable:

a. Diagnostic instructions.

b. Repair instructions.

c. Disassembly; component removal, repair and replacement and reassembly instructions.

d. Instructions for identifying parts and components.

e. Review of parts needed for operation and maintenance.

9. Faculty Member Training:

a. Manual for the basic operation/control of the HVAC room sensor/thermostat and lighting controls.

b. Organizational chart structure, to be completed by OWNER, for repair or emergency requests for the systems including contact information of the Plant Manager.

1.06 PREPARATION

A. Training Facilitator: Engage qualified training facilitator no later than 120 days prior to start of training to prepare instruction program and training modules, to coordinate

instructors, and to coordinate between CONTRACTOR, OAR and CxSP for number of participants, instruction times and location.

B. Training Instructor: Engage qualified training instructors to instruct OWNER's personnel to adjust, operate and maintain systems, subsystems and equipment not part of a system no later than 30 days prior to start of training of assigned modules.

C. Scheduling: Provide instruction at mutually agreed on times.

1. Schedule training with OWNER, through OAR, with at least two weeks advance notice.

2. Schedule training to conform to personnel availability at Site.

3. Conduct training(s) after the execution of commissioning Pre-functional and Functional Tests are completed.

4. Base duration of training on hours specified in the applicable specifications or minimums defined in Article 1.08.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of oral, written, demonstration, or combination of oral, written, and demonstration based testing.

E. Demonstration and Training Video: Record each training module separately. Include classroom instructions and demonstrations, board diagrams and other visual aids, excluding attendee practice or testing.

1. Make demonstration and testing videos at Site to ensure video is representative of installed system. As part of training, devote one lesson plan to reviewing of video to allow new employees to view the video recordings at their own convenience and be able to operate the video system without need for instructor attendance.

2. At the beginning of each video recording for the training module, incorporate a chart presenting the learning objective and lesson outline.

F. In addition to technical training, attendees shall be trained on how to provide future training for new employees.

G. Familiarize OWNER staff regarding CAL/OSHA Title 8, section 5142 Requirements.

H. Cleanup: Collect excess copies of educational materials and give to OAR. Remove instruction equipment. Restore systems and equipment to condition existing just before commencing training.

1.07 OPERATIONS AND MAINTENANCE MANUALS

A. CONTRACTOR shall direct Subcontractors to compile and prepare M&O Manuals and other required documentation for the equipment and systems that are provided and/or installed per their scope of work for submittal to OAR prior to project closeout.

B. The OAR shall receive a copy of the Operations and Maintenance manuals prior to initiation of demonstration and training for review and acceptance or rejection.

C. Operations and Maintenance manuals shall meet the respective requirements of Divisions 22,23 and Division 26, and Section 01 7700; and comply with the following:

1. Quantity: Two.

2. Format: 8 ½ by 11 loose leaf binders. Each binder shall be clearly labeled on the spine and meet the requirements of Section 01 7700. Dividers shall be made of card stock with permanently marked index tabs to separate each section and sub section. Tab labels shall not be handwritten. Binders will meet other formatting requirements as outlined in DIVISIONS 02 to 49, as applicable.

3. Contents: There shall be a title page and table of contents at the beginning of each binder. The table of contents shall be an outline that identifies the equipment or systems documentation included in the binder and references the specification sections relating to the equipment and systems that are being included in each part of the binder. Each part of the binder shall contain the information described below, in the following order.

   a. CONTRACTOR. The first page shall contain the name, address, and telephone number of the manufacturer and installing CONTRACTOR, as well as the 24-hour number for emergency service for each piece of equipment identified in this section.

   b. Preventive Maintenance Instructions. This section shall list the location of preventative maintenance instructions. The list shall show the piece of equipment, the Operations and Maintenance document name, and the O&M document page number that contains the instructions.

   c. Submittal and Product Data. This section shall include product data not covered by manufacturer's Operations and Maintenance instructions and associated shop drawings.

   d. Warranty and Service Contracts. This section shall include the following for each piece of equipment, as applicable:

      1) Copy of the equipment warranty information provided as part of Section 01 7836.

2) Additional Warranties in accordance with Warranty requirements in DIVISIONS 02 to 49, as applicable. Equipment Warranties shall clearly list requirements to maintain the Warranty in effect, conditions or acts that would invalidate or void the Warranty, and Warranty expiration date.

3) Service contracts issued. Contracts shall clearly indicate contract dates and scope of work included.

e. Operation and Maintenance Instructions. These shall be the written manufacturer's maintenance and operating instructions with the model number and features of the installed equipment or system clearly identified. This section shall include applicable data on the following:

1) Installation, startup, and break-in instructions.

2) Starting, normal shutdown, emergency shutdown, manual operation, seasonal changeover and normal operating procedures and data, including any special limitations.

3) Operations and Maintenance and installation instructions that were shipped with the unit.

4) Preventative maintenance and service procedures and schedules.

5) Troubleshooting procedures.

6) A parts list, edited to omit reference to items which do not apply to this installation.

7) A list of any special tools required to service or maintain the equipment.

8) Performance data, ratings, and curves.

f. Control Drawings. This section contains controls drawings and the final sequence of operations, set points, and schedules as set during the Commissioning Process. If shop drawings, portions of the project manual, or record drawings clearly show this information, a copy of this information may be inserted. Otherwise, original drawings shall be generated and included in this section.

D. Division 23 Special Water and Air Balance Documentation. The Balancing Subcontractor will compile and submit the following with other documentation that may be specified elsewhere in the Project Specifications.

1. Final report containing an explanation of the methodology, assumptions, test conditions, and the results in a clear format with designations of all uncommon abbreviations and column headings.

2. The Balancing Subcontractor shall mark on the drawings where all traverse and other critical measurements were taken and cross reference the location in the Test and Balance report.

1.08 DEMONSTRATION AND TRAINING SCHEDULE

A. The following applies to the minimum duration of demonstration and training provided District Maintenance and Operations Personnel.

1. Heat Generation:

a. Boilers: Minimum six hours demonstration and training [***Replace with specification required training time when available***].

b. Feedwater Equipment: Minimum four hours [***Replace with specification required training time when available***].

c. Pumps: Minimum four hours [***Replace with specification required training time when available***].

d. Steam Distribution Piping: Minimum two hours [***Replace with specification required training time when available***].

e. Water Distribution Piping: Minimum two hours [***Replace with specification required training time when available***].

2. Refrigerant Systems:

a. Chillers: Minimum six hours [***Replace with specification required training time when available***].

b. Cooling Towers: Minimum six hours [***Replace with specification required training time when available***].

c. Condensers: Minimum four hours [***Replace with specification required training time when available***].

d. Pumps: Minimum four hours [***Replace with specification required training time when available***].

e. Distribution Piping: Minimum two hours [***Replace with specification required training time when available***].

3. HVAC Systems:

   a. Air-handling Equipment: Minimum six hours [***Replace with specification required training time when available***].

   b. Air Distribution Systems: Minimum four hours [***Replace with specification required training time when available***].

   c. Terminal Equipment and Devices: Minimum six hours [***Replace with specification required training time when available***].

4. HVAC Instrumentation and Controls: Minimum sixteen hours [***Replace with specification required training time when available***].

5. Lighting Systems and Controls: Minimum four hours [***Replace with specification required training time when available***].

PART 2 – PRODUCTS – N/A

PART 3 – EXECUTION – N/A

END OF SECTION

SECTION 01 9113

GENERAL COMMISSIONING REQUIREMENTS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. This Section defines the Contractor's responsibilities with respect to Commissioning. The Contractor shall include this scope in the bid. This includes administrative and procedural requirements as well as a detailed execution of Commissioning. This Section supplements Section 01 4523 – Testing and Inspection, Section -01 4525 Testing, Adjusting, and Balancing for HVAC, as well as the Divisions 22 - Plumbing, Division 23 – Mechanical, and Division 26 – Electrical sections which specify testing procedures. This Section also defines the systems and equipment to be commissioned. For projects that have Specification Section 01 4516 or 01 4519, Contractor Construction Quality Control, the Commissioning schedule and activities as defined in the approved Commissioning Plan shall be incorporated by Contractor into the Construction Quality Control (CQC) plan. The Commissioning Services Provider will be part of the Owner's Quality Assurance (QA) Team and participate in the review and execution of the Project Construction Quality Control (CQC) plan, along with the Contractor, Owner's Authorized Representative (OAR), Project Inspector (PI), and Architect of Record (AOR).

1.02 DEFINITIONS

A. Commissioning (Cx): A systematic process which verifies that the building systems perform according to the Owner's Design Intent/Basis of Design (ODI/BOD). Commissioning includes system documentation, equipment startup, control system calibration, Testing, Adjusting and Balancing (TAB) verification, performance testing, and training.

B. Commissioning Services Provider (CxSP): A District appointed entity that plans and coordinates all activities which implement Commissioning as outlined by the Owner's Design Intent/Basis of Design (ODI/BOD). The CxSP has overall responsibility for planning and coordinating Commissioning. Commissioning activities that take place during construction shall be based on the Contractor's construction schedule.

C. Commissioning Plan (CxP): A contract document that identifies the project Commissioning goals, Owner's Design Intent/Basis of Design, commissioning milestones, coordination requirements, and project specific Pre-functional Equipment Checklists and Functional Performance Test Checklists. The CxP shall be incorporated by Contractor into the Construction Quality Control Plan.

D. Pre-functional Equipment Checklist (PEC): A form for each piece of equipment referenced in '1.08 SYSTEMS TO BE COMMISSIONED' that must be completed by

the Contractor as a prerequisite to the equipment's Functional Performance Test (FPT). Sample checklists and PEC forms are included in the CxP. The checklists and forms are completed by the Contractor and verified by the CxSP.

E. Functional Performance Test (FPT): A documented test designed by the Commissioning Services Provider to verifies the dynamic functioning and operation of equipment and systems with the goal of verifying that the Owners' Design Intent, Owner's Project Requirements, and Basis of Design (BOD) are met. Sample testing requirements and forms are included in the CxP. Test procedures are performed by the Contractor and witnessed by the INSPECTOR and CxSP.

F. Acceptance - A formal action, taken by a person with appropriate authorization, to declare that some aspect of the project meets defined requirements – thereby permitting subsequent activities to proceed.

G. Checklists - Documents that are developed and used during all phases of commissioning to verify that the Owner's intent is being achieved. This includes checklists for general verification, testing, training, and other specific requirements. Various checklists are prepared by the CxSP and the contractor to document completion of testing and/or commissioning of equipment and systems.

I. Coordination Drawings - Drawings showing the work of all trades to illustrate that equipment can be installed in the space allocated without compromising equipment function or access for maintenance and replacement. These drawings graphically illustrate and dimension manufacturers' recommended maintenance clearances.

K. Control system – A component of an environmental, HVAC, electrical, lighting, or energy management system for the reporting, monitoring and/or issuing of commands to and/or from field devices.

L. Data logging -The monitoring and recording of flows, currents, status, pressures, etc., of equipment using stand-alone data recorders separate from the installed control system or the trending capabilities of those control systems.

M. Deficiency - A condition that is not in compliance with the contract documents relative to the installation or function of a component, piece of equipment, or system.

N. Factory Testing - Testing of equipment at the factory or on-site by factory personnel with, or without, an owner's representative present.

O. Issues Log - A formal and ongoing record of problems or concerns – and their resolution – that have been raised by members of the commissioning team during the course of commissioning.

P. Seasonal Performance Tests - Tests that are performed when weather conditions are comparable to the design conditions based or the design conditions can be simulated.

R. Simulated Condition - Condition that is created for the purpose of testing the response of a system (for example: raising/lowering the set point of a thermostat to see the response in a VAV box).

S. Startup - The initial starting or activating of dynamic equipment.

T. Systems Manual - A system-focused composite document that includes the operation manual, maintenance manual, manufacturer's technical diagrams and additional information of use to the owner during facility occupancy and operation.

U. Test Procedure - A written protocol that defines methods, procedures, personnel, and expected outcomes for tests conducted on components, equipment, assemblies, systems, and interfaces among systems. The test procedures are specified in the Commissioning Plan and Technical Specifications sections of the contract documents and the CxP.

V. Training Plan - A written document that details the expectations, schedule, budget, and deliverables of commissioning activities related to the training of facility operating and maintenance personnel, users, and occupants.

X. Verification - The process by which specific documents, components, equipment, assemblies, systems, and interfaces among systems are confirmed to comply with the criteria described in the Owner's Design Intent/Basis of Design. Verification testing is performed per the prescribed test procedure(s) by the contractor and witnessed by the INSPECTOR and CxSP.

Y, Trending – The analysis of system performance gathered over a period of time by a building management system or other electronic data gathering equipment.

1.03 RELATED REQUIREMENTS

A. Section 00 7300 – Supplementary Conditions.

B. Section 01 1216 – Phasing of the Work.

C. Section 01 2100 – Allowances.

D. Section 01 2513 – Product Substitution Procedures.

E. Section 01 3113 – Project Coordination.

F. Section 01 3119 – Project Meetings.

G. Section 01 3213 – Construction Schedule.

H. Section 01 3300 - Submittal Procedures.

I. Section 01 4516 or 01 4519 – Contractor Construction Quality Control.

J. Section 01 4523 - Testing and Inspection.

K. Section 01 4525 - Testing, Adjusting, and Balancing for HVAC.

L. Section 01 5000 – Construction Facilities and Temporary Controls.

M. Section 01 7700 – Contract Close-Out.

N. Section 01 7836 – Warranties.

O. Section 01 7900 – Maintenance & Operation Staff Demonstration and Training.

P. Section 23 0800 – HVAC Systems Commissioning.

Q. Section 23 0813 – Environmental Controls and Energy Management Systems Commissioning.

R. Section 26 0800 – Electrical Systems Commissioning.

1.04 REFERENCES

A. Guideline 1.1-2007 -- HVAC&R Technical Requirements for the Commissioning Process.

B. Associated Air Balance Council Commissioning Guidelines.

C. CHPS Best Practices Manual, Volume V: Commissioning.

D. Sample Commissioning Plan Documentation.

1.05 COORDINATION

A. Items listed below require coordination between the Contractor, OAR, INSPECTOR, and CxSP. Details regarding each item are provided through out this Section and/or Sections 01 7900, 23 0800, 23 0813 and 26 0800.

1. Cx Schedule and Meeting Venue.

2. Commissioning Meeting Attendance.

3. Completion of Pre-functional Equipment Checklists (PEC).

4. Functional Performance Testing (FPT).

5. Operations & Maintenance Manual Submittal and Training.

6. Documentation of Pre-functional Equipment Checklists (PEC) & Functional Performance Testing (FPT) Inspections.

B. For projects using Specification Section 01 4516 or 01 4519, the CxSP shall coordinate with the Contractor's designated Quality Control representative, OAR and INSPECTOR.

1.06 SUBMITTALS

A. Submittal documentation required for the commissioning work will be identified by the CxSP and integrated into the normal submittal process and protocol of the construction team. At minimum, the CxSP's documentation request will identify the manufacturer and model number, the manufacturer's printed installation and detailed startup procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details of owner contracted tests. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted. All such documentation will be included by subcontractors in their O&M manual submittals.

B. The CxSP will review and recommend acceptance or any required revision to the OAR for all submittals related to the commissioned equipment for conformance with the contract documents as they relate to commissioning, performance of the equipment, and their adequacy of test procedures. This review is intended primarily to aid in the development of performance procedures and only secondarily to verify compliance with equipment specifications. The CxSP will notify the OAR of items missing or areas that are not in conformance with contract documents and which require resubmission.
Submittal of O&M manual documentation does not constitute compliance. The CxSP will review all such document submittals and recommend to OAR their acceptance or any required revisions.

C. Submittal documentation specified in Specifications 23 0800, 23 0813 and 26 0800.

1.07 CONTRACTOR RESPONSIBILITIES

A. The general responsibilities of Contractor and Subcontractors in commissioning are defined in this section. The specific responsibilities are in the Division 22 and 23 and Division 26 Technical Specifications. All parties shall:

1. Follow the Commissioning Plan.

2. Attend commissioning meetings.

B. Contractor, its design team, subcontractors and vendors shall assign representatives with expertise and authority to act on their behalf and schedule them to participate in and perform required commissioning activities including, but not limited to, providing all tools, or the use of tools, to start, check-out and test equipment and systems, except for specified testing with portable data recorders which shall be supplied and installed by the CxSP. Contractor and subcontractors shall:

1. Facilitate coordination of Commissioning.

2. Incorporate Commissioning activities (the CxP) into the Project Schedule.

3. Coordinate and direct Commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.

4. Participate in up to three meetings specifically for Commissioning-related items as scheduled by the OAR.

5. Review and accept construction checklists developed by the CxSP.

6. Provide information required to perform commissioning tasks, including O&M materials, contractor startup and checkout lists.

7. No later than 60 days prior to startup of the first piece of major equipment, meet with the CxSP and OAR to finalize the detailed commissioning procedures and schedule.

8. Before startup, provide detailed startup procedures including current control sequences and interlocks to comply with the detailed functional test plans.

9. Provide one additional copy of all submittals required in Section 01 3300 for all systems being commissioned for review of compliance with commissioning needs by the CxSP.

10. Develop and coordinate a startup and initial systems checkout plan with subcontractors and ensure that all subcontractors and vendors execute their commissioning responsibilities according to the contract documents.

11. Review TAB execution plan.

12. Oversee sufficient testing of the control system before TAB is executed.

13. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.

14. Coordinate retesting as necessary until satisfactory performance is achieved

15. Complete checklists as work is completed and provide to OAR on a weekly basis.

16. Review equipment warranties to ensure that the owner’s responsibilities to keep warranties in force are clearly defined.

17. Oversee and coordinate the training of the owner's personnel.

18. Review and approve the preparation of the O&M manuals including clarifying and updating of original sequences of operation to as-built/as-tested conditions.

19. Coordinate development of a systems manual

1.08 SYSTEMS TO BE COMMISSIONED

A. Systems to be commissioned for this project include, but are not limited to, those for which Specifications are included in Contract Documents and as listed in:

1. Section 23 0800, Article 1.06 - Equipment And Systems To Be Commissioned.

2. Section 23 0813.

3. Section 26 0800, Paragraph 3.01.B.

PART 2 – PRODUCTS

2.01 TEST EQUIPMENT

A. Standard testing equipment required to perform startup and initial checkout and required performance testing shall be provided by the contractor for the equipment being tested. This includes, but is not limited to, two-way radios and meters, etc. Testing specified as requiring portable data recorders will be performed with data recorders supplied and installed by the CxSP.

B. Testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance within the tolerances specified in the specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a current certified calibration to an accuracy of 0.5 degree F and a resolution of plus or minus 0.1 degree F. Pressure sensors shall have an accuracy of plus or minus 2.0 percent of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

PART 3 – EXECUTION

3.01 MEETINGS

A. Commissioning Kick-off Meeting: Within 15 days following issuance of Notice-to-Proceed 1 (NTP 1), the OAR will schedule a Construction Quality Control kick-off meeting. The INSPECTOR, Cx team and Contractor Quality Control representative

will be in attendance. CxSP shall prepare and distribute a list of commissioning topics to be placed on the meeting agenda. Attendance at this meeting and participation in the Commissioning topics is mandatory for the following Contractor personnel:

1. Contractor's Quality Control Engineer and Commissioning Representative.

2. Contractor's Project Scheduling personnel.

3. Mechanical Subcontractors.

4. Electrical Subcontractors.

5. TAB Subcontractor.

6. Controls Subcontractors.

B. Other Commissioning Meetings. Other Cx meetings will routinely be scheduled and generally be conducted in conjunction with regularly scheduled site meetings as the Construction progresses. The Commissioning portion of meetings will cover upcoming implementation and coordination of the CxP, deficiency resolution, and planning issues with particular subcontractors.

3.02 STARTUP, CONSTRUCTION CHECKLISTS, AND INITIAL CHECKOUT

A. The following procedures apply to all equipment/systems to be commissioned:

1. General: Contractor shall use PECs to verify that the equipment and systems are fully connected and operational. PECs for a given system must be successfully completed and accepted prior to startup and formal performance testing of equipment or subsystems of the given system.

2. Startup and Checkout Plan: The CxSP will assist the project commissioning team members responsible for startup of any equipment. The primary role of the CxSP in this process is to ensure that there is written documentation and that each of the manufacturer-recommended procedures has been completed. The CxSP shall provide all the required pre-functional checklists and forms to be completed by Contractor in the CxP. The CxSP will ensure that the INSPECTOR and/or District Special Inspectors are informed as to the planned and scheduled startup and checkout procedures.

a. Sample Pre-Functional checklists are provided as an attachment to the CxP. These checklists indicate required procedures to be executed prior to equipment startup.

b. Contractor shall determine which trade is responsible for executing and documenting each of the line item tasks and transmit the checklists to the responsible subcontractors. Each form may have more than one trade responsible for its execution.

c. The contractor/subcontractor responsible for the purchase and/or installation of the equipment shall develop a comprehensive startup plan (with assistance from the CxSP) by combining the manufacturer's detailed startup and checkout procedures and the pre-functional checklists.

d. The contractor/subcontractor shall submit the full startup plan to the CxSP for review and approval.

e. INSPECTOR will review and accept, based on CxSP recommendation, the procedures and the documentation format for reporting. The CxSP will return the procedures and the documentation format to Contractor through the OAR.

f. Contractor shall transmit the full startup plan to the subcontractors for their review and use.

B. Sensor and Actuator Calibration. All field-installed temperature, relative humidity, CO, CO_2, refrigerant, O_2, and/or pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated. Verify that all locations are appropriate and away from causes of erratic operation. Submit to the CxSP through the OAR the calibration methods and results. All test instruments shall have had a current certified calibration record. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated. Contractor to field verify all installed sensors.

1. Sensor Calibration Methods:

a. All Sensors: Verify that all sensor locations are appropriate and away from causes of erratic operation. Verify that sensors with shielded cable are grounded only at one end. For sensor pairs that are used to determine a temperature or pressure difference, make sure they are reading within 0.2 degrees F of each other for temperature and within a tolerance equal to 2 percent of the reading of each other for pressure.

b. Sensors Without Transmitters: Standard Application. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.

c. Sensors With Transmitters: Standard Application. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS and calibrate or replace sensor.

2. Tolerances, Standard Applications:

Sensor	Required Tolerance (+/-)
Cooling coil, chilled and condenser water temps	0.4F
AHU wet bulb or dew point	2.0F
Hot water coil and boiler water temp	1.5F
Outside air, space air, duct air temps	0.4F
Watthour, voltage & amperage	1 percent of design
Pressures, air, water and gas	3 percent of design
Flow rates, air, water	10 percent of design
Flow rates, water Relative humidity	4 percent of design
Combustion flue temps	5.0F
Oxygen or CO_2 monitor	0.1 percent pts
CO monitor	0.01 percent pts
Natural gas and oil flow rate	1 percent of design
Barometric pressure	0.1 inch of Hg

3. Valve and Damper Stroke Setup and Check EMS Readout: For all valve and damper actuator positions checked, verify the actual position against the BAS readout. Set pumps or fans to normal operating mode. With the command calve and damper closed, visually verify that the command valve or damper is closed and adjust output zero signal as required. With the command valve or damper open, visually verify that the position is full open and adjust output signal as required. Set command valve or damper to a few intermediate positions. If actual valve or damper position doesn't reasonably correspond, repair or replace actuator.

4. Closure for heating coil valves (NO): Set heating set point 20 degrees F above room temperature. Visually observe valve open. Set heating set point to 20 degrees F below room temperature. Visually observe the valve close. Restore to normal.

5. Closure for cooling coil valves (NC): Set cooling set point 20 degrees F above room temperature. Visually observe the valve close. Set cooling set point to 20°F below room temperature. Visually observe valve open. Restore to normal.

C. Execution of Construction Checklists and Startup:

1. Four weeks prior to the scheduled startup, Contractor shall coordinate startup and checkout with the INSPECTOR and CxSP. The execution and approval of the PECs, startup, and checkout shall be directed and performed by Contractor, subcontractor or vendor. Signatures are required of the applicable subcontractors for verification of completion of their work.

2. The INSPECTOR shall observe, as a minimum, the procedures performed for each piece of primary equipment, unless there are multiple units; in which case a sampling strategy may be used. The CxSP shall observe all testing.

3. For lower-level components of equipment, (e.g., sensors, controllers), the CxSP shall observe a sampling of the startup procedures.

4. Pre-functional checklist documentation, identified in the CxP, is to be used by the sub-contractor to document that equipment is ready for startup.

5. The subcontractors and vendors shall execute startup and provide the CxSP, through the OAR, with a signed and dated copy of the completed startup and construction checklists.

6. Only individuals of the contractor or sub-contractor (technicians, engineers, manufacturer's representatives/vendors, supervisors, etc.) who have direct knowledge and have witnessed that a line item task on the construction checklist was actually performed shall check off that item.

D. Deficiencies, Non-Conformance, and Approval in Checklists and Startup (Issues Log):

1. The contractor shall ensure that the subcontractors clearly list any outstanding items of the initial startup and construction checklist procedures that were not completed successfully, on an attached sheet. The form and any outstanding deficiencies shall be provided, through the INSPECTOR, to the CxSP within two days of test completion.

2. The CxSP will review the report and issue either a non-compliance report or acceptance form, through the INSPECTOR, to Contractor. The installing subcontractors or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, shall notify the INSPECTOR as soon as outstanding items have been corrected, and resubmit an updated startup report with a Statement of Correction on the original non-compliance report. When satisfactorily completed, the CxSP will recommend approval of the execution of the checklists and startup of each system.

3. Items left incomplete, which later cause deficiencies or delays during performance testing, may result in assessments to Contractor. Refer to Paragraph 3.05, herein, for details.

3.03 GENERAL REQUIREMENTS FOR TESTING

A. Complete the following at least two weeks prior to Functional Performance Testing:

1. Arrange for Commissioning observations to be performed by the CxSP.

2. Completion and acceptance of the Start-up Plan by the CxSP.

3. Correction of deficiencies identified during start-up.

4. Recording of pretest set points.

3.04 FUNCTIONAL PERFORMANCE TESTING (FTP)

A. Undertake functional testing after the testing requirements listed in Paragraph 3.02 are completed.

B. Equipment: Refer to Part 2 of this Section for test equipment requirements.

C. Perform FPT under the observation of the CxSP who will verify the results of the functional test procedures documented by Contractor.

D. Perform all specified tests according to approved testing procedures / plan.

1. Verify and test performance using actual conditions whenever possible.

2. Simulate conditions when it is not practical to test under actual conditions or when required seasonal testing conditions are not present. The procedure to be used shall be submitted to the OAR for INSPECTOR and CxSP review and acceptance at least one week before simulated testing is to occur. After test, return settings to normal operating conditions.

3. Alter set points when simulating conditions is not practical and when written approval to do so is received from OAR.

4. Override sensor values with a signal generator when actual or simulated conditions and altering set points are not practical. Do not use the sensor to act as the signal generator to simulate conditions or override values.

E. Functional Performance Testing (FPT) Documentation: This Section specifies the general description of the minimum Divisions 22, 23 and 26 Functional Performance Testing documentation requirements that the Contractor shall provide. The CxSP will develop testing procedures in accordance to the requirements of this Section and incorporate into the Cx Plan that Contractor must follow and document. The testing documentation must include the following information:

1. Test number.

2. Date and time of the test.

3. Indication of whether the record is for a first test or retest following correction of a problem or issue.

4. Identification of the system, subsystem, assembly, or equipment.

5. Conditions under which the test was conducted, including (as applicable) ambient conditions, set points, override conditions, and status and operating conditions that impact the results of the test.

6. Expected performance of the systems and assemblies at each step of the test.

7. Narrative description of observed performance of the system, equipment, or assembly.

8. Notation to indicate whether the observed performance at each step meets the expected results.

9. Issue number, if any, generated as the result of the test.

10. Dated signatures of the person performing the test and a witness.

F. The CxSP and INSPECTOR will review and OAR, if applicable, accept functional testing results. Deficiencies found during testing shall be submitted to the OAR and, if required, based on the recommendation of INSPECTOR, by the OAR, corrected by the Contractor and retested. Where there is a dispute over a deficiency, OAR, based on the recommendation of ARCHITECT and INSPECTOR, shall be the final authority.

G. Problem Solving: The burden of responsibility to solve, correct and retest problems is with the Contractor and the design team with OAR, based on the recommendations of the ARCHITECT, CxSP and INSPECTOR, having final responsibility for acceptance of the Work.

H. Substantial Completion: All testing, retesting, and acceptance of Functional Performance Testing shall be completed prior to issuing the Certificate of Substantial Completion. FPT may be conducted following building occupancy; however, all associated and reasonable additional costs incurred by the CxSP shall be assessed against Contractor Retention or Withhold funds.

I. Deficiencies in the Cx Plan Functional Performance Test Checklist: If there is any Functional Performance Test Checklist missing for any particular piece of equipment, the Contractor shall inform the CxSP and ask for an updated Functional Performance Test Checklist.

3.05 RETESTING

A. Retesting shall be required when a specific Pre-functional Checklist or Start-up test item, reported to have been successfully completed by Contractor or determined during functional testing to be faulty or incomplete, is identified.

B. Contractor shall be provided one retest opportunity at no additional cost when Contractor can make corrections within two hours of identification of the need to retest. Costs for retesting beyond one retest, or when Contractor cannot make corrections within two hours of identification of the need to retest, will be assessed against Contractor funds if OAR determines, based upon the recommendation of the INSPECTOR and CxSP, that the Contractor is responsible for the deficiency. These costs shall include all reasonable expenses incurred by the CxSP.

C. For a deficiency identified during functional testing, but not included in the approved Start-up Plan, OAR will direct retesting of the equipment with no costs assessed against Contractor for this initial retesting. Costs for retesting, when Contractor cannot effect corrections within two hours of identification of the need to retest, will be assessed against Contractor funds if OAR determines, based upon the recommendation of the INSPECTOR and CxSP, that the Contractor is responsible for the deficiency. These costs shall include all reasonable expenses incurred by the CxSP.

D. Retesting shall not be considered a reason for a claim of delay or for a time extension by the Contractor.

3.06 DEFERRED TESTING

A Unforeseen Deferred Tests: Checks or tests not completed due to the incomplete Work, required occupancy conditions, or other conditions may be delayed upon approval of the OAR based upon the recommendation of the INSPECTOR and CxSP. These tests may be conducted in the same manner as the seasonal tests.

B. Seasonal Testing: Complete seasonal testing, when weather or other testing conditions do not emulate the system's design conditions, employing simulated conditions acceptable to OAR based upon the recommendation of the INSPECTOR and CxSP. The OAR will coordinate with Contractor, and CxSP validate, this activity. Tests shall be executed, documented and deficiencies corrected by the Contractor, with the INSPECTOR and the CxSP witnessing. The Contractor shall make adjustments to the Operations and Maintenance Data, as necessary.

3.07 DOCUMENT REVIEW

A. General: See paragraph 1.06 for submittal requirements.

B. Operations and Maintenance Manuals: Refer to Section 01 7900 for specific requirements.

3.08 OPERATOR TRAINING

A. The CxSP, under the direction of the OAR, coordinates and verifies training completion as shown in Section 01 7900. Forms and procedures are also described in the CxP.

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 23 –- HVAC.
8. 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 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

Edit Note: Edit tolerances indicated below for project specifics.

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 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. ASTM International:

1. ASTM A184 - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement.
2. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
3. ASTM A706 - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
4. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

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.

3. ACI 117 – Specifications for Tolerance for Concrete Construction and Materials.

C. American Welding Society (AWS):

1. AWS D1.4 – Structural Welding Code – Reinforcing Steel.

D. Concrete Reinforcing Steel Institute (CRSI):

1. Manual of Standard Practice.

1.04 SUBMITTALS

A. Shop Drawings: Submit steel reinforcement Shop Drawings. Include assembly diagrams, schedule of reinforcement, stirrup spacing, bending charts and slab and framing plans. Indicate lengths and location of splices, laps of bars, size and lengths of reinforcing steel. Indicate steel type and grade of reinforcement. Indicate epoxy or non-epoxy reinforcement on general notes.

B. Closeout Submittals: Record exact locations of reinforcing that vary from Contract Documents.

C. Manufacturer's Mill Certificate: Submit, certifying that products meet or exceed specified requirements.

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:

1. ASTM A615, deformed grade 60 or 75 billet steel, as indicated on the drawings.

2. Weldable reinforcing bars shall conform to ASTM A706.

B. Bars or Rod Mats: ASTM A184.

C. Welded Wire Fabric for Reinforcement: ASTM A1064.

D. Tie Wire: ASTM A1064, 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 03 1000: Concrete Forming and Accessories.
3. Section 03 2000: Concrete Reinforcing.
4. Section 07 2600: Vapor Barriers.
5. Section 32 1313: Site Concrete Work.

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. Indicate dimensions and compressive strength.

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 with ACI 318 Section 26.4.1.2.1(a)(1) as modified by CBC Section 1903A.5

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 1903A 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) [ ] percent 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) [ ] percent 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, or V1200, Schonox ZM Rapid, US Self Leveler 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. 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. & CBC2022 1905A.1.17 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 2100

CLAY UNIT MASONRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Brick masonry as indicated.
2. Reinforcing steel and dowels embedded in concrete.
3. Setting of anchors, bearing plates, and other Work to be embedded into masonry.

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 5000 - Metal Fabrications.

1.02 REFERENCES

A. American Society of Testing and Materials (ASTM) Standards:

1. ASTM C5 – Standard Specification for Quicklime for Structural Purposes.
2. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale).
3. ASTM C67 – Standard Test methods for Sampling and Testing Brick and Structural Clay Tile.
4. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
5. ASTM C150 – Standard Specification for Portland Cement.
6. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
7. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).

8. ASTM C270 – Standard Specification for Mortar for Unit Masonry.

9. ASTM C404 – Standard Specification for Aggregate for Masonry Grout.

10. ASTM C476 – Standard Specification for Grout for Masonry.

B. Masonry Standards Joint Committee (MSJC):

1. ACI 530.1/ASCE6/TMS602 – Specification for Masonry Structures.

2. ACI 530/ASCE5/TMS402 – 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 QUALITY ASSURANCE

A. Comply with the requirements of Specification Section 01 4523 - Testing and Inspection

B. Examination: Brick masonry, including brick veneer, shall be continuously inspected during installation.

1. Test grout and mortar for compliance with Specifications.

2. Testing and Coring:

a. Test for compliance of brick, mortar and grout with 28-day strength requirements.

b. Repair brick masonry units after coring or other testing is performed.

C. Mock-up: Provide a minimum 100 square foot mock up of corner condition, parapet, and window opening.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store brick masonry units above grade on a level platform to provide air circulation under stacked units.

B. Cover and protect brick masonry units from becoming wet before installation.

C. Store cementitious ingredients in weather tight enclosures.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Higgins Brick Co., Redondo Beach, CA.

B. Pacific Claybrick Products, Lake Elsinore, CA.

C. H. C. Muddox, Sacramento CA.

D. Equal.

2.02 MATERIALS

A. Common Brick: ASTM C62, Grade SW Type FBS.

B. Face Brick: ASTM C216, Grade SW Type FBS, size as indicated, color and texture as selected.

C. Mortar and Grout Sand: Natural sand or sand manufactured by crushing stone or gravel, conforming to ASTM C144, except that at least 3 percent shall pass a No. 100 sieve.

D. Pea Gravel for Grout: ASTM C33 and ASTM C227. Maximum size of aggregate shall be 3/8 inch.

E. Cement: ASTM C150, Portland cement, Type I or II low alkali.

F. Hydrated Lime: Standard brand conforming to ASTM C207, Type S; Kel-Crete may be substituted for lime.

G. Mortar Color: Pure mineral pigment, lime-proof, non-fading, designed for use in mortar. Color as selected by the Architect.

H. Water: Clean and potable, free from deleterious amounts of acids, alkalis, salts or organic materials.

I. Reinforcing: As specified in Section 03 2000 - Concrete Reinforcing.

PART 3 - EXECUTION

3.01 EXAMINATION

A. A special inspector, approved by DSA to inspect the Work of this section, shall inspect brick masonry before and during installation. 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.

B. Brick masonry units shall be clean and free of dirt, dust, and other deleterious substances before installation.

3.02 GENERAL

A. Install patterns and details, maintaining indicated face bond. Install courses level and true to line, each tier plumb, with clean, straight and uniformly thick joints. Provide vertical joints plumb from top to bottom in corresponding courses. Toothing is prohibited; hold racking to a minimum.

B. Set and install anchors, bolts, sleeves, and other required Work items.

C. Brick shall be damp when installed. Allow surface water to drain off before installing. During installation, brick shall demonstrate sufficient absorption to retain applied mortar and absorb excess grout water. Mortar shall remain plastic for leveling and plumbing without breaking mortar bond.

D. Brick shall be installed as full units except where otherwise detailed. Install in a full bed of unfurrowed mortar. Solidly fill head joints with mortar and install brick into position. If a brick must be moved or shifted after initial installation, remove setting mortar, thoroughly clean the brick, and install with fresh mortar.

E. Install brick with uniform joints, thickness as indicated; perform joint finishing while mortar is still soft. Trowel exposed exterior joints flush and tool with a round bar, or tool, to provide a dense slightly concave surface. Exposed interior joints shall be finished flush. Cut off unexposed joints flush with face of brick. Install brick in bond pattern indicated on Drawings.

F. Top surfaces of walls shall be maintained free of mortar and grout droppings. To continue installation of brick masonry, clean brick, joints, and dampen top of brick surfaces with water.

3.03 PREPARATION

A. Lime Putty: Manufactured from hydrated lime. Lime putty shall weigh no less than 83 pounds per cubic foot.

B. Mortar: One part Portland cement, at least ¼ part but not more than ½ part lime putty or dry hydrated lime, and not more than four parts of sand based on dry loose volumes. Mortar shall provide a minimum strength of 3,350 PSI and shall be Type S.

C. Grout: One part Portland cement to not more than three parts sand and at least one part, but not more than two parts pea gravel, based on dry loose volumes. Add sufficient water to cause grout to flow into joints of masonry. Grout shall attain a minimum strength of 2,000 psi. Use Sika Chemical Corporation Grout Aid per manufacturer's instructions.

D. Reinforcement: Clean of mill scale, loose rust, oil, and coatings, which would reduce bond. Securely anchor in place.

E. Measurement: Accurately measure materials in calibrated devices. Shovel measurements are not permitted. Allowance for bulking of sand when measured damp loose shall not exceed 20 percent.

F. Mixing: Place sand, cement, and water in mixer in that order for each batch of mortar or grout and mix as long as needed to secure a uniform mass, but in no case less than 10 minutes. Add lime for mortar after initial 2 minutes of mixing time. Furnish paddle type mixers of at least one-sack capacity. Batches requiring fractional sacks will not be permitted unless cement is weighed for each such batch. Mortar and grout awaiting installation shall be turned and remixed to maintain a workable mix. Re-tempering of grout is not permitted. Re-tempering of mortar shall be performed by adding water into a mortar basin with additional mortar added to it. Re-tempering by dashing water over mortar is not permitted. Mortar or grout not installed within one hour after initial mixing shall be removed from the Work. Mortar shall be mixed and maintained on boards to a slump of 2 ¾-inch, plus or minus ¼ inch, using a truncated cone 2 to 4 inches, 6 inches high.

3.04 INSTALLATION

A. Brick Veneer:

1. Frame walls to receive brick veneer shall have sheathing covered with 15 pound asphalt saturated felt applied shingle fashion. Start at bottom of area to be covered, install sheets horizontally, and secure to sheathing with nails or screws spaced 16 inches on center along edges. Lap each succeeding sheet 3 inches over the one below.

2. Nail or screw continuous vertical galvanized anchor slots to each stud or support, as shown on the Drawings.. Install continuous 10 gage straight galvanized wires as detailed.

3. Install brick veneer on frame construction with a 1 ¼-inch minimum space between backing and backside of brick. Remove mortar projecting into space, which obstructs flow of grout. Install grout after each course is installed and puddle to eliminate voids and to solidly fill grout space. Where it is not possible to install grout, fill space solidly with mortar.

3.05 FINISHING

A. Upon completion, holes, cracks, and defects in mortar joints shall be neatly pointed with mortar and finished weather tight.

B. Maintain brick Work continuously moist with a nozzle-regulated fog spray for at least 3 days after installation.

3.06 TESTING

A. Samples: Mortar and grout Samples will be prepared by the special inspector. At the beginning of masonry Work, at least one test specimen each of mortar and grout shall be obtained on three consecutive days.

B. Grout test specimens shall be obtained from the mason's containers as it is being installed. Additional test specimens shall be obtained whenever any change in materials and conditions of the Work occur. At least three mortar cylinders and three grout prisms shall be obtained and tested for each 30 cubic yards or fraction thereof.

C. Test Specimens shall be stored and tested as specified for "Molded Cylinder Test" for concrete as specified in Section 03 3000 - Cast-In-Place Concrete. Minimum compressive strength of test specimens shall be as follows:

ITEM	7 days	28 days
Mortar	900 psi	1,900psi
Grout	1,200 psi	2,000 psi

D. At least two cores with a diameter of approximately 2/3 of wall thickness shall be obtained from each Project by the independent testing agency. At least one core shall be obtained from each building for each 5,000 square feet of wall area. One-half of the cores obtained shall be tested in compression normal to wall face and shall provide a strength of at least 1500 psi at 28 days. Cores shall be obtained and tested as specified for concrete core test in Section 03 3000 - Cast-In-Place Concrete. One-half of the cores shall be tested in shear, testing joint between unit and grout core, and shall provide unit shearing strength as required by CBC. Masonry cut or removed by coring operation shall be replaced with new masonry to match adjoining Work.

3.07 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.08 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

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 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. F'c = 3000#

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 **[light] [medium] [normal]** 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. Preparation of galvanized steel fabrications for painting.

B. Related Sections:

1. Division 01 - General Requirements.
2. Section 05 5000: Metal Fabrications.
3. 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.
4. Suggested Specifications for Paint Preparation Galvanized Structures.
5. Preparing Hot Dip Galvanizing for Paint.
6. Preparing Hot-Dip Galvanized Steel for Powder Coating.
7. Wet Storage Stain.

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 B201 – Standard Practice for Testing Chromate Coatings on Zinc and Cadmium Surfaces.

9. ASTM D6386 – Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.

10. ASTM D7803 - Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Powder Coating.

11. 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, for surfaces to receive paint or powder coating.

4. SSPC-SP5 – White Metal Blast Cleaning.

5. SSPC-SP10 – Near White Blast Cleaning.

6. 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 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. Galvanizer may request material test reports (MTRs) or metallurgical assays from fabricator.

C. Coordinate with steel fabricator appropriate marking and masking materials.

D. Coordinate modifications needed to the fabrications to accommodate lifting and handling during galvanizing.

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: Submit to OAR notarized Certificate of Compliance with ASTM standards and specifications herein listed, noting exception for intentional bare areas. The Certificate shall be signed by the galvanizer and contain a detailed description of the material processed.

B. When galvanizer prepares the surfaces of fabrications that will receive paint or powder coating over galvanizing provide statement indicating conformance with ASTM D6386 or D7803, as applicable.

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. If anti-spatter sprays are utilized, they shall be water-soluble or solvent-based.

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 holes or lugs to allow for handling during galvanizing. Avoid the use of chains or wires directly connected to steel articles to be duplexed or architecturally exposed.

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. Markings and stickers from fabrication or shipping that will interfere with galvanizing adhesion shall be removed prior to beginning the galvanizing process.

3.02 COATING APPLICATION

A. Galvanize steel articles, fabrications and assemblies by the hot-dip process in accordance with ASTM A123. The zinc used in the galvanizing bath shall conform to ASTM Specification B6. The molten metal in the working volume of the galvanizing bath shall contain at least 98.0 % zinc by weight.

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. Surface preparation requirements shall be performed in accordance to ASTM D7803 or D6386 but also in accordance with the paint manufacturer's requirements and recommendations.

3.03 COATING REQUIREMENTS

A. Conform to paragraph 6.1 of ASTM A123, or Table 1 of ASTM A153, as applicable.

B. Surface Finish: Conform to paragraph 6.2 of ASTM A123, or Paragraph 5 of ASTM A153, as applicable.

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.

B. Test 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 as indicated in Article 1.05 Submittals.

3.05 REPAIR OF DAMAGED COATINGS

A. Smooth out icicles by hand filing or power sanding the area without removing any more zinc coating than necessary. Smooth out rough and bumpy surface of fabrications to be painted, powder coated or are indicated as architecturally exposed. Repair damaged galvanized surface with a zinc rich coating.

B. Repair areas damaged at the galvanizing facility by methods in accordance with ASTM A780, but meeting the maximum repair size criteria and minimum repair thickness in accordance with ASTM A123 and A153.

C. Remove lifting lugs and repair coating with a zinc rich coating.

3.06 PREPARATION FOR TOP COATING

A. Galvanized fabrications indicated on the drawings to be painted shall be prepared in accordance with ASTM D6386 and the American Galvanizers Association (AGA) Suggested Specifications for Paint Preparation Galvanized Structures. For field painting refer to Section 09 9000, Painting and Coating.

B. Galvanized fabrications indicated on the drawings to be powder coated shall be prepared in accordance with ASTM D7803.

C. Galvanizer shall ensure water quenching and chromate passivation are not performed. for fabrications scheduled for duplex coatings.

END OF SECTION

SECTION 05 5000

METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Metal fabrications:

1. Steel thresholds.
2. Steel ladders and ladder safety cages.
3. Elevator hoist way door sill angles,
4. Steel framing and supports for countertops.
5. Steel tube reinforcement for low partitions.
6. Steel framing and supports for mechanical and electrical equipment.
7. Steel Gates.
8. Gratings, frames and covers.
9. Steel bollards.
10. Embedded edge angles in concrete.
11. Steel supports for coiling doors.
12. Steel framing and supports for operable partitions.
13. Supportive framing for sunshade panels.
14. 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.
15. 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 0513: Hot-Dip Galvanizing.

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 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.

3. Section 03 1000: Concrete Forming and Accessories.

4. Section 03 3000: Cast-In-Place Concrete.

5. Section 06 2000: Finish Carpentry.

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. Redwood structural and framing lumber shall be graded in accordance with Standard Specifications for Grades of California Redwood Lumber of the Redwood Inspection Service.

2. 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).

3. 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 the current edition of USEPA's guidance publication "Mold Remediation in Schools and Commercial Buildings (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 of the LAUSD Office of Environmental Health and Safety.

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.	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	Douglas fir and Larch	Same as subparagraphs 5 and 6.

	foundations, or installed on concrete slab in direct contact with earth.	treated	
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: Elastomeric adhesive – follow manufacturer's installation instructions. Product must be approved by OWNER Office of Environmental Health and Safety and conform to ASTM D 3498 or 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 direction 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. Attic Space Partitions and Attic Walkways:

1. Attic space partitions shall be constructed of 2 by 4 wood members spaced at 2 feet on center maximum with 5/8 inch gypsum board.

2. Doors in attic space partitions shall be self-closing, of the same sheathing material as partition, constructed with 2 battens and a diagonal brace across back.

3. Shear walls passing through attic space shall be sheathed with 5/8 inch gypsum board on each side.

4. Attic walkways shall be constructed of 2 by 12 planks installed one-inch apart and nailed at each support with three 16d nails.

G. 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.

H. 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.

I. 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.

J. 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.

K. 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.

L. Wood Bucks: Furnish and set wood bucks to form openings for doors and other openings in concrete or masonry walls and in steel stud or channel partitions and furring. Bucks shall be Douglas fir, S1S2E, 2 inches (nominal) thickness and of width indicated or required. Bucks in connection with concrete shall be bolted thereto, and bucks in masonry walls shall be attached by means of strap anchors embedded in masonry joints. Bucks in connection with steel studs and metal channels shall be secured with nails or screws spaced not to exceed 24 inches on centers.

M. Bench Tops and Backs: Tops and backs shall be 3/4 inch thick asbestos free board, fabricated to minimize number of joints. Edges shall be neatly cut, smoothly finished and joints accurately fitted and butted. Tops and backs shall be secured with countersunk flathead galvanized wood screws. At bench with steel pan, apply with manufacturer's recommended adhesive. Cut and drill as required for Work to be attached to benches.

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 06 1643

GYPSUM SHEATHING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Fiberglass-mat faced, moisture and mold resistant exterior gypsum sheathing.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 05 4100 - Structural Metal Stud Framing.
3. Section 06 1000 - Rough Carpentry.
4. Section 07 0800 Commissioning of Thermal and Moisture Protection.
5. Section 07 2100 Thermal Insulation.
6. Section 07 9200 - Joint Sealants.
7. Section 07 2719 Plastic Sheet Barriers.

1.02 PROJECT REQUIREMENTS

A. Design Requirements: Provide systems capable of resisting deflection.

B. Regulatory Requirements: Comply with CBC requirements for design and installation.

1.03 SUBMITTALS

A. Material Samples: Submit 5.5” inch by 8.5” inch sample of the exterior sheathing panel. Submit 5 screws to be utilized in attaching the exterior sheathing panel.

B. Product Data: Submit manufacturer's catalog data for the sheathing product and the attachment screws.

1.04 QUALITY ASSURANCE

A. Comply with following as a minimum requirement:

1. 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.
2. ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

3. ASTM C1280 Standard Specification for Application of Gypsum Sheathing.

4. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.

5. Gypsum Association (GA): GA-253 Application of Gypsum Sheathing.

B. Qualifications: Installer shall have a minimum 5 years experience in installing and finishing gypsum board.

A. CHPS Low-Emitting Materials table: Materials submitted shall meet the CHPS Low-Emitting criteria and be listed as Low-Emitting on the following web site: www.CHPS.net or be listed on UL website Greenguard.org as Greenguard Gold Certified.

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. Exterior Sheathing 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 Exterior Sheathing systems before, during, and after installation.

E. Exterior sheathing showing any evidence of water damage shall not be installed. Exterior sheathing showing evidence of water damage after installation shall be removed and replaced.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS AND PRODUCTS

A. Georgia-Pacific - Dens Glass Gold sheathing.

B. National Gypsum Co. - Gold Bond eXP sheathing.

C. U.S. Gypsum Co. - SECUROCK brand UltraLight glass Mat.

D. Or equal.

2.02 MATERIALS

A. Exterior sheathing Type X (fire-resistant): 5/8 inch thick, 4-foot wide and up to 10 feet long conforming to ASTM C1177.

1. Edges: Square.

2. Surfacing: Fiberglass mat on face, back, and long edges.

3. Mold Resistance: score of 10 per ASTM D3273 in a test as manufactured.

2.03 ACCESSORIES

A. Fasteners: ASTM C1002, corrosion resistance of more than 800 hours per ASTM B117. In coastal environments or aggressive environments, stainless steel fasteners shall be used.

PART 3 – EXECUTION

EDIT NOTE: ADD PROJECT INSTALLATION REQUIREMENTS FOR WALL CONSTRUCTION ASSEMBLY USED IN PROJECT.

3.01 INSTALLATION

A. Install in accordance with the fire rated assembly indicated on the drawings, GA-253, ASTM C1280 and the manufacturer's recommendations.

B. Prior to application of exterior system, attachment of sheathing to framing shall be able to withstand design wind loads of building.

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 06 1733

WOOD I-JOISTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Prefabricated wood-based flanges and webs I joists for use as floor joists and roof rafters, as indicated on the drawings.

B. Related Sections:

1. Division 01 - General Requirements.

2. Section 01 4523 - Testing and Inspection.

3. Section 06 1000 - Rough Carpentry.

1.02 REFERENCES

A. ASTM International (ASTM):

1. ASTM D5055 – Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.

2. ASTM D2559 – Standard Specification for Adhesives for Bonded Structural Wood Products for Use under Exterior Exposure Conditions.

B. Division of The State Architect (DSA) Interpretation Regulations (IR):

1. DSA IR A-5 – Acceptance of Products, Materials & Evaluation Reports.

2. DSA IR 23-9.10 – Prefabricated Wood I-Joist.

C. The International Code Council Evaluation Service (ICC-ES):

1. ICC Acceptance Criteria AC 14 – Prefabricated Wood I-Joists.

2. Wood-I-Joist Manufacturer ICC-ES Evaluation Report.

D. National Institute of Standards and Technology (NIST) U.S. Department of Commerce:

1. Voluntary Products Standard PS2 - Performance Standard for Wood-Based Structural-Use Panels

1.03 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating joist layout, sizes, camber, spacing, species, stress grades and attachment details.

B. Evaluation Reports: Submit current ICC-ES evaluation reports stating compliance to ICC Acceptance Criteria AC14.

1.04 QUALITY ASSURANCE

A. Manufacturer of prefabricated wood I-joists shall hold a current evaluation report from the ICC Evaluation Service stating data is in accordance to Acceptance Criteria AC14.

B. Structural capacities and design provisions for prefabricated wood I-joists shall be established and monitored in accordance with ASTM D5055.

C. Fabrication and installation of wood I-joists shall comply with the requirements of CBC Chapter 23 and the applicable DSA Interpretation Regulations (IR) and Bulletins.

D. The wood I-joist manufacturer shall maintain a required Quality Assurance and Control program, including periodic independent third party audits.

E. Engineered wood rim board shall conform to CBC section 2303.1.13.

F. Each I-joist shall be marked or stamped with the product designation, the I-joist series, the production date, the evaluation report number, the manufacturer’s name or logo and the manufacturer’s mill or plant number.

G. I-joist fabrication shall be inspected as part of manufacturer’s approved quality assurance program. Inspection shall be performed in accordance with Section 01 4523, Testing and Inspection and CBC Chapter 17A.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact. Unload material in accordance with manufacturer’s recommendations.

B. Store I-joists in vertical orientation, above grade on platforms, skids, or other required supports.

C. Protect I-joists from moisture with polyethylene film or waterproof paper.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design:

B. Acceptable Manufacturers:

1. RedBuilt LLC.

2. Equal.

2.02 MATERIALS

A. Flange: Solid-sawn lumber, laminated veneer lumber (LVL), laminated strand lumber (LSL) or machine-stress-rated (MSR) structural lumber, as indicated on the manufacturer's ICC-ES report.

B. Web: oriented strand board (OSB) conforming to the manufacturer's ICC-ES report and to the U.S. Voluntary Product Standard PS 2, exposure 1.

C. Accessories: Supply miscellaneous accessories including bracing, blocking, stiffeners, bearing clips, fasteners, and other required accessories required by I-joist manufacturer to complete I-joist installation.

D. Adhesives: Adhesives shall meet the requirements for exterior type complying with ASTM D2559.

2.03 FABRICATION

A. Fabricate I-joists in accordance with the referenced standards and the structural properties of the manufacturer's ICC Evaluation Report.

PART 3 - EXECUTION

3.01 GENERAL

A. I-joists shall be of sizes and spacing indicated. Flanges and web members shall be of sizes and stress-grade lumber indicated or specified.

3.02 INSTALLATION

A. Joints shall be installed in accordance with Drawings and Shop Drawings.

B. Temporary construction loads, which cause stresses beyond design limits, shall not be applied to I-joists.

C. Provide bracing to keep I-joists straight and plumb until sheathing material has been installed.

3.03 CLEANUP

A. Remove debris, rubbish, and waste material and legally dispose of off Project site.

3.04 PROTECTION

A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 06 1813

GLUED LAMINATED BEAMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Structural glued laminated wood members.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 01 4523 - Testing and Inspection.

3. Section 06 1000 - Rough Carpentry.

1.02 REGULATORY REQUIREMENTS

A. Manufacture and fabrication of structural glued laminated timber shall be in accordance with CBC Chapter 23.

1.03 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings for glued laminated members.

1.04 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. AITC 117 - Structural Glued laminated Timber of Softwood Species.

2. ASTM D3737 - Design and Manufacture of Structural Glued Laminated Timber.

3. NSI/ATC A190.1 - Standard Specifications for Glued Laminated Timber.

4. WCLIB - Standard Grading and Dressing Rules.

B. Beams to comply with CBC Chapter 23.

C. Special inspection of structural-glued laminated members shall be performed during fabrication by an inspector approved by DSA. Inspection shall be performed in accordance with CBC Chapter 17A.

1.05 DELIVERY, STORAGE AND HANDLING

A. After fabrication and prior to shipping, seal surfaces of each member, including ends, with two coats of sealer primer, installed in accordance with manufacturer's written recommendations.

B. Each member, which will be exposed in completed structure, shall be separately wrapped in heavy waterproof paper for protection against weather and damage in shipping and handling. Do not remove wrapping until after members have been installed. Protect all members from damage, whether concealed or exposed in the finished Work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Lumber for Laminating: Conforming to the structural requirements and laminating specifications of AITC 117, of stress grades and combination indicated that provides glued laminated members with allowable stress values in bending as indicated.

B. Glue: Exterior type; waterproof.

2.02 FABRICATION

A. Appearance grade of members shall be Industrial Grade where concealed and Architectural Grade where exposed.

B. Weather exposed surfaces of members as defined in CBC shall be protected to prevent decay. When member is protected with pressure treatment, treatment process shall not impair structural integrity of member. When member is protected by flashing or is encased, provide ventilation and prevent moisture entrapment on member.

C. Joints: End joints in adjacent laminations shall be separated in accordance with CBC requirements. Joints in adjacent laminations of arched members shall be separated as required for bending members.

D. Maximum moisture content of the wood at time of gluing shall not exceed 16 percent for Projects located in coastal areas, 12 percent for Projects located in interior valleys or 10 percent for Projects located in desert areas, with geographical areas determined by DSA. Moisture content of wood for members that will be exposed to direct sunlight in finished structure shall not exceed 10 percent at time of gluing. Range of moisture content of laminations assembled into a single member shall not exceed 5 percent at time of gluing.

E. Reinforcement for Radial Tension: Where mechanical reinforcement is required to resist radial tension, reinforcement shall be as described in the Timber Construction Manual. Maximum spacing of mechanical reinforcement shall not exceed half effective depth of member at location of reinforcement.

F. Notches: Notched glued laminated members shall be designed as required for sawn lumber using allowable stress of a combination, with outer lamination being grade of laminations exposed by notch. Where a notch is located on tension face of a member, at least one fully-threaded lag bolt, or equal, shall be provided on each side of notch to prevent splitting.

G. Fabricate and assemble components for laminations in combinations in accordance with requirements of AITC 117 and ASTM D3737.

PART 3 - EXECUTION

3.01 ERECTION

A. Provide erection bracing in addition to required lateral bridging. Avoid temporary construction loads in excess of design limits. Maintain members straight and plumb. Provide adequate lateral support for individual members and entire system until permanent bridging and sheathing is installed. Deliver and erect each member in one piece. Field splicing is not permitted unless reviewed by the Architect.

3.02 CLEANUP

A. Remove debris, rubbish and waste material 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 06 2000

FINISH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Finish carpentry.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 06 1000: Rough Carpentry.
3. Section 06 4000: Architectural Woodwork.
4. Section 08 1416: Flush Wood Doors.
5. Section 08 7100: Door Hardware.
6. Section 08 8000: Glazing.
7. Section 09 2900: Gypsum Board.

1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings of each item of finish carpentry and millwork, indicating materials, dimensions, construction, and anchorage details.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. Douglas fir finish lumber shall be manufactured and graded in accordance with WCLIB - Standard Grading and Dressing Rule No. 17.
2. Redwood finish lumber shall be manufactured and graded in accordance with RIS - Standard Specifications for Grades of California Redwood Lumber.
3. Hardwood finish lumber shall be manufactured and graded in accordance with NHLA - Rules for the Measurement and Inspection of Hardwood and Cypress Lumber.

4. Softwood Plywood: Plywood shall comply with APA - Product Standard PS 1. Plywood shall be grade marked by APA.

5. Products and installation shall comply with the North American Architectural Woodwork Standards (NAAWS) for the Grade or Grades specified.

B. Finish lumber shall be kiln-dried according to recognized methods for the thickness and species. Lumber one inch thick or less shall be dried to an average moisture content of not more than 13 percent. Lumber 1-1/4 inches to 2 inches in thickness shall be dried to an average moisture content of not more than 15 percent.

1.04 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to the Project site in undamaged condition, stored in fully covered, well ventilated areas, and protected from extreme changes in temperature and humidity.

B. Interior millwork and finish carpentry shall not be installed unless interior building temperature and humidity levels are within the ranges recommended by the manufacturer and/or recognized standards.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Douglas Fir: Interior trim, solid lumber shelves, partitions, door frames and other concealed members of interior finish; NAAWS Economy Grade.

B. Hardwood: Birch, maple firsts and seconds.

1. Birch: NAAWS Custom Grade.

2. Maple: NAAWS Custom Grade.

C. Softwood Plywood: Except where otherwise specified, AWI Custom Grade, Douglas fir unless otherwise indicated.

D. Hardwood Plywood: NAAWS Premium Grade, species as indicated.

E. Redwood: Exterior millwork, except framing lumber, shall be clear heartwood redwood. Where installed in direct contact with earth or provided for exterior storage units, install Foundation Grade.

F. Perforated Hardboard Panels: Panels shall be 1/4 inch thick tempered hardboard, SIS with 1/4 inch diameter holes spaced one inch on center.

2.02 FABRICATION

A. The means of fastening various parts together shall be concealed in finished Work. Work which is curved shall be fabricated from solid stock, or if veneered, shall be bent to a uniform radius.

PART 3 - EXECUTION

3.01 GENERAL

A. Interior and exterior wood, millwork, blocking, and lumber shall be installed level, plumb, and true to line. Members shall be neatly and accurately scribed in place, maintaining full widths of end members, wherever possible. Trim shall be installed in full lengths, without piecing, except where use of single lengths is not required. Butt joints, if necessary, shall be beveled. Exterior angles shall be mitered, and interior angles of molding parts coped. Nails shall be set for putty. Grain and color of adjoining interior finish shall match adjacent finishes. Where Work specified in this section adjoins other Work, provide a neat tight joint.

B. Interior and exterior finish carpentry and other fixed wooden equipment having hammer marks or other visible damage will be deemed defective Work.

C. Staff or brick moulds of exterior wood doorframes shall be attached to frames after frames have been set and caulked. Moulds shall be mitered at corners and coped to sills, accurately secured in place with finish nails, and nails set.

3.02 INSTALLATION

A. Install Work of this section as specified in the North American Architectural Woodwork Standards.

B. Wood shoe base shall be fitted and temporarily tacked in place until floor covering is installed. Provide and install corner fillets, same contour and materials as shoe base, in corners where shoe base is installed.

C. Platform Front: Plywood at platform front and adjoining steps in Multi-Purpose Building shall be provided with face veneers of unselect birch. Trim and frames shall match face veneer of panels. Joints shall be V-shaped where indicated.

D. Door Frames: Frames shall be installed plumb and true, solidly blocked, reinforced for butts and hardware, and shall be fastened to structural frame with 16d set finish nails at not more than 24 inches on centers. Nails securing exterior door and window frames shall be cement coated. Doorframes shall be dadoed together at the head.

E. Sealing of Joints: Joints between exterior frames and adjoining surfaces shall be primed before sealing.

3.03 CLEAN UP

A. Remove debris, rubbish 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 06 4000

ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Architectural woodwork, casework, trim, hardware, countertops, and shelving as indicated on Drawings.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 06 1000: Rough Carpentry.
3. Section 06 2000: Finish Carpentry.
4. Section 08 8000: Glazing.
5. Section 09 9000: Painting and Coating.
6. Section 10 1100: Visual Display Units.
7. Section 22 1000: Plumbing.

1.02 DEFINITIONS

A. "Sustainably managed" is defined as "forests that are being managed through a professionally administered forestry management plan in which timber growth equals or exceeds harvesting rates in both quantity and quality, protecting rivers and streams from degradation, minimizing damage to the forest when harvesting and promoting biodiversity".

1.03 SYSTEM DESCRIPTION

A. Design Requirements: Provide wood products from certified sustainably harvested sources.

1.04 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings of casework indicating materials and hardware, details of construction, dimensions, methods of fastening and installation details. Shop Drawings shall bear a Woodwork Institute (WI) Certified Compliance Label indicating that Shop Drawings fully meet requirements of the North American Architectural Woodwork

Standards (NAAWS) grade or grades specified. Shop Drawings shall indicate grounds, backing, blocking, sleepers and other items required for installation of casework, which are to be provided and installed as part of the Work.

B. Certificates: Provide a WI Certified Compliance Certificate certifying that materials, fabrication and installation will comply with the specified requirements.

C. Material Samples: Submit 2-inch by 3-inch plastic laminate and solid surfaces color Samples of manufacturer's entire color range.

D. Submit manufacturer’s product data for adhesives and finishes. Indicate VOC limits of the product. Submit MSDS highlighting VOC limits.

E. Forest Stewardship Council (FSC): Provide letter of certification signed by lumber supplier. Indicate compliance with FSC "Principles for Natural Forest Management" and identify certifying organization.

F. Closeout Submittals: Provide a WI Certified Compliance Certificate for Installation.

1.05 QUALITY ASSURANCE

A. Comply with the North American Architectural Woodwork Standards (NAAWS), latest edition, published jointly by the Architectural Woodwork Manufacturer’s Association of Canada and the Woodwork Institute of California, grades as specified herein.

B. Each elevation of casework shall bear a WI Certified Compliance Label indicating that casework fully meets requirements of the AWS grade specified.

C. Each plastic laminate countertop and/or solid surface top shall bear a WI Certified Compliance Label indicating tops fully meet requirements of the AWS grade specified.

D. Mock-ups: When required by the Architect, submit a full-scale base cabinet, countertop, and wall-hung cabinet, illustrating joinery and plastic laminate finish. Base cabinet shall incorporate a drawer, an adjustable shelf, and a door. Wall-hung cabinet shall incorporate two doors, one adjustable shelf and finished end, including required hardware.

1.06 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to the Project site in undamaged condition, stored in fully covered, well ventilated areas, and protected from extreme changes in humidity and temperature. Refer to the North American Architectural Woodwork Standards (NAAWS) for recommended care and storage.

B. In event of damage immediately furnish necessary repairs or replacements.

1.07 PROJECT CONDITIONS

A. Store indoors, in ventilated areas with constant but minimum temperature of 60 degrees F. and maximum relative humidity of 25 percent to 55 percent. Do not install casework until building is enclosed and ambient conditions are within the temperature and humidity range to be expected during occupancy. Acclimatize materials to the installation temperature and humidity for at least 72 hours prior to installation. Maintain conditions until Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Plastic Laminate Faced Cabinets:

1. Plastic laminate: High pressure plastic laminate conforming to NEMA standard LD-3; Grade HGS 0.048 inches at horizontal surfaces, Grade VGS 0.028 inches at exposed vertical surfaces and edge bands, and HGP 0.039 inch minimum for post-formed countertops.

2. Particle Board Core Material: 45 lb. density, conforming to ANSI A208.1, Table 1, Grade 1-M-2.

3. Solid Lumber:

   a. Solid lumber for exposed members, drawers, trays and special details shall be Clear birch or maple.

   b. Unexposed solid lumber for concealed webs or structural members shall be of Douglas Fir., alder or birch.

4. Softwood Plywood: Rotary cut exterior type A-C grade softwood plywood complying with PS1.

5. Hardboard: Factory finished pressure sealed hardboard conforming to the requirements of PS 58. Oil tempered hardboard shall conform to CS 251.

6. Cabinet Liner: Semi-exposed surfaces shall be finished with 0.020 inch high-pressure laminate cabinet liner, conforming to NEMA Standard LD-3.

7. Edge Banding:

   a. 0.028 inch minimum thickness plastic laminate.

8. Glass Doors: 1/4 inch laminated safety glass.

9. Adhesive: Type II water-resistant, rigid type glue of formula conforming to PS 51.

10. Sealer: Thompson Water Seal 101, Watco Oil, Zinsser, or equal.

11. The Owner will supply tote trays unless otherwise indicated.

12. Base: Cover toe spaces with typical wall base unless otherwise indicated.

B. Wood Casework:

1. Sheets:

a. Medium Density Fiberboard (MDF): ANSI A208.2.

2. Solid Lumber:

a. Concealed portions: Any species of sound, dry, solid stock.

b. Semi-exposed portions: Hardwood veneer of the same species as exposed material with a specific gravity in excess of 0.37.

c. Exposed portions: Select White Birch, well matched for color and grain.

3. Hardboard: Factory finished, pressure sealed hardboard conforming to requirements of PS 58.

4. Edge Banding: Same species of wood as adjacent to exposed surfaces.

C. Countertops:

1. 3/4 inch 1-M-2 grade particleboard, ANSI A208.1.

2. Medium Density Fiberboard (MDF): ANSI A208.2.

3. Solid Surfaces: Filled cast polymeric resin panel, with homogeneous composition throughout its thickness.

a. Corian.

b. Formica.

c. Wilsonart.

d. Equal.

D. Hardware:

1. Drawer Slides for Custom Grade Cabinetry:

a. Pencil drawers: Full extension type: Accuride 2006, Blum, Hafele, or equal.

b. Drawers and box drawers, up to 24 inches wide: Accuride 3832E, Blum, Hafele, or equal.

c. Lateral file drawers, up to 30 inches wide: Accuride 4034 overtravel or 4033 equal travel, Blum, Hafele, or equal.

d. Lateral file drawers, more than 30 inches wide: Accuride 3640, Blum, Hafele, or equal.

2. Drawer Slides for Premium Grade Cabinetry:

a. Pencil drawers: Full extension type: Accuride 2632, Blum, Hafele, or equal.

b. Drawers and box drawers, up to 24 inches wide: Accuride 7432, Blum, Hafele, or equal.

c. Lateral file drawers, up to 30 inches wide: Accuride 4034 overetravel or 4033 equal travel, Blum, Hafele, or equal.

d. Lateral file drawers, more than 30 inches wide: Accuride 3641, Blum, Hafele, or equal.

3. Flipper Door Slides for Premium and Custom Grade Cabinetry:

a. For vertically mounted retracting cabinet doors up to 75 pounds and 72 inches tall: Accuride 1432, Blum, Hafele, or equal, with hinge carrier strip.

4. Door Mutes: Rubber, approximately 1/4 inch diameter, colors to match adjacent finish.

5. Plastic Grommets: Doug Mockett, Alliance Express, Rockler, or equal; color as selected by Architect.

6. Adjustable Shelves with Clips: Adjustable shelf supports (EDP type, unless otherwise noted) set in 5 mm holes spaced 32 mm on center:

a. Hafele America, Co., No. 282.04.711, Blum, Hettich, or equal.

b. Hafele America, Co., No. 282.24.13, Blum, Hettich, or equal.

7. Hinges: Five-knuckle overlay hinge with hospital tip - Rockford 376, or equal.

8. Cabinet Locks:

a. Door Locks: Pin tumbler type – CompX National No. C8173, Olympus 100DR x 12-1 strike, CCL Security Products, or equal.

b. Locks for Sliding Doors: National No. C8142 x thimble strike, Olympus 300 SD x thimble strike, CCL Security Products, or equal.

c. Drawer Locks: CompX National C8179brass strike, Olympus 200 DW x 12-1 strike, CCL Security Products, or equal.

d. Cabinet locks shall be flush with surface of door and protrude no greater than 3/16 inch.

9. Top-hung Hardware Assembly for Sliding Doors: Grant No. 6064, Hafele, Blum, or equal.

10. Track for Sliding Doors: K & V 455 x or 455.55, Hafele, Blum, or equal.

11. Pull Flush Ring at Drawers behind Doors: Safe No. 6116, Trimco 24, Quality, or equal.

12. Pulls: Quality No. 179 x 180, Trimco No. 553P, Hafele, or equal.

13. Catches: Magnetic type - Epco No. 592, Lawrence No. SC1364-AL, or equal.

14. Four-way Tension Catch: Glynn-Johnson GJ21A, Trimco, Quality, or equal.

15. Noiseless Catch:

16. Elbow Catch: Schlage SP2A3, or equal.

17. Bolts: Surface type, Quality B6, Trimco No. 4856-6, or equal.

18. Brackets and Shelf Strip for Glass Shelves: K & V No. 80 x 180, Garcy 604 x 686, or equal.

19. Shelf Standards and Brackets: K & V No. 255 x 256, line bored holes for pins as approved by AWI Standards Stanley No. 798 x 799, steel zinc plated, or equal.

20. Card Holders for Drawers: Corbin No. 1913-1/4H, Garcy No. 853, or equal.

21. Hanger Rods: 1-1/16 inches minimum diameter metal tubing, aluminum or stainless steel clad, KV660; heavy wall steel tubing KV770, Stanley, or equal.

22. Hanger Rod Flanges: KV757, or flanges KV734, KV735; Ronther Reiss R44-55; or equal.

23. Hardware Finish: With exception of finish hardware items which have finishes specified, hardware shall be furnished with dull chrome US 26D or dull stainless steel US 32D finish.

24. Keying:

a. Key locks inside one room alike. Furnish three keys for each lock keyed separately, and 2 keys for each lock in keyed alike groups. Master keys shall be tagged and delivered to the Inspector. Locks and keys shall be stamped

with coded set number / direct digit.

b. Master keys shall be National GM2.

2.02 FABRICATION

A. Plastic Laminated Casework: Construction of plastic laminated casework shall conform to the material and construction requirements for North American Architectural Woodwork Standards Custom grade, flush overlay construction, except, modified as follows:

1. Exposed Exterior surfaces shall be High Pressure Decorative Laminate grade VGS.

a. Edge Band: PVC 1 mm. for cabinet body and 3 mm. at doors and drawer fronts.

2. Exposed Interior surfaces: Interior surfaces of open cabinets shall be laminated to match exteriors. Cabinets with glass doors shall use cabinet liner grade CLS.

3. Semi-exposed Surfaces: Shall be cabinet liner grade CLS and edges of panels shall be edge banded per 2.01 A.

4. Cabinet bases may be integral or separate. Bases shall be 3/4 inch thick plywood securely jointed at four corners to a supporting block 1 ½-inch thick.

5. Adjustable shelving shall be 3/4 inch thickness particleboard for spans up to 25 inches and one inch thickness for spans over 25 inches up to 34 inches. Adjustable shelving over 34 inches in span shall be one inch thick plywood core with 0.020 inch cabinet liner grade CLS both sides. Shelving hardware shall be adjustable to 1 1/4 inch centers. Faces of shelving shall be finished with 0.020 inch thickness cabinet liner grade CLS both sides.

6. Drawers:

a. Drawers shall be of dovetail or dowel construction. Sides, backs and sub-fronts shall be made of 1/2 inch thick clear birch or maple solid stock, or 9 ply plywood without knots or interior voids. Drawer bottoms shall be in accordance with AWI requirements, glued and nailed.

b. Drawers shall be fitted with ball bearing slides accurately installed for smooth drawer operation.

c. Drawer fronts shall be of 3/4 inch thick plastic laminate construction, fully edge-banded with plastic laminate T-banding to be used when matching existing. T-banding joint shall occur at center of bottom edge of panel.

7. Doors:

a. Doors shall be of flush overlay type. Doors shall be fully edge-banded.

Doors of cabinets within any group of adjacent units shall be in alignment.

b. Wrap around hinges shall be routed into edge of door.

8. Back Priming: Seal unfinished materials installed for backs, bases, self-edge backing, stripping and other concealed portions with a water-repellent sealer.

9. Banding:

a. Edge banding shall be accurately fitted. Where edge band joins plastic surfaces, there shall be no open spaces, voids, or chipping of plastic laminate surface.

b. Exposed cabinet surfaces shall be flush, and any protruding edges of banding shall be machined or trimmed to provide a flat smooth corner at intersection of banding and adjoining surfaces. Plastic laminate edge banding shall be installed on tops, webs, bottoms, ends, and inside partitions. T banding may only be installed on drawer fronts and door edges and when required to match existing.

B. Wood Casework: Manufacture in accordance with AWI Architectural Woodwork Standards, Custom Grade, except, modified as follows:

1. Exposed surfaces for transparent finish shall be plain sliced select white birch.

2. Exposed Interiors: surfaces at the interiors of open cabinets and cabinets with glass doors shall be of the same species and grade as exposed portions.

3. Semi-exposed surfaces shall be natural birch.

4. Edge banding shall be wood edge bands of same species as adjacent exposed faces.

5. Cabinet doors shall be particleboard core a minimum of 3/4 inch thickness, unless otherwise noted. Interior faces of cabinet doors shall be same species and grade as exposed surfaces. Cabinet doors shall be flush overlay.

C. Countertops:

1. Plastic Laminate Tops: Each plastic laminate countertop shall bear the WI Certified Compliance Label.

a. Laminated plastic countertops shall be self-edged. Edge shall rise 1/8 inch above counter surface and back and return splashes shall be 6 inches high measured from exposed countertop surface, unless otherwise indicated.

b. Cove and roll front sticking, for plastic laminate back-up, shall be kiln dried clear sugar pine glued to core material. c. Square butt splashes, including end splashes shall be Deck Mount. Splashes shall be end applied and be set in mastic and secured to top with screws 8 inches on centers. Splash edges shall

be self-edged and scribed to wall.

c. Joints shall be splined and fastened with screw clip fasteners on at least 8 inch centers. Water resisting mastic or glue shall be applied in joints. Joints shall not occur at sink cutouts. Sink cutouts shall be sealed.

d. Core material for counters and splashes shall be 3/4 inch thick Grade 130 MR50 MDF.

e. Installation of plastic laminate shall be in accordance with published specifications and recommended practices of the plastic laminate manufacturer.

2. Hardwood Countertops:

3. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.

a. Manufacturers:

1. Avonite Surfaces.

2. E. I. du Pont de Nemours and Company.

3. Formica Corporation.

4. Wilsonart International.

5. Equal.

b. Type: Provide Standard Type.

c. Integral Sink Bowls: Comply with ISSFA-2 and ANSI Z124.3, Type 5 or Type 6, without a precoated finish.

d. Colors and Patterns: As selected by Architect from manufacturer's full range.

e. Butt splash or seamless (coved) backsplash.

f. Provide drip groove.

2.03 FINISHING

A. Wood casework and wood components of laminated plastic casework shall be factory finished. Exposed surfaces shall be finished with one coat of lacquer sealer and 2 coats of finish lacquer. Unexposed materials such as backs, webs, back of tops, and the like, shall be sealed with one oil base prime coat. Semi-exposed wood surfaces such as drawers shall be finished with one coat of sanding sealer and one coat of clear gloss lacquer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install Work of this section as specified in the North American Architectural Woodwork Standards (NAAWS), grade to match the grade of the work to be installed.

B. Cabinets: Install cabinets level, plumb, and secure to walls. Exposed screws shall have finish washers.

C. End Panels and Fillers: Furnish to match exposed surfaces and accurately scribe to walls and neatly and securely fit to cabinets.

D. Completion: Upon completion of installation, cabinets including drawers and shelves shall be cleaned. Doors and drawers shall operate easily and freely.

E. Scribe plastic laminated cabinets to walls. Installation of surface-applied moldings is not permitted.

F. Coordinate sink and penetration locations with 22 1000 Plumbing.

G. Install solid surface countertops per NAAWS custom grade.

3.02 CLEAN UP

A. Remove debris, rubbish and waste material 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 06 8316

FIBERGLASS REINFORCED PANELS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Fiberglass reinforced plastic panels and accessories.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 09 2900 - Gypsum Board.

1.02 PROJECT REQUIREMENTS

A. Fiberglass reinforced plastic panels and accessories for kitchen and food preparation areas as indicated on the Drawings.

1.03 SUBMITTALS

A. Shop Drawings: Indicate location and dimension of joints and fastener attachments

B. Samples: Submit 8 inch by 10 inch sample of each type, color, and accessories to be installed.

C. Certificate of Compliance: Submit certificate from manufacturer the installed wall surfacing meets Specification requirements.

1.04 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. Class A Interior Finish Material as defined by the National Fire Protection Association Life Safety Code 101.

2. Underwriters Laboratories, Inc. listed, in accordance with ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

3. USDA/FSIS Requirements.

4. FMRC (Factory Material Research Center) approved.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer’s cartons properly labeled and identified.

B. Store materials flat in a clean, dry storage area where temperature shall be maintained above 50 degrees F. Do not store rolls on end.

1.06 PROJECT CONDITIONS

A. Installation environment shall be stable and controlled.

B. Room temperature shall be controlled to 75 degrees F plus or minus 5 degrees, during and after installation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Wall and/or ceiling panels: Crane Composites, Fire-X Glasbord FM with Surfaseal, , Marlite FRP Panel P-100 Class A, Panolam Industries International Inc., or equal.

1. Wall Panels: Class 1 (A) Interior Finish. Thickness to be .09 inch, embossed, color as selected by Architect.

2. Class A Flame Spread: Less than 25, with Smoke Developed less than 450, per ASTM E84.

3. Barcol Hardness scratch resistance: 39 as per ASTM D2583, Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.

4. IZOD Impact per ASTM D256: 11.

~~EDIT NOTE~~: ~~IN ARTICLE "B" BELOW SELECT EITHER STAINLESS STEEL OR PVC TRIM.~~

B. Stainless steel trim or extruded PVC with integral color profiles. Provide inside corner and outside corners, panel division and edge trim.

C. Adhesive and Sealants: VOC compliant, as recommended by manufacturer.

PART 3 - EXECUTION

3.01 PREPARATION

A. Examine backup surfaces to determine corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.

B. Do not begin installation until backup surfaces are in satisfactory condition.

3.02 APPLICATION

A. Perform cutting with carbide tipped saw blades or drill bits, or cut with snips.

B. Install panels with manufacturer's recommended gap for panel field and corner joints.

C. Fastener holes in the panels shall be predrilled 1/8 inch oversize.

D. For trowel type and application of adhesive, follow adhesive manufacturer's recommendations.

E. Utilizing products acceptable to manufacturer, install the system in accordance with panel manufacturer's printed instructions.

3.03 CLEANING

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 0150

ROOF REPAIR

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Repair of existing roofing system disturbed as a result of construction work that is a part of new additions and remodeling including the following:

a. Areas adjacent to new additions.

b. At new openings.

c. At existing openings being filled in.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 02 2819 – Asbestos Abatement of Non-Friable Roofing Material.

3. Section 05 3000 – Metal Decking.

4. Section 06 1000 - Rough Carpentry.

5. Section 07 6000 - Flashing and Sheet Metal.

6. Division 07 - Thermal and Moisture Protection.

1.02 SUBMITTALS

A. Comply with requirements of Section 01 3300 Submittal Procedures.

B. Product Data: Manufacturer's specifications and technical data including the following:

1. Detailed specification of construction and fabrication.

2. Manufacturer's installation instructions, specifically written for this Project.

C. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures.

D. Roofing Work Program:

1. Written outline indicating methods and materials proposed for accomplishing the Work.

2. Base program upon requirements inspection of existing field conditions made jointly by roofing installer and representative of the manufacturer of the roofing materials to be installed.

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Not less than five years experience in the actual production of specified products.

B. Installer's Qualifications: Firm experienced in installation or application of systems similar in complexity to those required for this Project, plus the following.

1. Acceptable to or licensed by manufacturer.

2. Not less than three years experience with systems.

3. Successfully completed not less than five comparable scale projects using this system.

C. Pre-installation Conference: Contractor, installer, manufacturer's representative, and representatives of other affected trades shall meet at Site to review procedures, acceptance of substrate surfaces, and coordination with other trades.

1. Schedule meeting at least one week before start of installation.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Storage and Protection: Comply with manufacturer's recommendations.

1.05 WARRANTY

A. Prior to start of work, confirm warranty status of existing roof with OAR.

B. If the roof is covered by warranty, make repairs in compliance with the warrantor’s requirements to maintain the warranty.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Insulation: Match existing. Provide tapered insulation as required.

B. Roofing System: Match existing.

C. Sheet Metal: Match existing.

D. Roof Accessories: Reinstall removed existing roofing accessories or provide new to match existing.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion.

1. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protection:

1. During installation of new materials and until openings are completely closed, protect building interior from damage by weather.

2. Apply materials to roof deck using methods that will protect building interior from damage.

3.03 INSTALLATION

A. Remove gravel, built-up roofing and insulation.

B. Perform cutting required in existing roofing membrane.

C. Install tapered insulation to provide slope of roof surface to drains. Install to match existing roof system construction.

D. Repair existing roofing membrane and flashings where new openings are installed, and where existing openings are closed.

E. Install curbs as detailed.

F. Install top of new blocking and roof insulation flush with top of existing roof insulation.

G. Form and install flashings as indicated or if not indicated to match existing.

H. Strip in flashing at roof penetrations to match roof system.

I. Install flashings and counter flashings at adjacent walls to match existing.

J. Roof Accessory Installation: Install accessories into roofing system to comply with manufacturer's recommendations

END OF SECTION

SECTION 07 0800

COMMISSIONING OF THERMAL AND MOISTURE PROTECTION

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes: General requirements for Commissioning (Cx) of building envelope systems and assemblies, including submittal review, documentation, installation, testing, , and training.

1.02 REFERENCES

A. ASTM International:

1. ASTM C1060 - Standard Practice for Thermographic Inspection of Insulation Installations in Envelope Cavities of Frame Buildings.

2. ASTM C1153 - Standard Practice for Location of Wet Insulation in Roofing Systems Using Infrared Imaging.

3. ASTM C1193 - Standard Guide for Use of Joint Sealants.

4. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.

5. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage through Installed Windows and Doors.

6. 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.

7. ASTM E 1186 – Standard Practice for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems.

1.03 SUBMITTALS

A. For general submittal requirements refer to Section 01 3300, Submittal Procedures, and Section 01 9113, General Commissioning Requirements. For product and specific submittal requirements refer the Sections of Divisions 07 and 08 requiring commissioning.

1.04 COMMISSIONING

A. Commissioning Responsibilities: For CONTRACTOR's and OWNER's Commissioning Services Provider's general commissioning responsibilities refer to Section 01 9113, General Commissioning Requirements.

B. Systems to be Commissioned and field tested by the CONTRACTOR:

1. Fenestrations: Air and water infiltration testing.

a. Section 08 4113 Aluminum Entrances Storefronts..

b. Section 08 6323 Metal-Framed Skylights Sloped Glazing.

2. Sealants: Adhesion testing of sealants used on fenestration systems.

a. Section 07 9200 – Joint Sealants.

C. Systems to be Commissioned requiring no field testing. Commissioning is limited to review of submittals, close-out documents and training observation, documentation collection and recording in the commissioning report:

1. Section 07 1326 – Self Adhering Sheet Waterproofing.

2. Section 07 1413 – Hot Fluid Applied Rubberized Asphalt Waterproofing.

3. Section 07 2100 – Thermal Insulation.

4. Section 07 2500 - Gypsum Board Weather Resistant Barrier and Air Barrier System.

5. Section 07 2719 – Plastic Sheet Air Barriers.

D. Meetings:

1. For Commissioning Job Start Meeting refer to Section 01 9113, General Commissioning Requirements.

2. For commissioning meetings refer to Section 01 3119, Project Meetings, and Section 01 9113, General Commissioning Requirements.

3. For pre-installation conferences refer to Section 01 9113, General Commissioning Requirements.

E. Pre-functional Equipment Checklist (PEC): Commissioning Services Provider (CxSP) will provide CONTRACTOR a PEC form for each product or system to be commissioned. CONTRACTOR shall complete the PECs forms and verify that the products or systems are ready for the Functional Performance Test (FPT).

F. Verification: CxSP will perform the following activities:

1. Review CONTRACTOR's submittals of systems to be commissioned for conformance to OWNER's OPR, and Construction Documents, including:

a. Product data and shop drawings.

b. Laboratory test reports.

c. Labeling and certifications related to U-factors, solar heat gain coefficients, visible transmittance and air leakage for fenestration products.

2. Randomly verify that products of systems to be commissioned delivered to the site correspond to the approved product submittals.

3. When required by other sections of the Contract Documents, review construction of mock-ups of systems requiring commissioning.

4. Verify that substrates and conditions under which products are to be installed are ready and are acceptable for installation in accordance to manufacturer's installation instructions and Construction Documents.

5. Randomly verify correct materials and products are used, and that their installation are per the Construction Documents and manufacturer's installation instructions.

G. Functional Performance Test (FPT): Shall be done in conformance to FPT requirements of Section 01 9113, General Commissioning Requirements. CxSP will perform the following activities:

1. Witnessing field performance testing of systems to be commissioned:

a. Adhesion testing of sealants per ASTM C1193 and C1521, at building envelope joints, to detect application problems such as improper cleaning, use of improper primer, poor primer application or improper joint configuration.

b. Infrared thermography testing per ASTM C1060 and E1186 to determine air leakage pathways in the building envelope and overall thermal performance.

c. Infrared thermography testing per ASTM C1153 to determine locations of wet insulation in roofing systems.

d. Air and water infiltration tests of window, storefront and curtain wall assemblies per ASTM E783 and E1105, to determine compliance to performance requirements specified on Division 08 Sections.

2. Identifying issues observed during the testing and reviewing test reports. Preparing and maintaining Commissioning Issues Log and submitting report to OAR indicating tests, locations, dates, results, and remedial actions, in conformance to Section 01 9113, General Commissioning Requirements.

3. Retesting of products or systems determined during functional testing to be faulty or incomplete will be in conformance to Retesting requirements of Section 01 9113, General Commissioning Requirements.

4. Documenting commissioning progress and keeping and updating Tests and Inspection Reports, Corrective Action Documents and Commissioning Issues Log, in conformance to requirements of Section 01 9113, General Commissioning Requirements.

5. Submitting Final Report and Addendum to Final Commissioning Report, in conformance to requirements of Section 01 9113, General Commissioning Requirements.

6. Deferred Testing and Seasonal Testing: In conformance to Retesting requirements of Section 01 9113, General Commissioning Requirements.

7. Warranty Period: Return to the site at 10 months into warranty period and review with OAR and facility staff the current building operation and the condition of outstanding issues related to the original and seasonal Systems Functional Performance Testing, in conformance to Retesting requirements of Section 01 9113, General Commissioning Requirements.

1.05 TRAINING

A. Training Preparation Conference: Refer to Section 01 9113, General Commissioning Requirements.

B. CONTRACTOR shall provide training and demonstration as required by Section 01 7900, Maintenance and Operations Staff Demonstration and Training.

C. CxSP shall be review al training materials and collect all information for inclusion in the project's commissioning report.

PART 2 – PRODUCTS – Not Used

PART 3 – EXECUTION – Not Used

END OF SECTION

SECTION 07 1326

SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Sheet waterproofing in locations indicated including:

1. Sheet waterproofing on vertical walls below grade enclosing occupied spaces.
2. Sheet waterproofing in planters.
3. Drainage sheets and protection boards.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 3000 - Cast-In-Place Concrete.
3. Section 04 2200 - Concrete Unit Masonry.
4. Section 07 0800 - Commissioning of Thermal and Moisture Protection.
5. Section 07 1400 - Fluid Applied Waterproofing.
6. Section 07 1413 - Hot Fluid Applied Rubberized Asphalt Waterproofing.
7. Section 07 2100 - Thermal Insulation.

1.02 SUBMITTALS

A. Certificates: Submit a certificate stating applicator is certified by the waterproofing material manufacturer and, upon completion, submit a certificate stating that 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 and attachment, laps, and related conditions.

D. Samples: Submit Samples, not less than 12-inch square, of each type of composite sheet membrane, mounted on plywood. Submit 12-inch square Samples of each type of drainage and protection board.

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.

F. Commissioning Services Provider (CxSP) will review the Submittals of this Section as part of the Commissioning of Thermal and Moisture Protection.

1.03 QUALITY ASSURANCE

A. References:

1. ASTM D6506 - Standard Specification for Asphalt Based Protection for Below-Grade Waterproofing.

2. ASTM D6135 - Standard Practice for Application of Self-Adhering Modified Bituminous Waterproofing.

3. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

4. ASTM E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

B. Qualifications of Manufacturer: Sheet membrane waterproofing system shall be manufactured by a firm with a minimum of 20 years experience in the production of self-adhesive sheet membrane 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 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 membrane 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.

G. Commissioning:

1. Commissioning Services Provider (CxSP) retained by the OWNER shall perform Commissioning (Cx) of building envelope systems and assemblies, including review of submittals, installation compliance, and training materials. CxSP shall witness training and collect all materials for inclusion in the commissioning report. All Cx services shall be in compliance with the requirements indicated in Section 07 0800, Commissioning of Thermal and Moisture Protection.

2. CONTRACTOR shall follow the commissioning responsibilities stated in Section 01 9113, General Commissioning Requirements.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's unopened packages fully identified with manufacturer's name, trade name, type, class and grade. Each package 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 pallets of membrane. 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 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. Apply sheet waterproofing materials 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 apply sheet waterproofing materials to damp or wet surfaces unless specifically approved in writing by manufacturer.

1.06 WARRANTY

A. Manufacturer shall provide a five year material warranty.

B. Installer shall provide a five year labor warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Sheet waterproofing shall be as manufactured by:

1. W.R. Grace & Co.

2. W.R. Meadows, Inc.

3. Protecto Wrap Company.

4. Equal.

2.02 MATERIALS

A. Sheet waterproofing material shall be self-adhesive, cold-applied such as W.R. Grace Bituthene 4000, W.R. Meadows Mel-Rol, Protecto Wrap PW 100/60, or equal. The material shall be a self-adhesive, cold-applied composite sheet consisting of a thickness of 0.056 inches of rubberized asphalt and 0.004 inches of cross-laminated, high density polyethylene film specially formulated for use with water-based surface conditioner. Provide rubberized asphalt membrane covered with a release sheet, which is removed during installation. No special adhesive or heat shall be required to form laps.

B. Surface conditioner: Latex based surface conditioner as recommended by manufacturer

C. Adhesives fillets and sealers: Types as recommended by manufacturer for installation with specified membrane sheet.

D. Prefabricated Drainage Sheet:

1. For vertical surfaces: Hydroduct 220, Mel-Drain 5035B, Protecto Drain 2000-V, or equal, consisting of a dimpled high impact polystyrene core and a needle punched non-woven filter fabric adhered to one side of the core. A film shall be adhered to the other side of the core.

2. For horizontal surfaces: Hydroduct HSF, Mel-Drain 7555, Protecto Drain 2000-V, or equal, consisting of dimpled high impact polystyrene core and an extra heavy woven filter fabric bonded to the core.

E. Protection board for horizontal surfaces shall be 1/8 inch thick complying with ASTM D6506, semi-rigid sheets of fiberglass or mineral-reinforced asphaltic core, pressure laminated between two asphalt-saturated fibrous liners.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Inspect and verify condition of substrates and related Work, in the presence of the manufacturer's technical representative. Do not start installation of membranes until defects in substrates have been corrected. Concrete shall be smooth, dry, and free of voids. Masonry shall have a parge coat applied.

3.02 APPLICATION OF MEMBRANE ON VERTICAL WALLS BELOW GRADE ENCLOSING OCCUPIED SPACES AND IN PLANTERS

A. Surface Conditioning: Install surface conditioner and allow to dry to surfaces to be covered with membrane the same day.

B. Corner Treatment: Pretreat inside corners with liquid membrane compound, to form a fillet or use formed reinforcement fillet recommended by manufacturer. Smooth all surfaces of outside corners.

C. Horizontal Surfaces: Install nine inch wide strips of membrane material over construction joints, cracks, and grouted joints. Seal expansion joints as recommended by manufacturer. At drains and vertical projections, install two layers of membrane sheet extended out not less than 6 inches in all directions, and seal. At drains, extend the membrane into the clamping ring and seal. Over prepared surfaces install membrane in one layer and roll into place. Lap sheets 2-1/2 inches at edges and ends.

D. Vertical Surfaces: Install membrane vertically in heights to 8 feet. Lap seams 2 ½ inches. Roll membrane with hand roller. Extend membrane over top of foundation walls, planter walls and parapet walls, except where reglets are provided for termination.

3.03 PREFABRICATED DRAINAGE SHEET

A. Vertical Surfaces: Install rolls of vertical drainage sheet over the completed membrane, starting at the base of the wall. Peel the fabric back approximately 12 inches from the lower edge. Where drainage pipe occurs, install the drain core behind the pipe and extend the fabric over the outside of the pipe. Adhere the drainage sheet to the wall using strips of adhesive as recommended by manufacturer.

B. Horizontal Surfaces: Adhere the drainage sheet to the membrane with strips of adhesive. Butt adjacent panels together and overlap fabric onto the previous panel. At corners, cut the core and cover the core with filter fabric or tape.

3.04 COMPOSITE STRIP WATERPROOFING

A. Provide at sills, copings, eaves, ridges, and under other flashing as indicated. Do not fold over exposed edges. Prime concrete and masonry surfaces as recommended by manufacturer. Cut the membrane into 10 to 15-foot lengths and reverse roll. Separate membrane from release paper, press firmly into place, and roll to eliminate bubbles and

assure full adhesion. Lap sides of sheets not less than 3.5 inches and ends not less than 6 inches.

3.05 HIGH TEMPERATURE RESISTANT UNDERLAYMENT

A. Seal joints in insulation as recommended by manufacturer. Prime insulation at rate of one gallon per 500 square feet if recommended by manufacturer. Over prepared surfaces install membrane in one layer and roll into place. Lap sheets 3 ½ inches at edges and 6 inches at ends. Roll firmly into place to obtain full adhesion of sheets to substrate.

3.06 APPLICATION OF MONOLITHIC MEMBRANE FOR ALL SUBSTRATES OTHER THAN CONCRETE

A. Membrane Application:

1. Install the rubberized asphalt membrane at a rate to provide a continuous, monolithic coat of 90 mil, into which is fully embedded a layer of spunbound polyester fabric reinforcing sheet, followed by another continuous monolithic coat of membrane at a minimum thickness of 125 mils. Total membrane thickness to be provided is 215 mils.

2. Overlap fabric reinforcing sheet 1 to 2 inches with membrane between sheets.

3.07 PROTECTION BOARD

A. Cover all surfaces, vertical and horizontal, with protection board, unless indicated otherwise. Install with adhesive recommended by manufacturer, and compatible with membrane materials.

3.08 TESTS OF MEMBRANES

A. Horizontal membranes shall be subjected to standing water test after completion, but before protection board is applied. Tests shall be conducted as soon as possible after completion of membrane in each area. When membrane installation is completed, seal drain, sandbag perimeter, fill membrane with water to height of not less than 2 inches, pond test for not less than 24 hours, repair all leaks or defects disclosed, and test until results are satisfactory. Remove all sandbags, plugs and drain when testing is completed. Clean surfaces of membrane.

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 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.

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.

5. Equal.

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. Polyisocyanurate rigid board insulation for exterior walls and under roof decks.
2. Thermal batt insulation for exterior walls and under roof decks.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 07 0800 - Commissioning of Thermal and Moisture Protection.
3. Section 07 1326 - Self-Adhering Sheet Waterproofing.
4. Section 07 2719 –Plastic Sheet Air Barriers.
5. Section 09 2423 – Cement Plaster and Metal Lath.
6. Section 09 8100 – Acoustical Insulation.

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.

E. Commissioning Services Provider (CxSP) will review the Submittals of this Section as part of the Commissioning of Thermal and Moisture Protection.

1.03 QUALITY ASSURANCE

A. Surface Burning Characteristics: Flame spread rating shall not exceed 25 and smoke density shall not exceed 450 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.

9. NFPA 285 – Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

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.

E. Commissioning:

1. Commissioning Services Provider (CxSP) retained by the OWNER shall perform Commissioning (Cx) of building envelope systems and assemblies, including review of submittals, installation compliance, and training materials. CxSP shall witness training and collect all materials for inclusion in the commissioning report. All Cx services shall comply with the requirements indicated in Section 07 0800, Commissioning of Thermal and Moisture Protection.

2. CONTRACTOR shall follow the commissioning responsibilities stated in Section 01 9113, General Commissioning Requirements.

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. DuPont.

E. DiversiFoam Products.

F. Atlas Roofing Corporation

G. Equal.

2.02 MINERAL FIBER BATT INSULATION

A. Unfaced Glass Fiber Batt Insulation: Provide friction-fit, unfaced glass fiber batts. Insulation shall consist of glass fibers, glass or slag, and thermosetting resins complying with ASTM C665, Type I.

B. Foil Faced Glass Fiber Batt Insulation: Provide glass fiber batts with vapor barrier consisting of glass fibers, glass or slag, and thermosetting resins complying with ASTM C665, Type III, Class A, Category 1 with vapor-retardant membrane facing.

C. Fasteners for Attaching Insulation to Wood Framing:

1. 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.

2. For unfaced batt insulation provide 18 gage, minimum, galvanized steel wire where required to maintain proper insulation placement.

D. Fasteners for Attaching Insulation to Underside of Metal Roof Decks:

1. 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.

2. String Wires: Minimum 18 gage galvanized steel wire.

2.03 POLYISOCYANURATE RIGID INSULATION BOARD

A. Non-structural, rigid board insulation consisting of a glass-fiber-infused polyisocyanurate foam core laminated between smooth, reflective aluminum facers on both sides conforming to E84, Type I, Class 1 (or 2) and Class A Foam. Thickness as indicated on the drawings.

1. Atlas Roofing Corporation, Energy Shield Pro.

2. Dupont.

3. Firestone, Enverge C1 Foil.

4. Equal.

B. Physical Properties:

1. Compressive Strength, ASTM D1621. Not less than 25 pounds per cubic foot.

2. Dimensional Stability, ASTM D2126: 0.2% maximum.

3. Tensile Strength, ASTM D1623: 24 PSI minimum.

4. Flexural Strength, ASTM C203: 40 PSI minimum.

5. Water Absorption, ASTM C209: less than 1% by volume.

6. Water Vapor Transmission, ASTM E96: Less or equal to 0.04 perm.

7. Surface Burning Characteristics, ASTM E84, Class A:

a. Flame Spread:25 or less.

b. Smoke Developed: Less than 450.

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 polyisocyanurate or 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 polyisocyanurate board as required by Section 07 1326.

B. Continuous Insulation:

1. Continuous insulation shall be installed in accordance with 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 2500

GYPSUM BOARD WEATHER-RESISTANT BARRIER AND AIR BARRIER SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Fiberglass-mat faced, moisture and mold resistant exterior gypsum sheathing.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 06 1000 - Rough Carpentry.
3. Section 07 0800 - Commissioning of Thermal and Moisture Protection.
4. Section 07 2100 Thermal Insulation.
5. Section 07 9200 - Joint Sealants.

1.02 PROJECT REQUIREMENTS

A. Design Requirements: Provide systems capable of resisting deflection.

B. Regulatory Requirements: Comply with CBC requirements for design and installation.

1.03 SUBMITTALS

A. Material Samples: Submit 5.5” inch by 8.5” inch sample of the exterior sheathing panel. Submit 5 screws to be utilized in attaching the exterior sheathing panel.

B. Product Data: Submit manufacturer's catalog data for the sheathing product and the attachment screws.

C. Commissioning Services Provider (CxSP) will review the Submittals of this Section as part of the Commissioning of Thermal and Moisture Protection.

1.04 QUALITY ASSURANCE

A. Comply with following as a minimum requirement:

1. 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.

2. ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

3. ASTM C1280 Standard Specification for Application of Gypsum Sheathing.

4. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.

5. ICC ES AC212 Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing.

6. Gypsum Association (GA): GA-253 Application of Gypsum Sheathing.

B. Qualifications: Installer shall have a minimum 5 years of experience in the installation and finishing gypsum board sheathing.

C. CHPS Low-Emitting Materials table: Materials submitted shall meet the CHPS Low-Emitting criteria and be listed as Low-Emitting on the following web site: www.CHPS.net or be listed on UL website Greenguard.org as Greenguard Gold Certified.

D. Commissioning:

1. Commissioning Services Provider (CxSP) retained by the OWNER shall perform Commissioning (Cx) of building envelope systems and assemblies, including review of submittals, installation compliance, and training materials. CxSP shall witness training and collect all materials for inclusion in the commissioning report. All Cx services shall comply with the requirements indicated in Section 07 0800, Commissioning of Thermal and Moisture Protection.

2. CONTRACTOR shall follow the commissioning responsibilities stated in Section 01 9113, General Commissioning Requirements.

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. Exterior Sheathing 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 Exterior Sheathing systems before, during, and after installation.

E. Exterior sheathing showing any evidence of water damage shall not be installed. Exterior sheathing showing evidence of water damage after installation shall be removed and replaced.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS AND PRODUCTS

A. Georgia-Pacific- DensElement™ Barrier system- Integral gypsum WRB and air barrier.

B. Or Equal.

2.02 MATERIALS

A. Exterior sheathing Type X (fire-resistant): 5/8 inch thick, 4-foot wide and up to 10 feet long conforming to ASTM C1177.

1. Edges: Square.

2. Surfacing: Fiberglass mat on face, back, and long edges.

3. Mold Resistance: score of p10 per ASTM D3273 in a test as manufactured.

2.03 ACCESSORIES

A. Fasteners: ASTM C1002, corrosion resistance of more than 800 hours per ASTM B117. In coastal environments or aggressive environments, stainless steel fasteners shall be used.

B. Flashing: Prosoco FastFlash and other components as part of The DensElement™ Barrier system, or Equal approved by OWNER'S Office of Environmental Health and Safety (OEHS).

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install in accordance with the fire rated assembly indicated on the drawings, GA-253, ASTM C1280 and the manufacturer's recommendations.

B. Prior to application of exterior system, attachment of sheathing to framing shall be able to withstand design wind loads of building.

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 07 2600

VAPOR BARRIERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Vapor barrier and accessories for installation under concrete slabs.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 03 3000: Cast-in-Place Concrete.

3. Division 09: Finishes; flooring sections.

1.02 REFERENCES

A. American Concrete Institute (ACI) Publication:

1. ACI 302.2R - Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

B. ASTM International (ASTM):

1. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

2. ASTM D1709 - Standard Test Methods of Impact Resistance of Plastic Film by the Free-Falling Dart Method.

3. ASTM E154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth under Concrete Slabs.

4. ASTM E1643 - Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.

5. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer’s product data and installation instructions for vapor barrier and accessories.

B. Samples:

1. 12 inch by 12 inch vapor barrier samples.

2. Pressure-Sensitive Tape: 12 inch long sample.

C. Test Reports: Conducted by nationally recognized independent testing agency indicating conformance with specified performance requirements.

1.04 QUALITY ASSURANCE

A. ASTM tests referenced in this Section shall be performed on a single production roll per ASTM E1745 Section 8.1. Submit third party documentation certifying this requirement.

B. Pre-Installation Conference: CONTRACTOR shall coordinate and conduct pre-installation conference in accordance to Section 01 3119, Project Meetings, to review the progress of construction activities and preparations for the installation of vapor barrier.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect in accordance with manufacturer's instructions and recommendations.

B. Deliver materials in manufacturer's packaging with labels intact.

C. Store materials in a clean and dry area.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Multi-layer plastic extrusion manufactured with high grade prime, virgin, polyolefin resins. Thickness shall be 15 mils minimum.

1. Stego Wrap by Stego Industries LLC.

2. Perminator by W.R. Meadows.

3. Ecoshield-E by Epro.

4. Husky Yellow Guard by Poly-America.

5. Equal.

B. Physical Properties:

1. Maintain permeance of less than 0.01 Perms [grains/(ft^2 · hr · inHg)] as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).

2. Class Rating per ASTM E1745: Class A.

3. Puncture resistance per ASTM D1709: 2200 g or higher.

4. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1

C. Accessories: Provide manufacturer recommended accessories for seams, penetrations and perimeter edges, including tapes, mastics, termination for a complete vapor barrier installation per ASTM E1643.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsoil and notify OAR of deficiencies detrimental to proper vapor barrier installation; do not proceed until corrected.

3.02 INSTALLATION

A. Install vapor barrier in accordance ASTM E1643 and manufacturer's instructions.

1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.

2. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise, where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself using manufacturer ASTM E1643 compliant accessory designed to adhere to concrete. Seam tape shall not be used for sealing the vapor barrier to the foundation wall, grade beam or slab.

3. Overlap joints 6 inches and seal with manufacturer's seam tape.

4. Seal vapor barrier penetrations per manufacturer's instructions.

5. Avoid the use of non-permanent stakes driven through the vapor barrier.

B. Prior to concrete placement inspect vapor barrier for damage. Clean damaged areas and with vapor barrier material cut a minimum 6 inches larger than damaged area on all sides. Seal to main vapor barrier with continuous seam tape.

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 2719

PLASTIC SHEET AIR BARRIERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Mechanically attached permeable flexible plastic sheet air barriers.

2. Flexible flashing of openings, penetrations, joints, and terminations of exterior walls and taping of seams.

B. Related Requirements:

1. Section 06 1000 - Rough Carpentry.

2. Section 07 0800 - Commissioning of Thermal and Moisture Protection.

3. Section 07 6000 – Flashing and Sheet Metal.

4. Section 07 9200 – Joint Sealants.

5. Section 08 4113 - Aluminum Entrances and Storefronts.

6. Section 09 2423 – Cement Plaster and Metal Lath.

1.02 REFERENCES

A. ASTM International:

1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

2. ASTM E1677 - Standard Specification for an Air Barrier (AB) Material or System for Low-Rise Framed Building Walls.

3. ASTM E2178 – Standard Test Method for Air Permeance of Building Materials.

B. International Code Council (ICC):

1. ICC-ES Evaluation Reports.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's product data for each material and component proposed for installation.

B. Shop Drawings: Dimensioned plans and elevations indicating:

1. Complete information as to size and location of openings, sleeves, conduits, ducts, boxes, inserts, attachments, and structural interferences.

2. Layout of air barrier showing sheet lapping, cutting, flashing and taping, with references to enlarged details.

C. Installation Instructions: Submit detailed manufacturer's installation instructions.

D. Material Samples: Submit minimum 8-1/2-inch by 11-inch samples of air barrier, and 12 inch long flashing.

E. Test Reports: Submit Test Reports showing performance characteristics equaling or exceeding those specified.

F. Evaluation Reports: Submit ICC-ES Evaluation Report demonstrating conformance of plastic sheet air barrier to CBC 1404.2, for use as water-resistive barrier.

G. Qualification Statements:

1. Installer: Statement from plastic sheet air barrier manufacturer indicating installer is approved, certified, or has been trained for the installation of their products.

H. Commissioning Services Provider (CxSP) will review the Submittals of this Section as part of the Commissioning of Thermal and Moisture Protection.

1.04 QUALITY ASSURANCE

A. Manufacturer:

1. Plastic sheet air barrier components and accessories shall be from a single source.

2. Manufacturer shall have a minimum of five years of continued experience in the manufacture of the specified products.

B. Installer:

1. Minimum five years in the installation of air/weather barriers.

2. Trained or certified by manufacturer for the installation of their products.

C. Mock-up: Refer to Section 09 2423, Cement Plaster and Metal Lath.

D. Pre-Installation Conference: CONTRACTOR shall coordinate and conduct pre-installation conference in accordance to Section 01 3119, Project Meetings, to review the progress of construction activities related to the installation of plastic sheet air barrier. In addition to the conference attendees listed on Section 01 3119, plastic sheet air barrier installer and manufacturer technical representative shall attend pre-installation conference.

E. Commissioning:

1. Commissioning Services Provider (CxSP) retained by the OWNER shall perform Commissioning (Cx) of building envelope systems and assemblies, including review of submittals, installation compliance, and training materials. CxSP shall witness training and collect all materials for inclusion in the commissioning report. All Cx services shall comply with the requirements indicated in Section 07 0800, Commissioning of Thermal and Moisture Protection.

2. CONTRACTOR shall follow the commissioning responsibilities stated in Section 01 9113, General Commissioning Requirements.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the job site in undamaged and original packaging.

B. Store materials in a clean, dry, protected location and within temperature range required by plastic sheet air barrier manufacturer. Protect stored materials from direct sunlight.

C. Handle materials in accordance with Manufacturer's recommendations.

1.06 WARRANTY

A. Provide a ten-year manufacturer's standard material warranty for replacement of plastic sheet air barriers that fail due to material defects.

B. Installation Warranty: Provide a two-year installation warranty for the plastic sheet air barrier, including accessories, against loss of water-tight seal and loss of attachment.

C. Warranty shall start on the day of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Manufacturer and Products:

1. DuPont (E. I. du Pont de Nemours and Company): Tyvek CommercialWrap.

2. Polymer Group Inc., TyparMetroWrap.

3. Equal.

B. Properties:

1. Plastic sheet air barrier shall be Type I in accordance to ASTM E1677.

2. Air Permeance: shall not exceed 0.004 cfm/ft^2, under a pressure differential of 0.3 in w.g. (1.57 psf) (0.02 L/m^2 at 75 Pa), when tested in accordance with ASTM E2178.

3. Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested in accordance to ASTM E84.

2.02 MISCELLANEOUS MATERIALS

A. Flashing: Self-adhesive butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).

1. DuPont (E. I. du Pont de Nemours and Company); FlexWrap and StraightFlash.

2. Polymer Group Inc.; Flashing Flex and Flashing AT.

3. Equal.

B. Fasteners: Manufacturer approved fasteners.

C. Tape: Three-inch-wide seam tape. Pressure-sensitive plastic tape recommended by air barrier manufacturer for sealing joints and penetrations in air barrier.

D. Sealants and Adhesive Primers: Compatible with plastic sheet air barrier and flashings system and approved by OWNER's Office of Environmental Health and Safety (OEHS).

1. Sealant: Dow Corning 732.

2. Spray Adhesive: Design Polymerics DP77.

3. Equal.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas and conditions under which plastic sheet air barrier will be installed.

B. Verify that substrate to receive air barrier has been completed and inspected before commencement of work.

C. For the installation of flashing and tape, surface shall be smooth, clean, dry and free from voids, loose substrate, protrusions, or any material that would hinder adhesion.

3.02 INSTALLATION

A. Install plastic sheet air barrier in accordance to manufacturer's installation guidelines, providing continuity throughout exterior walls. Install plastic sheet air barrier with drainage plane surface pattern in vertical position for proper drainage.

B. Install plastic sheet air barrier starting from the bottom of the building up to ensure proper overlapping of vertical and horizontal seams. Upper layer of plastic sheet air barrier shall overlap bottom layer by a minimum of six inches. Plastic sheet air barrier shall extend over the weep screed by two inches and be taped down.

C. Secure plastic sheet air barrier by fastening into studs at 12 to 18 inches on center vertically.

D. Unroll plastic sheet air barrier directly over windows and doors rough openings. Do not install fasteners within six inches of the sills and jambs of the openings and within nine inches of the header, plastic sheet air barrier shall be fastened at these locations during flashing installation.

E. Horizontal joints shall be overlapped a minimum of six inches with upper courses overlapping lower courses in water-shedding fashion. Vertical seams shall be overlapped a minimum of six inches. Overlap corners of building a minimum of 12 inches.

F. Tape vertical and horizontal seams using adhesive tape recommended by manufacturer. Seal tears and cuts with adhesive tape as recommended by manufacturer.

G. Place patch or strip of self-adhered flashing over plastic sheet air barrier where base plates, metal channels, z-girts, or other hardware will be installed.

3.03 FLASHING

A. Cut air barrier from door and window openings along jambs and sill. Cut a header flap at 45 degree angle to expose eight inches of plastic sheet air barrier to allow for head flashing installation. Install sill flashing per manufacturer instructions, overlapping up the jambs a minimum of six inches on each side.

B. Wrap flashing around interior jamb, wall face and exterior jamb, overlapping the vertical portion of the sill flashing by at least two inches.

C. Adhere flashing to the head following manufacturer's instructions. Flashing shall wrap jamb flashings by a minimum of two inches.

D. Flash piping, conduit, duct and similar penetrations through walls, and flashing ledgers and sills as recommended by manufacturer.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's technical representative shall inspect the work and submit a statement indicating that the installation has been done in conformance to manufacturer's installation instructions.

3.05 CLEANING

A. Remove rubbish, debris, and waste material 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 07 4000

METAL ROOF PANELS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Preformed roof panels, including accessories and supplementary devices for a waterproof installation.

B. Related Requirements:

1. Division 1: General Requirements.

4. Section 06 1000: Rough Carpentry.

5. Section 07 2100: Thermal Insulation.

6. Section 07 6000: Flashing and Sheet Metal.

7. Section 07 7100: Roof Specialties.

8. Section 07 9200: Joint Sealants.

1.02 SYSTEM DESCRIPTION

A. Metal Roof System:

1. Standing seam metal roofing over solid deck or over steel framing members, as indicated in the drawings, with a minimum pitch of 3:12.

2. Standing seam metal roofing with a minimum pitch of 1/2-inch per foot.

B. Performance Requirements:

1. Structural Performance: System shall safely resist the CBC positive and negative loads, including appropriate safety factors, when tested in accordance with ASTM E1592.

2. Wind Uplift Classification: Roof panel system shall be listed as a Class 90 rated system, as determined by UL 580.

3. Air Infiltration: Maximum 0.06 cfm per lineal foot (0.33 m3/hr per linear meter) of seam at static pressure of 6.24 psf (3.0 kPa) when tested per ASTM E1680.

4. Water penetration:

a. No uncontrolled water penetration through joints when tested in accordance with AAMA 501.2.

b. No uncontrolled water penetration through the joints at a static pressure of 6.24 psf (3.0 kPa) when tested in accordance with ASTM E1646.

5. Finish Performance Requirements:

a. Color change and fade resistance: No cracking, peeling, blistering or loss of adhesion when tested in accordance with ASTM D4214, Method A.

1) Color: No more than 5 Hunter units at 20 years.

2) Chalk: Rating not less than 8 at 20 years.

3) Film Integrity: 25 years.

b. Humidity resistance: No blistering, peeling or loss of adhesion after 1,000 hours testing, in accordance with ASTM D2247.

1.03 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings, indicating panel and fastener layout, joints, corners, supports, anchorages, trim, flashing, closures and special details.

B. Product Data:

1. Submit catalog cuts, technical data sheets and descriptive literature on sheets, panels, accessories and fasteners.

2. Submit complete installation recommendations.

3. Recycled Content Data: Submit information regarding product post-industrial and post-consumer recycled content.

C. Material Samples: Submit Samples showing full range of manufacturer's standard colors, minimum 3-inch by 5-inch.

1.04 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.

2. AISC - Steel Construction Manual.

3. AISI - Cold Form Steel Design Manual.

4. ASTM A653 - Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

5. ASTM A792 - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy Coated by the Hot-Dip Process.

6. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

7. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.

8. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.

9. ASTM D2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.

10. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.

11. ASTM E408 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.

12. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.

13. ASTM E1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.

14. ASTM E1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.

15. ASTM E1918 - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.

16. ASTM G90 - Standard Practice for Performing Accelerated Outdoor Weathering of Nonmetallic Materials Using Concentrated Natural Sunlight.

17. Cool Roof Rating Council (CRRC) - Product Rating Program Manual (CRRC-1).

18. SMACNA – Architectural Sheet Metal Manual.

19. UL 580 – Standard for Tests for Uplift Resistance of Roof Assemblies.

20. UL 790 - Test Methods for Fire Tests of Roof Coverings, Class A.

B. Qualifications of Installer:

1. Minimum two years experience in the installation of roof panel systems of similar complexity as required by this section.

2. Trained and certified by manufacturer to install the specified products.

C. Regulatory Requirements:

1. Conform to CBC Title 24 Part 6 and to the requirements for a Cool Roof under the Product Rating Program CRRC-1 of the Cool Roof Rating Council.

    a. Solar Reflectance (albedo by 100): three year aged minimum 0.23 percent when tested in accordance to C1549.

    b. Emissivity: three year aged minimum 0.85 percent when tested in accordance to ASTM E408 or ASTM C1371.

    c. Solar Reflectance Index (SRI): Alternative minimum 20 on slopes greater than 2:12 using three year aged values of solar reflectance and solar emittance.

1.05 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver panels to the Project site without damage.

B. Storage: Store materials and accessories above ground on skidded platforms. Store under waterproof covering. Provide proper ventilation to panels to prevent condensation build-up.

C. Handling: The bending, warping, or twisting of panels is not permitted during unloading, storing or installation.

1.06 WARRANTY

A. Manufacturer shall provide a 20 year material warranty.

B. Installer shall provide a five year labor warranty.

C. Finish Warranty: 20 year warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. AEP-Span.

B. Berridge Manufacturing Company.

C. Centria Architectural Systems.

D. Firestone Metal Products, LLC/UNA-CLAD.

E. McElroy Metal Inc.

F. Peterson Aluminum Corporation.

G. The Garland Company, Inc.

H. Equal.

EDIT NOTE: DELETE UNUSED OPTIONS FROM PARAGRAPH 2.02.A BELOW.

2.02 PANEL DESIGN

A. Roofing Panel style and configuration:

1. Integral snap together standing seam (for steep slope greater than 3:12 applications).

2. Snap-on Batten standing seam (for steep slope greater than 3:12 applications).

3. Field Seam Standing Seam (for low slope less than or equal to 3:12 applications).

B. Replaceability: Panels shall have the ability to be replaced without removal of adjacent panels.

2.03 MATERIALS

A. Roof panel materials:

1. Galvanized Steel: ASTM A653, Coating Class G90 coating weight. Minimum thickness 22 gage.

2. Galvalume (Zincalume): Steel sheets coated with 55 percent aluminum and 45 percent zinc/mischmetal by weight, conforming to ASTM A792, AZ55 coating weight. Minimum thickness 22 gage.

3. Aluminum: ASTM B209, for sheets, alloy 3003-H14 aluminum not less than 0.040 inch thick. For fasteners, clips, and accessories, alloy 6063-T5 extruded aluminum, 0.050 inch minimum thickness.

4. Profiles and Panel Sizes: As indicated on the drawings.

B. Accessory materials:

1. Clips, flashings, ridge sections, closures and other accessories: Manufacturer's standard, finished to match roof sheets where exposed.

2. Underlayment: W.R. Grace Ultra, or equal, high temperature resistant, butyl rubber-based adhesive-backed, high-density cross laminated polyethylene sheet, 30 mils thick, furnished in 34-inch wide rolls.

3. Slip sheet: Unsaturated building paper weighing not less than five pounds per 100 square feet.

4. Sealant: Elastomeric type containing no oil or asphalt. Exposed sealant shall be colored to match the applicable building color and shall cure to a rubber-like

consistency. Sealant placed in the roof panel standing seam ribs shall be provided in accordance with the manufacturer's recommendations.

5. Gaskets and insulating compounds: Non-absorptive and suitable for insulating contact points of incompatible materials. Insulating compounds shall be non-running after drying.

C. Recycled Content: Post-consumer recycled content plus half of the post-industrial content shall equal to a minimum of 25 percent.

D. Finish: Polyvinylidene fluoride color coat, minimum 70 percent pvdf resin content, applied to sight-exposed face of sheet after pretreatment and priming in accordance with coating manufacturer’s recommendations; Kynar 500 or Hylar 5000.

2.04 FABRICATION

A. Roll form panels in continuous lengths, full length of detailed runs.

B. Fabricate trim, flashing and accessories to detailed profiles.

C. Fabricate trim and flashing from same material as panel.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Examination: Examine substrates and other installed item to verify suitability for installation. Do not proceed until unsuitable conditions have been corrected.

3.02 INSTALLATION

A. Install base sheet and eave protection sheet underlayment as recommended by manufacturer.

B. Install panels weathertight, without waves, wraps, buckles, fastening stresses or distortion, allowing for expansion and contraction.

C. Install panels in accordance with manufacturer's installation instructions and Shop Drawings.

D. Where elements of metal roof panel system come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by manufacturer.

E. Provide concealed anchors at all panel attachment locations.

F. Install panels plumb, level and straight with seams and ribs/battens parallel, conforming to design indicated on Drawings.

3.03 CLEANING

A. Comply with the requirements of the Waste Management Plan, section 01 7419, Construction and Demolition Waste Management.

1. Recycle excess materials.

2. 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 5416

POLYVINYL-CHLORIDE ROOFING
(MECHANICALLY ATTACHED)

PART 1 – GENERAL

1.01 SUMMARY

A. Mechanically-attached Polyvinyl-Chloride (PVC) roofing system with flashings and other components to comprise a mechanically fastened roofing system.

B. Section Includes:

1. Mechanically fastened PVC roofing over metal decking.
2. Mechanically fastened PVC roofing over wood sheathing.

C. Related Requirements:

1. Division 01 - General Requirements.
2. Section 05 3000 - Metal Decking.
3. Section 06 1000 - Rough Carpentry.
4. Section 07 6000 - Flashing and Sheet Metal.
5. Section 07 7100 - Roof Specialties.
6. Section 07 9200 - Joint Sealants.
7. Division 22 – Plumbing.
8. Division 26 – HVAC.
9. Division 26 - Electrical.

1.02 SYSTEM DESCRIPTION

A. One layer, PVC membrane, one layer of barrier board mechanically fastened to wood decking.

1.03 SUBMITTALS

A. Shop Drawings: Submit roof plans and details. Include roof dimensions, drain and scupper locations, gutter locations, and the layout of insulation boards. Provide details indicating components, attachment, and insulation thickness; include a complete set of detail drawings from roofing manufacturer, including one set in a digital format acceptable to OAR. Provide calculations indicating the average R-value for the system. Indicate drainage patterns and slopes required.

B. Product Data:

1. List of each component to be used in roof system and Manufacturer's current literature for each component, indicating physical and mechanical properties.
2. Manufacturer's current installation literature.
3. Evidence that proposed products are compatible with PVC.
4. Material Safety Data Sheets (MSDS).

C. Evidence that proposed roof system meets requirements of local building code and has been tested and approved or listed by the following test organizations.

1. FM Global, I-90 wind uplift rating.
2. Underwriters Laboratory, Class A assembly.

D. Sample copy of Roofing Manufacturer's warranty, including no exclusion for ponding water with a no time limit for any such ponding water.

E. Sample copy of Installers' warranty.

F. Letter from Roofing Manufacturer confirming that installer is an authorized applicator of specified roof system.

G. Samples: Submit Physical samples of membrane components, with the manufactures name and product name clearly identified for each item. Samples shall be no smaller than 6 inches square. Submit samples of fasteners.

1.04 QUALITY ASSURANCE

A. Unless otherwise specified, roofing shall be installed in accordance with the National Roofing Contractors Association Manual – Latest Edition.

B. Qualifications of Manufacturer: Roofing materials shall be product of a manufacturer regularly engaged in manufacture of this product for not less than five years.

C. Qualifications of Installer: Minimum of five years experience in successfully installing the same or similar roofing materials. Work pertaining to the installation of the PVC membrane and flashings shall be completed by Contractor personnel trained and authorized by Roofing Manufacturer in those procedures.

D. Pre-Installation Conference and Inspection: After review of submittals, but prior to starting installation of the Work of this section, conduct a meeting at the Project site attended by the Architect, Project Inspector, OAR, Contractor, roofing materials installer, and a technical representative of the roofing material manufacturer. The installer and material manufacturer's technical representative shall inspect the substrates to receive the Work of this section, and report defective conditions to the Architect, Project Inspector, 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 the application of roofing materials to review installation procedures.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to Project site in unopened packages bearing manufacturer's labels.

B. Store materials above grade and protected from moisture and humidity, in accordance with manufacturer's recommendations.

1.06 JOB CONDITIONS

A. PVC materials may be installed under certain adverse weather conditions but only after consultation with the Roofing Manufacturer, as installation time and system integrity may be affected.

B. Only as much new roofing as can be made weather tight each day, including flashing and detail work, shall be installed. Seams shall be cleaned and heat-welded before leaving job site that day.

C. Work shall be scheduled and executed without exposing building's interior areas to effects of inclement weather. Building and its content shall be protected.

D. Surfaces to receive insulation, barrier board, membrane or flashings shall be dry. Should surface moisture occur, provide necessary equipment to dry surface prior to installation.

E. New and temporary construction, including equipment and accessories, shall be secured to prevent damage by wind or other elements.

F. Uninterrupted waterstops shall be installed at the end of each day's work and shall be completely removed before proceeding with next day's work. Waterstops shall not emit dangerous or unsafe fumes and shall not remain in contact with finished roof as installation progresses. Contaminated membrane shall be replaced at no cost to Owner.

G. Certain PVC membranes are incompatible with asphalt, coal tar, heavy oils, roofing cements, creosote and some preservative materials. Such materials shall not remain in contact with PVC membranes. Contractor shall consult Roofing Manufacturer regarding compatibility, precautions and recommendations.

H. Do not overload roof deck or building structure.

I. Rooftop contamination that is anticipated or that is occurring shall be reported to OAR and Project Inspector to determine corrective steps to be taken.

J. Verify that roof drain lines are functioning correctly (not clogged or blocked) before starting work and after completion. Contractor shall report any such blockages in writing to OAR for corrective action prior to installation of roof system.

K. Immediately stop work if any unusual or concealed condition is discovered. Notify Owner of condition in writing, on appropriate project form, for direction.

L. Conduct fastener pullout tests in accordance with latest revision of SPRI/ANSI Fastener Pullout Standard to help verify condition of deck/substrate and to confirm expected pullout values. Testing shall be performed in the presence of the Project Inspector and OAR.

1.07 WARRANTIES

A. Roofing Manufacturer's Standard 10 year No Dollar Limit (NDL) Material and Labor Warranty: Warranty shall be issued at Substantial Completion. Warranty shall be Non-Prorated, shall not exclude ponding water and no time limit shall be assigned for any ponding.

B. Contractor's five year warranty: Contractor's Performance Bond shall cover the first two years of warranty period only.

1. Supply Owner with a separate five year workmanship warranty. In the event any work related to roofing, flashing, or metal is found to be within Contractor warranty's term, defective or otherwise not in accordance with Contract Documents, repair defect at no cost to Owner. Contractor's warranty obligation shall run directly to Owner. Repair shall comply with this specification.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. PVC roofing system shall be as manufactured by one of the following manufacturers:

1. Sika Sarnafil, Inc.
2. Johns Manville.
3. Carlisle.
4. Equal.

2.02 MEMBRANE

A. Membrane, Sarnafil S327 FB, thermoplastic membrane with polyester reinforcement and feltback membrane, as the basis of design.

B. Membrane shall conform to following physical properties:

1. ASTM D4434 Standard Specification for Polyvinyl Chloride (PVC) Sheet Roofing.
2. California Energy Code, Section 118 for "Cool Roof Requirements". Reflective values shall be as follows when tested in accordance to CRRC-1:
   a. Minimum initial total solar reflectance of 0.70.
   b. Minimum thermal emittance of 0.75 when tested in accordance with ASTM E408 Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.

B. Membrane shall conform to following physical properties:

1. Color: White.
2. Thickness: Minimum of 60 mil (0.060 inch) without fleece backing.

C. Membrane shall be field fabricated. Blanket type systems will not be accepted.

2.03 FLASHING MATERIALS

A. Wall/Curb Flashing: PVC Membrane Flashing (Fiberglass): Fiberglass reinforced membrane attached to substrate using approved mechanical attachment.

B. Perimeter Edge Flashing PVC Clad Metal: PVC-coated, heat-weldable sheet metal capable of being formed into a variety of shapes and profiles. Clad metal shall be 25 gage, G90 galvanized metal sheet with a 20 mil unsupported PVC membrane laminated on one side.

C. Miscellaneous Flashing

1. Reglet/Termination Bar: Reglets shall be heavy-duty, extruded aluminum flashing termination reglet shall be used at walls and large curbs. Reglet shall be produced from 6063-T5, 0.10 inch to 0.12 inch thick extruded aluminum.

2. PVC Prefabricated Pipe Flashing: Prefabricated vent pipe flashing shall be made from 0.050 inch (50 mil) thick PVC membrane.

3. PVC Prefabricated Corners: Prefabricated outside and inside flashing corners shall be made of 0.060 inch (60 mil) thick membrane that is heat-welded to membrane or clad metal base flashings.

4. PVC Cover-strip: Precut flashing shall be made from PVC polyester reinforced membrane. Use to coverstrip attachment bars and attachment discs.

2.04 BARRIER BOARD

A. DensDeck, or approved equal, minimum ¼ inch thick, siliconized gypsum, fire-tested hardboard with fiberglass-mat facers.

B. DensDeck, or approved equal, minimum ½ inch thick, siliconized gypsum, fire-tested hardboard with fiberglass-mat facers.

2.05 INSULATION

A. Rigid isocyanurate foam insulation with black mat facers 4-foot by 8-foot boards, of thickness as required to achieve R-Value of **[30]**.

2.06 ATTACHMENT COMPONENTS

A. Barrier Board Attachment Plate: Provide heavy duty fasteners to attach insulation/barrier boards to roof deck. Attachment plate shall be 3-inch round, 26 gage stamping of SAE 1010 steel with an AZ 55 Galvalume coating.

B. Membrane Attachment Plate: High strength plate used with heavy duty fasteners to attach PVC roof membrane directly to roof deck. Plates shall be 20 gage, 2-inch diameter corrosion resistant steel.

C. Fasteners shall be pre-approved by OAR and roofing system manufacturer. Avoid galvanic corrosion. Fasteners for attachment of metal to masonry shall be expansion type fasteners with stainless steel pins. Concrete fasteners and anchors shall have a minimum embedment of 1.25 inch and shall be approved for such use by fastener manufacturer. Miscellaneous wood fasteners and anchors used for flashings shall have a minimum embedment of 1 inch and shall be approved for such use by fastener manufacturer.

D. Solvent-based reactivating-type adhesive used to attach membrane to flashing substrate.

E. FM Global approved, heavy-duty, 14 gage, galvanized or stainless, roll-formed steel bar used to attach membrane to roof decks. The formed steel is pre-punched with holes every 1 inch on center to allow various Fastener spacing options.

2.07 WALKWAY PROTECTION

A. PVC Walk Tread: Polyester reinforced, 0.096 inch, weldable membrane with surface embossment.

2.08 MISCELLANEOUS ACCESSORIES

A. Aluminum Tape: 2-inch wide pressure-sensitive aluminum tape shall be used as a separation layer between small areas of asphalt contamination and membrane and as a bond-breaker under cover-strip at clad metal joints.

B. Sealing Tape Strip: Compressible foam with pressure-sensitive adhesive on one side. Use with metal flashings as a preventive measure against air and wind blown moisture entry.

C. Membrane Cleaner: High quality solvent cleaner shall be used for general cleaning of residual asphalt, scuff marks, etcetera, from membrane surface. Membrane cleaner shall be used daily to clean seam areas prior to hot-air welding in tear off or dirty conditions or if membrane is not welded same day it is unrolled.

2.09 SEALANTS

A. Multi-Purpose Sealant (for termination details): Manufacturer's recommendation as approved by LAUSD's Office of Environmental Health and Safety (OEHS).

B. Depending on substrates, for temporary overnight tie-ins provide one of the following:

1. Multiple layers of roofing cement and felt conforming to ASTM D4586.

2. Mechanical attachment with rigid bars and compressed sealant.

PART 3 – EXECUTION

3.01 SUBSTRATE CONDITION

A. Contractor shall be responsible for acceptance or provision of proper substrate to receive new roofing materials.

1. Roof curbs, nailers, equipment supports, vents and other roof penetrations shall be properly secured and prepared to receive new roofing materials.

2. Surfaces shall be smooth and free of dirt, debris and incompatible materials.

3. Roof surfaces shall be free of water.

3.02 SUBSTRATE PREPARATION

A. Dry, clean and smooth substrate shall be prepared to receive PVC mechanically-attached roof system. Contractor shall inspect substrate for defects such as excessive

surface roughness, contamination, structural inadequacy, or any other condition that will adversely affect quality of work. Substrate shall be free of flaws, sharp edges, loose granules and foreign material, oil and grease. Roofing shall not start until defects have been corrected. PVC membrane shall be applied over compatible and accepted substrates only.

B. Prior to and during application, dirt, debris and dust shall be removed from surfaces by vacuuming, sweeping, blowing with compressed air or similar methods.

3.03 INSULATION AND BARRIER BOARD INSTALLATION

A. Insulation and barrier board shall be installed according to manufacturer's instructions.

B. Insulation and barrier board shall be neatly cut to fit around penetrations and projections.

C. Do not install more insulation and barrier board than can be covered with PVC membrane by end of day or onset of inclement weather.

D. When the total insulation thickness exceeds 2 1/2 inches, use at least two layers of insulation. Stagger joints at least 12 inches between layers.

E. Mechanical Attachment:

1. Barrier board shall be mechanically fastened to deck with approved fasteners and plates at a rate of six per four-foot by eight-foot board. The location of the fasteners and plates shall cause the barrier board to rest evenly on roof deck or substrate so there is no significant and avoidable air spaces between boards and substrate. Each board shall be installed tightly against adjacent boards on all sides.

2. Fasteners shall be installed in accordance with manufacturer's instructions. Fasteners shall have a minimum penetration into structural deck as recommended by manufacturer.

3.04 INSTALLATION OF POLYVINYL CHLORIDE (PVC) MEMBRANE

A. The surface of substrate shall be inspected prior to installation of PVC roof membrane. The substrate shall be clean, dry, and free from debris and smooth, with no surface roughness or contamination. Broken, delaminated, wet or damaged barrier boards shall be removed and replaced.

B. General

1. PVC membrane shall be attached with fasteners and discs according to Roofing Manufacturer and FM Global's requirements.

2. Membrane overlaps shall be shingled with flow of water where possible.

3. Tack welding of PVC membrane for purposes of temporary restraint during installation on windy days is not permitted.

4. PVC membrane shall extend over edge of roof and be turned down face a minimum of two inches wherever clad metal edging is to be installed.

C. Perimeter and Corner Areas

1. Over properly installed and prepared substrate surface, install PVC half-width rolls parallel to perimeter. Number of adjacent half-rolls shall be determined according to FM Global guidelines and Roofing Manufacturer's Technical Specifications. Fasteners and discs shall be installed along edge of membrane on fastening line at a spacing of nine inches on center.

2. Perimeter area is defined as outer boundary of roof. If roof is composed of different levels, each area shall be treated as an individual roof. Internal expansion joints and firewalls are not full perimeters. Refer to FM Global Data Sheet 1-28 for more information.

3. Hot-air weld overlaps according to Roofing Manufacturer's requirements. Take test cuts at least 3 times per day.

D. Interior Area

1. Install full-width rolls over properly installed and prepared substrate. Fasteners and discs shall be installed at perimeter at NINE (9) inches on center. Fasteners shall clamp PVC membrane tightly to substrate.

2. Hot-air weld overlaps according to Roofing Manufacturer's recommendations. Take test cuts at least 3 times per day.

E. Secure Perimeter and Rooftop Penetrations

1. Install fasteners and discs around perimeters, at base of walls, drains, curbs, vent pipes, or any other roof penetrations. Fasteners shall be installed at a spacing equal to perimeter, and according to manufacturer's instructions. Fasteners shall be installed using fastener manufacturer's recommended torque-sensitive fastening tools with depth locators. Fasteners shall clamp PVC membrane tightly to substrate.

2. PVC membrane flashings shall extend 2 ½ inches past discs and be hot-air welded to PVC deck membrane.

3.05 WELDING OF SEAMS

A. General

1. Seams shall be hot-air welded. Seam overlaps shall be 3 inches (75 mm) wide when automatic machine welding and 4 inches wide when hand-welding.

2. Welding equipment shall be approved by Roofing Manufacturer. Mechanics intending to use the equipment shall have successfully completed a training course provided by the Roofing Manufacturer's Technical Representative prior to welding.

3. Membrane to be welded shall be clean and dry.

B. Quality Control of Welded Seams: Contractor shall check welded seams for continuity. On-site evaluation of welded seams shall be made daily by Contractor at locations directed by OAR. One inch wide cross-section samples of welded seams shall be taken three times a day, minimum. Correct welds displaying failure, from

shearing of membrane, prior to separation of weld. Each test cut shall be patched by Contractor at no extra cost to Owner.

3.06 MEMBRANE FLASHINGS

A. Flashings shall be installed concurrently with roof membrane as job progresses. No temporary flashings shall be allowed without prior written approval of OAR. Approval shall only be for specific locations on specific dates. If water enters under newly completed roofing, affected area shall be removed and replaced at Contractor's expense. Flashing shall be attached to compatible, dry, smooth, and solvent-resistant surfaces.

B. Install discs according to Drawings submitted by Contractor and approved by Owner with approved fasteners into structural deck at base of parapets, walls and curbs. Discs may be required by roofing material manufacturer at base of transitions, peaks, and valleys according to roofing manufacturer's details.

C. Flashings shall extend a minimum of 8 inches above roofing level unless otherwise indicated.

D. Flashing membranes shall be attached consistently to substrates. Interior and exterior corners and miters shall be cut and hot-air welded into place.

E. Flashing membranes shall be mechanically fastened along counter-flashed top edge with batten bar at 6 to 8 inches on center.

F. PVC flashings shall be terminated according to Roofing Manufacturer's recommended details.

3.07 PVC CLAD METAL BASE FLASHINGS/EDGE METAL

A. Flashings shall be installed concurrently with roof membrane as job progresses. No temporary flashings shall be allowed without prior written approval of OAR and Roofing Manufacturer. Acceptance shall only be for specific locations on specific dates. If any water is allowed to enter under newly completed roofing due to incomplete flashings, affected area shall be removed and replaced at Contractor's expense.

B. PVC clad metal flashings shall be formed and installed according to detail drawings submitted by Contractor and approved by Owner.

1. Metal flashings shall be fastened with two rows of post galvanized flat head annular ring nails, 4 inches on center staggered. Fasteners shall penetrate wood nailers a minimum of 1 inch.

2. Metal shall be installed to provide adequate resistance to bending and allow for normal thermal expansion and contraction.

C. Clad metal shall be installed over field membrane and stripped in with a 6-inch minimum PVC cover strip, prior to installation of the cover.

D. Adjacent sheets of PVC clad shall be spaced ¼ inch apart. The joint shall be covered with 2 inch wide aluminum tape. A 4-inch minimum wide strip of PVC flashing membrane shall be hot-air welded over joint.

E. Clad metal shall be installed over field membrane and stripped in with a 6-inch minimum PVC cover strip, prior to installation of the 8-inch cover plate target.

3.08 METAL FLASHINGS

A. Metal details, fabrication practices and installation methods shall conform to applicable requirements of following:

1. Specification Section 07 6000, Flashing and Sheet Metal.

2. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) – Latest Edition.

3. National Roofing Contractor's Association (NRCA) Manual – Latest Edition.

B. Metal, other than that provided by Roofing Manufacturer, is not covered under Roofing Manufacturer's warranty, but will be included in Contractor's warranty.

C. Complete metal work in conjunction with roofing and flashings so that a watertight condition exists daily.

D. Metal shall be installed to provide adequate resistance to bending to allow for normal thermal expansion and contraction.

E. Metal joints shall be watertight.

F. Metal flashings shall be securely fastened into solid wood blocking. Fasteners shall penetrate wood nailers a minimum of 1 inch.

G. Airtight and continuous metal cleats are required behind metal fascias. Cleats shall be fastened 12 inches on center into wood nailers or masonry wall.

H. Counter flashings shall overlap base flashings at least 4 inches.

3.09 WALKWAY INSTALLATION

A. PVC Walkway Tread: Do not apply walk tread until welded seams in traffic area have been inspected by Project Inspector and deficiencies repaired. Roofing membrane to receive PVC Walkway Tread shall be clean and dry. Clean deck membrane in areas to be welded. Hot-air weld entire perimeter of Walkway to PVC deck sheet. Re-weld any inconsistencies.

3.10 ADDRESS ON ROOF

A. On the Administration or main building on the campus; using PVC membrane of a contrasting color over roofing, install the numerical address of facility. Font for numbering shall be Arial. Numbering shall be facing the street it is addressing, and be located as close to center of roof as possible. Numbers shall be 3-foot high and have a 6-inch line width. A pre-manufactured stencil shall be used to mark membrane material prior to cutting.

3.11 COMPLETION

A. Single ply roofing shall be washed with running water, mild (environmentally safe) detergent, and clean brooms after completion of minor punch list items, with cleaning being the final item.

3.12 CLEANUP

A. Remove rubbish, debris, and waste materials on a daily basis and legally dispose of off Project site.

3.13 PROTECTION

A. Protect new roofing from damage by walking or for equipment movement and storage

B. Protect Work of this section until Substantial Completion.

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.
7. Splash pans where downspouts empty onto roofing.
8. Conductor heads.
9. Drip flashings.
10. Sheet metal covering at outside storage units.
11. Sheet metal wall coverings.
12. Roof pipe flashings.
13. Roof expansion joint covers.
14. 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 05 3000 – Metal Decking.
3. Section 07 1800 – Traffic Coating.
4. Section 07 2200 - Roof and Deck Insulation.
5. Section 07 3113 - Fiberglass Reinforced Asphalt Shingles.
6. Section 07 3213 - Clay Roof Tiles.
7. Section 07 4000 - Roofing and Siding Panels.
8. Section 07 5419.13 - Polyvinyl-Chloride Roofing (Mechanically Attached For Existing Facilities).
9. Section 07 7100 - Roof Specialties.
10. Section 07 9200 - Joint Sealants.

11. Section 08 3313 - Coiling Counter Doors.
12. Section 08 6323 - Metal-Framed Skylights.
13. Section 09 2423 - Cement Plaster and Metal Lath
14. Division 22 –- Plumbing.
15. Division 23 - HVAC.
16. 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: **[Standard one-side bright].**

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, 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: 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:

1. PVC roofs: 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.

OF SECTION END

SECTION 07 7100

ROOF SPECIALTIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Roof hatches.
2. Smoke Hatches.
3. Gravity ventilators.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 05 5000 – Metal Fabrications.
3. Section 06 1000 - Rough Carpentry.
4. Section 07 5416 - Polyvinyl-Chloride Roofing (Mechanically Attached).
5. Section 07 6000 - Flashing and Sheet Metal.

1.02 SUBMITTALS

A. Shop Drawings: Submit for fabricated sheet metal indicating details, methods of joining, anchoring and fastening, thicknesses and gauges of metals, concealed reinforcement, sections, and profiles.

B. Samples: Submit Samples for materials or assemblies as requested. Provide finish Samples of exposed items.

C. Product Data: Submit brochures of manufactured items.

D. Installation Instructions: Provide manufacturer's recommended installation methods and instructions for each item. Instructions shall be prepared to indicate exact conditions of roofing, structure and adjoining construction.

1.03 QUALITY ASSURANCE

A. Drawings and requirements specified govern. Provide the Work in accordance with the Architectural Sheet Metal Manual published by SMACNA for conditions not indicated or specified and for general fabrication of sheet metal items.

B. Qualifications of Installer: Minimum 5 years experience in successfully installing the same or similar sheet metal specialties on roofing systems similar to the roofing systems specified.

C. Coordinate opening sizes and installation with roofing and related Work to ensure fit and installation.

D. 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. Protect roof specialties and accessories by storing above grade on required skids or supports. Protect from physical damage and do not install bent or damaged materials.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Roof Hatches:

1. Babcock Davis.

2. Bilco Company.

3. Lane-aire Model CRH.

4. Dur-Red Products.

5. Equal.

B. Ventilators: Loren Cook Company, Greenheck, Grainger, or equal.

C. Smoke Hatches:

1. Babcock Davis.

2. Bilco Company.

3. Dur-Red Products.

4. Equal.

2.02 PRODUCTS

A. Roof Hatches: Provide roof hatches of indicated sizes. Hatches shall be fabricated of galvanized steel, 14 gage curb and cover, 22 gage cover liner, and 1 inch thick insulation in cover and curb. Cover shall operate by a compression spring enclosed in a telescopic case or enclosed torsion spring, with automatic hold-open arm. Provide padlock hasp on inside of unit. Include the following accessories:

1. Fixed hatch railing system, providing a permanent means of fall protection for roof hatch openings. Rail system shall meet OSHA Standard 29 CFR 1910.23(a)(3).

2. Ladder extensions. Bilco Model 1, "Ladder UP Safety Post," Maxam Metal Products, "Spring Balance Safety Post", or equal, on fixed ladders below roof hatches. Device shall be manufactured of high strength steel with telescoping tubular section that locks automatically when fully extended. Upward and downward movement shall be controlled by a stainless steel spring balancing mechanism. Finish shall be hot dip galvanized. Unit shall be completely assembled with fasteners for securing to the ladder rungs in accordance with the manufacturer's instructions.

B. Gravity Ventilators: Provide ventilators at locations and of sizes and type indicated on plans. Ventilators shall be securely fastened to roof curbs as indicated in manufacturer's details. Ventilators shall have ½-inch mesh galvanized steel mesh bird screen.

C. Smoke Hatches: Manufacturer's standard, with [single] [double]-walled insulated curbs, welded or mechanically fastened and sealed corner joints, integral condensation gutter, and cap flashing. Fabricate with insulated double-walled lid and continuous weathertight perimeter lid gaskets, and equip with automatic self-lifting mechanisms and UL-listed [fusible links rated at 165 deg F] [fire-suppression system] [smoke-detection system].

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrate to receive roofing accessories and associated Work and conditions under which accessories will be installed. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install roof accessories in accordance with SMACNA and manufacturer's recommendations as required.

3.03 FIELD QUALITY CONTROL

A. Upon request of the Project Inspector, perform field water testing to demonstrate that 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 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 07 8413

PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.

2. Mineral fiber insulation, fire safing, and safing edge of floor slabs and curtain walls.

3. Damming material, clips, and closures.

4. Gaps between the top of walls and ceilings or roof assemblies.

5. Expansion joints in walls and floors.

6. Openings around structural members which penetrate floors or walls.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 03 3000 - Cast-in-Place Concrete.

3. Section 04 2200 - Concrete Unit Masonry.

4. Section 07 2100 - Thermal Insulation.

5. Section 07 9200 - Joint Sealants.

6. Section 09 2219 - Top Track Fire-Rated System.

7. Section 09 2900 - Gypsum Board.

8. Division 22 - Plumbing.

9. Division 23 - HVAC.

10. Division 26 - Electrical.

11. Division 27 - Communications.

1.02 REFERENCES

A. ASTM Standards:

1. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

2. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.

3. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

4. ASTM E1399 – Standard Test Method for Cyclic Movement and Measuring Minimum and Maximum Joint Widths on Architectural Joint Systems.

5. ASTM E1966 – Standard Test Methods for Fire-Resistive Joint Systems.

6. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestops

7. ASTM E2307 – Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus.

8. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.

B. Underwriters Laboratories, Inc.

1. UL Fire Resistance Directory.

2. UL 263 – Standard for Fire Tests of Building Construction and Materials.

3. UL 723 – Standard for Test for Surface Burning Characteristics of Building Materials.

4. UL 1479 – Fire Tests of Through Penetration Firestops.

5. UL 2079 – Test for Fire Resistance of Building Joint Systems.

C. Testing Services:

1. Intertek ES SAT.

2. Southwest Research Institute.

3. Underwriters Laboratories.

D. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments.

E. California Building Code, Chapter 7 Fire Tests of Through-Penetration Fire Stops.

F. F. Firestop Contractors International Association (FICA) Manual of Practice.

1.03 SYSTEM DESCRIPTION

A. Provide fire stops and smoke seals to prevent the passage of fire, smoke, toxic gasses or water from one floor or area to another. Seal openings in floors, fire rated walls and permanent partitions penetrated by pipes, ducts, conduits and other items as shown, specified, and as required for the type of construction.

B. Mineral fiber insulation installed as fire safing at non-rated penetrations not containing pipes, ducts, conduits, and other items in floor slabs, wall partitions, construction-joint conditions between slabs and adjacent construction and where indicated or required.

C. Provide damming material, clips, and closures as required for support and containment of dams, and other insulation materials required for tested and rated fire stop systems.

1.04 QUALITY ASSURANCE

A. Performance Criteria:

1. Provide materials and Work to conform to source quality control criteria specified herein and CBC requirements in fire resistant wall and floor assemblies to prevent the passage of fire, smoke, and toxic gases.

2. Installed fire stops shall be of sufficient thickness, width, and density to provide a fire resistance rating at least equal to the floor, wall, or partition construction into which it is installed.

B. Comply with CBC requirements for fire rated construction.

C. Qualifications of Manufacturer: Products furnished for fire stopping and smoke seals shall be manufactured by a firm which has been continuously and regularly employed in the manufacture of these materials for a period of at least 5 years; and which can provide evidence of these materials being satisfactorily installed on at least 5 projects of similar size and type within such period.

D. 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 5 consecutive years; and can provide evidence of satisfactory completion of 5 projects of similar size and scope. Installer shall have applicators trained and certified by manufacturer for performing this Work. Comply with requirements of FICA Manual of Practice.

E. For those firestop applications that exist for which no UL tested system is available through a manufacturer, an engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment drawings must follow requirements set forth by the International Firestop Council.

F. Firestopping tests shall be performed by a qualified testing and inspection agency. A qualified testing and inspection agency shall be UL, Intertek or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction. Firestopping products shall bear the classification marking of a qualified testing and inspection agency.

1.05 SUBMITTALS

A. Product Data:

1. Submit manufacturer's Product Data for each type of fire stop and smoke seal material proposed for installation. Indicate product characteristics, typical installations, performance, and limitation criteria and test data.

2. Submit manufacturer's printed installation instructions for each type of product, system, and construction required for the Work. Indicate fire resistance rating of each installation.

3. Submit fire test reports from independent testing agency indicating the following:

a. Fire test report of fire stop material installed to substrate and penetration materials similar to the Work of this section. Test to indicate both Fire Resistance (F) and Temperature (T) Ratings.

b. Test reports of products to be installed shall indicate conformance to ASTM E814 or UL 1479 for penetrations, ASTM E1966 or UL 2079 for joints, and ASTM E2307 for perimeter fire barrier (edge-of-slab) systems.

B. Field Samples: No less than 10 days before commencing the Work of this section, provide field installed Samples of fire stop materials and systems.

1. Apply one Sample of fire stop material for each different penetration and related fire rating required for the Work.

2. Sample areas shall comply with thickness, fire resistance ratings, and finished appearance.

C. Manufacturer's Qualifications: Submit evidence of conformance with qualification requirements specified above.

D. Installer’s Qualifications: Submit evidence of conformance with qualification requirements specified above.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver products to the Project site in manufacturer's original, unopened containers bearing correct UL labeling.

B. Fire stop material shall be stored above grade in an area protected from detrimental weather and moisture conditions and in compliance with manufacturer’s requirements, including temperature restrictions.

C. Fire stop and seal materials shall be installed before expiration of shelf life.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Unless otherwise noted, products of this section shall be as manufactured by:

1. 3M Fire Protection Products.
2. Hilti, Inc.
3. Nelson Firestop Products.
4. Specified Technologies, Inc. (STI).
5. Tremco, Inc.
6. Equal.

B. Provide materials and systems of specified manufacturers to suit penetration and substrate as determined by various conditions of installation.

C. Provide firestopping composed of components that are compatible with the substrates forming openings and the items penetrating the firestop, under conditions of service and application, as demonstrated by the fire stopping manufacturer based on testing and field experience.

2.02 MATERIALS

A. Cast-in Firestop Devices: Pre-installed firestop devices penetrating cast-in-place concrete decks and concrete over metal decks, for use with combustible and non-combustible pipe, (closed and open systems) insulated pipe, conduits and cable bundles. Provide metal deck adapters and top seal plugs.

1. 3M: Fire Barrier Cast-in-Place Devices.
2. Hilti: CP 680 Cast-in-Place FS Device
3. Tremco: CIPP Plastic, CIPP Metal.
4. Specified Technologies, Inc. (STI): Cast-In Firestop Devices.
5.
5. Equal.

B. Firestop Collar: Made of galvanized steel housing and Intumescent inserts for firestopping combustible pipes through walls and floors. For use with concrete, masonry, wood floor and gypsum wall assemblies. Provide two collars on walls, one on each side, and one collar on underside of floors.

1. 3M: Plastic Pipe Device PPD.
2. Hilti: CP 643N and CP 644.
3. Tremco: TREMstop D.
4. Nelson Firestop Products: PCS Pipe Choke System.

5. Specified Technologies, Inc. (STI): Intumescent Firestop Collars, type LCC, SSC or RTC.

6. Equal.

C. Fire Pillows and Blocks: Intumescent flexible pillows consisting of a mineral fiber core sealed with a water-resistant intumescent membrane, heat-sealed in a durable fire-retardant poly bag; or intumescent block based on a two component foam, for use in walls and floors and concrete, masonry and gypsum wall assemblies. For large openings containing multiple penetrations: wall openings up to 48 inches by 48 inches and floors up to 36 inches by 36 inches.

1. 3M: Fire Barrier Self-Locking Pillow.

2. Hilti: FS 657.

3. Tremco: TREMstop PS1, TREMstop PS2.

4. Nelson Firestop Products: Fire Brick, Pillows.

5. Specified Technologies, Inc. (STI): SSB Firestop Pillows.

6. Equal.

D. Firestop Mortar: Fire-resistant mortar suitable for firestopping large horizontal or vertical, concrete or masonry openings penetrated by single or multiple non-combustible pipes or cable trays.

1. 3M: Fire Barrier Mortar.

2. Hilti: CP 637.

3. Tremco: TREMstop Mortar.

4. Nelson Firestop Products: CMP Firestop Mortar.

5. Specified Technologies, Inc. (STI): SSM Firestop Mortar.

5. Equal.

E. Firestop Putty Stick: Intumescent, non-hardening, firestop putty for single or bundled cables and non-combustible pipe penetrations. For use in horizontal or vertical, concrete, masonry or gypsum wall assemblies.

1. 3M: MP + Stix.

2. Hilti: CP 618 and CP 619T.

3. Tremco: TREMstop MP Putty Stick.

4. Nelson Firestop Products: FSP AA445, AA439.

5. Specified Technologies, Inc. (STI): SSP Firestop Putty.

6. Equal.

F. Firestop Putty Pad: Moldable firestop putty for protection of electrical outlet boxes.

1. 3M: MPP+.

2. Hilti: CP 617.

3. Tremco: TREMstop MP Putty Pad.

4. Nelson Firestop Products: FSP AA452, AA439.

5. Specified Technologies, Inc. (STI): SSP Putty Pads or Electrical Box Insert.

6. Equal.

G. Firestop Sealant: Smoke, gas and water resistant. For use in horizontal or vertical, concrete, masonry or gypsum wall assemblies.

1. Single component intumescent sealant for protection of combustible and non-combustible pipe, conduit and cable penetrations.

a) 3M: CP-25WB+, IC-15WB+, 3000WT.

b) Hilti: FS ONE.

c) Tremco: TREMstop IA+ or FyreCaulk.

d) Nelson Firestop Products: ES1399.

e) Specified Technologies, Inc, (STI): LCI or SSS Intumescent Firestop Sealant.

f) Equal.

2. Silicone based system that provides maximum movement in fire-rated joint applications and pipe penetrations.

a) 3M: 2000+, 2000 NS.

b) Hilti: CP 601S.

c) Tremco: TREMstop Fyre-sil.

d) Nelson Firestop Products: CLK AA529, AA542, AA492.

e) Specified Technologies, Inc. (STI): SIL Silicone Firestop SealantSIL300 or SIL300SL (self-leveling).

f) Equal.

3. Acrylic based system that provides movement capability in fire rated joints and seals through penetration applications.

a) 3M: FD 150+.

b) Hilti: CP 606.

c) Tremco: TREMstop Acrylic GG.

d) Nelson Firestop Products: FSC3.

e) Specified Technologies, Inc. (STI): ES Elastomeric Firestop Sealant.

f) Equal.

4. Self-leveling silicone-based firestop sealant for use with through penetrations and construction joints in horizontal floor/ceiling assemblies.

a) 3M: 1000 SL.

b) Hilti: CP 604.

c) Tremco: TREMstop Fyre-sil S.L.

d) Nelson Firestop Products: CLK AA539, AA552.

e) Specified Technologies, Inc. (STI): SIL Silicone Firestop, type SIL300SL.

f) Equal.

H. Firestop Wrap Strip: Wrap strip of intumescent, flexible firestop for use with plastic and insulated pipe penetrations. For use in horizontal or vertical, concrete, masonry or gypsum wall assemblies.

1. 3M: Ultra GS, FS-195.

2. Hilti: CP 648-S, CP 648-E.

3. Tremco: TREMstop SuperStrip or TREMstop WS.

4. Nelson Firestop Products: MCT, MPS.

5. Specified Technologies, Inc. (STI): SSW Intumescent Wrap Strips, type BLU, BLU2, RED or RED2.

6. Equal.

I. Spray: Sprayable or brush applied fire-rated mastic for construction joints where maximum movement is required. For use in horizontal or vertical, concrete, masonry or gypsum wall assemblies, at top of wall joints, curtain wall/slab edge and expansion joints.

1. 3M: FD 200.

2. Hilti: CP 672.

3. Tremco: TREMstop Acrylic SP spray.

4. Nelson Firestop Products: FSC3.

5. Specified Technologies, Inc. (STI): AS200 Elastomeric Spray with or without SpeedFlex® Joint Strip, or Fast Tack® Firestop Spray.

6. Equal.

J. Drywall Track Gaskets: Intumescent cover for drywall ceiling track providing fire, smoke and acoustical ratings for head-of-wall joints between gypsum walls and concrete floor slabs.

1. Hilti: CFS-TTS Top Track Seal.

2. Specified Technologies, Inc. (STI): TTG Track Top Gasket.

3. Equal.

K. Fire Rated Cable Pathways: Gangable device modules capable of being retrofitted around existing cables and comprised of steel raceway with built-in intumescent material allowing 0 to 100 percent cable fill and requiring no additional action in the form of plugs, twisting closure, putty, pillow, or sealant to achieve fire and leakage ratings.

1. 3M: Fire Barrier Pass-Through Device.

2. Hilti: CP 653 Firestop Speed Sleeve.

3. Specified Technologies, Inc. (STI): EZ-Path Fire Rated Pathway.

4. Equal.

L. Fire Rated Grommet or Disc: For single or dual cable penetrations through the same small opening.

1. Hilti: CFS-D Firestop Cable Disc.

2. Specified Technologies, Inc. (STI): EZ-Path Firestop Grommets

3. Equal.

M. Metal Deck Strips and Plugs: Precut preformed mineral wool plugs and strips to fit flutes of metal deck profile and gap between top of wall and metal deck.

1. 3M: PM4.

2. Hilti: CP 777 Speed Plugs; CP 767 Speed Strips.

3. Tremco.

4. Nelson Firestop Products.

5. Equal.

N. Fire Safing, Mineral Fiber or Ceramic Wool Non-Combustible Insulation:

1. Mineral Fiber: Density 4 pounds per cubic foot, USG Thermafiber, Johns Manville Industrial Insulation Group (IIG), Roxul AFB, or equal.

2. Ceramic Wool: Density 6 pounds per cubic foot, Johns Manville "Ceramic Fiber Insulation", Unifrax "Fiberfrax" ceramic fiber, or equal. Provide material in tested thickness for required hour rating.

   a. Flame Spread: Less than or equal to 25.

   b. Smoke developed: Less than or equal to 50.

3. For mineral fiber, provide 20 gage minimum size metal retainer clips and plates for fire safing support in vertical applications and in compliance with tested system design.

O. Supplemental Material: Provide supplementary materials required for complete, fire rated, installation.

2.03 SOURCE QUALITY CONTROL

A. Fire stop and smoke seal material shall be tested by an independent testing agency for conformance to Flame (F) and Temperature (T) requirements of ASTM E814/UL 1479, ASTM E1966/UL 2079, or ATSM E2307.

B. Conform to UL Fire Hazard Classification Requirements. Material shall be classified as a fill, void, or cavity material and system for UL through Penetration Firestop System.

C. Material shall be tested and shall display Flame Spread Index of 25 or less, and Smoke Developed Index of 450 or less when tested in accordance with ASTM E84.

PART 3 - EXECUTION

3.01 APPLICATION REQUIREMENTS

A. Provide single component fire stop sealant or putty:

1. Within penetrations subject to movement including conduit, cable bundles, buss duct, and noncombustible pipe.

2. As a sealant or caulking for smoke barrier construction, fire, and smoke dampers, mechanical/electrical framed elements in masonry and gypsum board partition systems, and other conditions.

B. Provide mineral fiber insulation for fire safing at joints and openings through floor slabs, walls, and partitions not indicated to be grouted, gaskets, sealed or otherwise made sound or air tight in this or other sections. Fire safing shall be packed and wedged solidly from both sides of walls and partitions, and from both top and bottom sides of slabs with noncombustible mineral fiber insulation.

3.02 PREPARATION

A. Examine the areas and conditions where fire stops and smoke seals are to be installed for conditions detrimental to the proper completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected for rated fire protection.

B. Surface to receive fire stops or smoke seals shall be free of dirt, dust, grease, form release agents, or other matter that would impair the bond of the fire stop material to the substrate or penetrating items. Substrate shall be frost free and when required, dry.

C. Voids and cracks in substrate shall be filled and unnecessary projections removed before installation of fire stops.

D. Assure that all pipes, conduit, cable, and other items, which penetrate fire rated construction, have been permanently installed before installation of fire stops. Schedule and sequence the Work to assure that partitions and other construction, which would conceal penetrations, are not installed before the installation of fire stops and smoke seals.

E. Comply with manufacturer's recommendations for temperature and humidity conditions before, during, and after installation of fire stops and smoke seals.

3.03 INSTALLATION

A. General: Provide installation in accordance with manufacturer's installation procedures, as required. Install fire stops in accordance with fire test reports, UL Fire Resistance Directory, Intertek Testing Services Directory or SpecDirect, and reviewed Sample installations.

B. Dam Construction:

1. Install dams when required to properly contain fire stopping materials within openings and as required to achieve fire resistance rating as tested and rated.

2. Provide in conformance with installation requirements for type of floor, wall, and partition construction, and as recommended by fire stop manufacturer.

3. Combustible damming material shall be removed after appropriate curing. Noncombustible damming material may be left as a permanent component of the fire stop system.

4. Placement of dams shall not interfere with function, or adversely affect the appearance, of adjacent construction.

C. Installation of Single Component Fire Stop Sealant:

1. Provide noncombustible insulation as required to achieve fire resistance rating.

2. Install with manual or powered sealant gun. For up to four hour rating, install to the thickness required by the Listed System Designs as directed for wall and floor applications.

3. Surface of gun grade fire stop sealant shall be tooled in accordance with manufacturer's recommendations.

4. Remove excess materials from adjacent surfaces within 10 minutes, with either water or other material compatible with sealant and recommended by sealant manufacturer, leaving the Work in a neat, clean condition.

D. Installation of Cementitious Fire Stop Mortar:

1. Mixing: Add dry powder to water and mix with mechanical mixer or hand mixing tools. Ratio and duration of mix shall be as instructed by fire stop mortar manufacturer. Average wet density of mortar shall be 70 pounds per cubic foot (plus or minus 5).

2. Wet surfaces before installation of fire stop mortar. Mortar may be hand installed or pumped into the opening.

3. When installing around layered and grouped cables, vibrate or move the cables slightly to prevent voids from forming between the cables.

4. Exposed surfaces shall be finished with conventional plastering tools before curing.

5. Allow at least 48 hours for initial cure before form removal. For full cure allow 28 days.

3.04 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

B. Repair damaged areas and restore integrity of assembly.

C. Keep areas of work accessible until inspection by authorities having jurisdiction.

D. OWNER will engage a qualified independent inspection agency to inspect through-penetration firestop systems in accordance with ASTM E2174, or joint systems in accordance with ASTM E2393. Manufacturer representatives shall not perform inspections of installed firestopping systems.

3.05 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.06 CLEANUP

A. Clean surfaces adjacent to sealed openings and joints and remove excess of firestopping materials.

B. 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. Section 06 2000 - Finish Carpentry.
3. Section 07 0800 Commissioning of Thermal and Moisture Protection.
4. Section 07 6000 - Flashing and Sheet Metal.
5. Section 07 8413 - Penetration Firestopping.
6. Division 08 - Openings.
7. Division 09 - Finishes.

1.02 REFERENCES

A. ASTM Standards:

1. ASTM C834 - Standard Specification for Latex Sealants.
2. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
3. ASTM-C1193 - Standard Guide for Use of Joint Sealants.
4. ASTM C1311 - Standard Specification for Solvent Release Sealants.
5. ASTM C1521 – Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.
6. ASTM D2377 - Standard Test Method for Tack-Free Time of Caulking Compounds and Sealants
7. ASTM D1056 - Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber.

1.03 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 C1521 for each substrate.

G. CxSP will review the Submittals of this Section as part of the Commissioning of Thermal and Moisture Protection.

1.04 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.

B. Commissioning of Thermal and Moisture Protection: Refer to Field Quality Control article for testing of sealants.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store in accordance with manufacturer’s recommendations. Provide a uniform ambient temperature between 60 and 80 degrees F.

1.06 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 MANUFACTURERS

A. Sealants must be approved by LAUSD's Office of Environmental Health and Safety (OEHS). Check OEHS website for approved products. Not all products by a manufacturer are approved by OEHS.

2.03 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.

c. Equal.

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.

c. Equal.

3. Sealant 3: Silicone sealant, one-part non-acid-curing silicone sealant complying with ASTM C920, Type S, Grade NS, Class 50.

a. Dow Corning Corp., Dow Corning 791, 795.

b. General Electric Co., Silpruf SCS 2000, SCS 9000 NB.

c. Tremco, Inc., Spectrem 2.

d. Pecora Corp., 864.

e. Equal.

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.

    d. Equal.

5. Sealant 5: One-part non-sag urethane sealant, complying with ASTM C920, Type S, Grade NS, Class 25.

    a. Sika Corporation, Sikaflex -221e.

    b. Equal.

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.

    b. Equal.

7. Sealant 7: Acoustical sealant, non-drying, non-hardening permanently flexible conforming to ASTM D2377.

    a. Pecora Corp., BA-98 Acoustical Sealant.

    b. Equal.

B. See 07 8413 - Penetration Firestopping for rated sealants.

C. Joint Backing: ASTM D1056; round, closed cell Polyethylene Foam Rod; oversized 30 to 50 percent larger than joint width, reticulated polyolefin foam.

D. Primer: Non-Staining Type. Provide primer as required and shall be product of manufacturer of installed sealant.

E. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer.

F. 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 C1193.

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	Sealant 7	Match Adjacent Surfaces

and other openings in
insulated partitions

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 ¾ -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 ½-inch deep or less than ¼-inch deep.

3.06 FIELD QUALITY CONTROL

A. Commissioning of Thermal and Moisture Protection: CONTRACTOR shall perform field adhesion tests of sealants of the work of the Sections listed below in accordance with manufacturer's instructions and ASTM C1521, Method A, Tail Procedure. Remove sealants that fail adhesion testing; clean substrates, reapply sealants, and re-test. Test sealants adjacent to failed sealants. Submit field adhesion test report indicating tests, locations, dates, results, and remedial actions taken. Number of tests shall be per ASTM C1521, Destructive Procedure.

1. Section 08 4113 – Aluminum Entrances and Storefronts.

2. Section 08 4413 – Glazed Aluminum Curtain Walls.

3. Section 08 5113 – Aluminum Windows.

4. Section 08 6323 – Metal-Framed Skylights and Sloped Glazing.

3.07 CLEANING

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.08 CURING

A. Sealants shall cure in accordance with manufacturer's printed recommendations. Do not disturb seal until completely cured.

3.09 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.

8. Equal.

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.

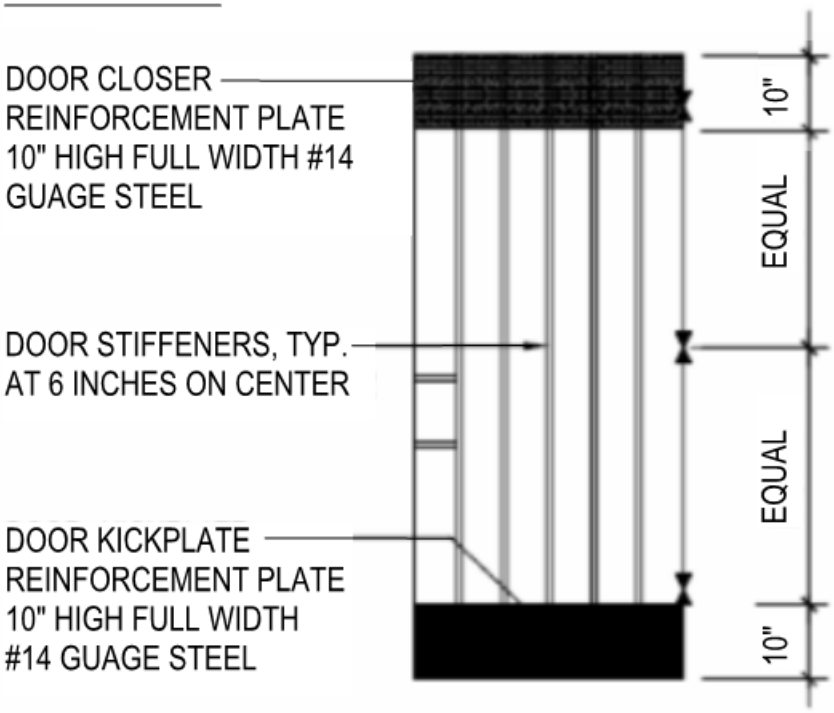
3.05 PROTECTION

A. Protect Work of this section until Substantial Completion.

END OF SECTION

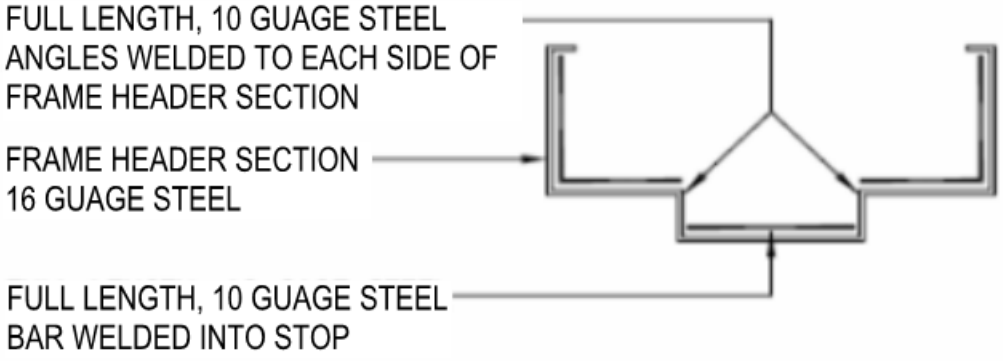
DETAIL #1 - DOOR REINFORCEMENT

ELEVATION



DETAIL #2 - DOOR HARDWARE REINFORCEMENT

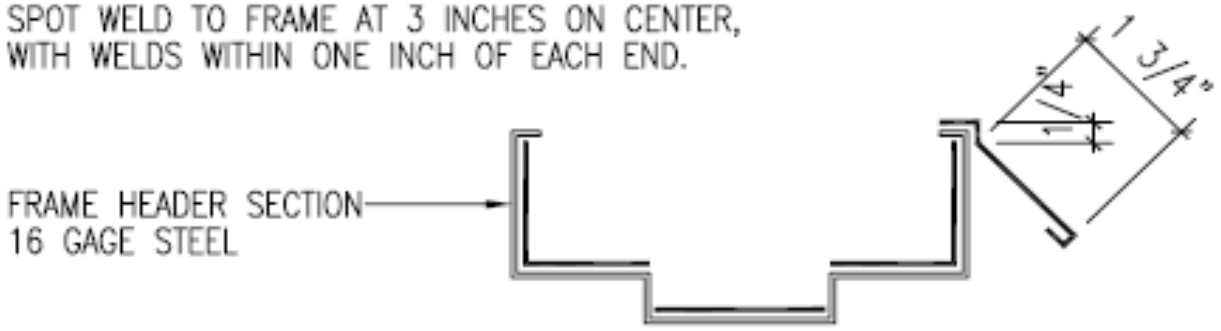
DOOR CLOSER REINFORCEMENT FOR ALL STEEL DOOR FRAMES



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.

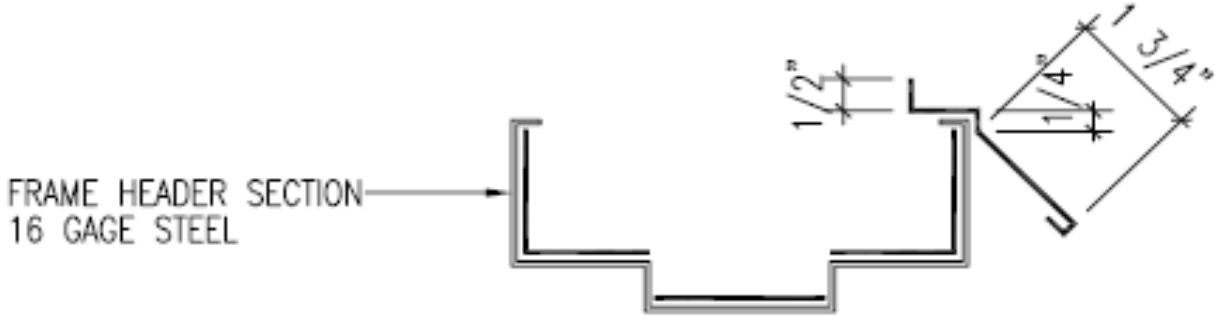
SPOT WELD TO FRAME AT 3 INCHES ON CENTER, WITH WELDS WITHIN ONE INCH OF EACH END.



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 1416

FLUSH WOOD DOORS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Wood doors.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 06 2000 - Finish Carpentry.
3. Section 08 1113 - Hollow Metal Doors and Frames
4. Section 08 7100 - Door Hardware.
5. Section 08 8000 - Glazing.
6. Section 09 9000 - Painting and Coating.

1.02 DESIGN REQUIREMENTS

A. Drawings indicate sizes, locations and general details of wood door construction and installation.

B. Regulatory Requirements:

1. Fire rated doors shall be listed by a nationally recognized testing and certification agency in accordance with local building codes and acceptable to the authorities having jurisdiction. The listed doors shall meet or exceed the requirements of UL10B, NFPA 252 and NFPA 80. All door requiring fire-rating shall carry either a UL or ITS (Intertek Testing Services-Warnock Hersey) label.
2. ASTM E2074 – Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure on Side-Hinged and Pivoted Swinging Door Assemblies.

1.03 SUBMITTALS

A. Shop Drawings: Submit schedules, plans, elevations and details indicating door construction details, opening identification symbols, sizes, door type and grade, fire classification, swing, light and louver cutout size and locations, and undercuts.

B. Product Data: Submit manufacturers technical data for each specified door type, including details of wood species, design and construction, factory finishing specifications and installation instructions.

C. Construction Samples: Submit samples of not less than 6-inch by 6-inch for each type of door to be furnished, showing face, edge and core construction.

D. Color/finish Samples: Submit samples of not less than 4-inch by 6-inch on representative door finish and samples of 3-inch by 8-inch for the exposed edges. Each sample shall bear a label identifying the job name, Architect, Contractor and the Woodwork Insitute finish system number.

E. Certificates:

1. Submit Certificate that solid core doors comply with all requirements of ANSI/WDMA I.S. 1-A.

2. Submit certification that fire rated doors comply with CBC Section 715 or UL 10B.

1.04 QUALITY ASSURANCE

A. Wood doors construction, manufacture, and fabrication shall conform to ANSI/WDMA I.S. 1-A, custom grade, extra heavy duty grade including the latest revisions, and special requirements specified.

B. Doors shall be fabricated, hardware factory fitted and machined, and factory finished, unless noted otherwise.

C. Wood Door Finishes shall comply with the North American Architectural Woodwork Standards (NAAWS) latest edition.

D. Doors shall be products of one manufacturer.

E. Door modifications are not permitted, unless reviewed by the OAR.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturers original, unopened, undamaged containers with identification labels intact.

B. Deliver doors to the Project site only after building has been provided with design temperature and humidity.

C. Store and handle in accordance with ANSI/WDMA I.S.1-A. Store doors protected from exposure to harmful conditions and at temperature and humidity conditions recommended by the manufacturer.

1.06 PROJECT CONDITIONS

A. Do not install doors until building is enclosed and ambient conditions are within the temperature and humidity range to be expected during occupancy.

1.07 WARRANTY

A. Manufacturer shall provide a two year material warranty for exterior doors.

B. Manufacturer shall provide a life time material warranty for interior doors.

C. Installer shall provide a two year fabrication and installation warranty for all doors.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Provide products manufactured by one of the following:

1. Algoma Hardwood Inc.

2. Brentwood Manufacturing.

3. Eggers Industries.

4. Mohawk Flush Door, Inc

5. VT Industries, Inc.

6. Western Oregon Door.

7. Equal.

2.02 DOOR CONSTRUCTION

A. Exterior Flush Doors:

1. Exterior doors shall be furnished as follows:

a. Transparent Finished (Stained): NAAWS Custom grade, extra heavy duty grade, solid wood core, 5 ply, veneer faces, fully bonded to core.

b. Opaque Finished (Painted): NAAWS Custom grade extra heavy duty grade, solid wood core, 5 ply, medium density overlay faces, bonded to core.

2. Staved Lumber Core shall be low density, thoroughly kiln-dried wood blocks not more than 2 ½-inches wide, with joints staggered, and random lengths.

3. Edge strips: Shall be kiln-dried birch or maple

a. Transparent Finished Doors: Same species as face veneer or similar in overall color, grain, character and contrast as the face veneer.

b. Opaque Finished Doors: Close grain hardwood.

4. Full stile edge strip shall be not less that 2 inches wide. Stiles shall be fully bonded to the core. The outer face stiles shall be full length ¾ inch birch or maple. The inner back stile shall be 1 ¼-inch, 2 ply of similar species which may have four finger joints well staggered or be full lengths.

5. Top rail shall be a minimum of 2 inches with a maximum of three plies. Bottom rail shall be a minimum of 5 inches with a maximum of 6 plies. The outer rail faces shall be full length 7/8 inch of same species as edge strips. The inner rails shall be full length of similar species. Rails shall be fully bonded to core.

6. Crossbanding: Doors shall be furnished with full width crossbanding of properly dried hardwood, 1/16 inch thick, with a density of 52 pounds or higher per cubic foot.

7. Face Veneer for Transparent Finished Doors: NAAWS Custom grade, veneer shall be Grade"A". Minimum thickness shall be 0.0277 inches before sanding and 0.020 inches after sanding of specified face veneer.

   a. Veneer Species:

   b. Veneer Cut: [Rotary] [Plain] [Quarter]

   c. [Rift-cut]

   d. Veneer Match: [Book] [Slip] [Random]

   e. [Running] [Balance] [Center]

   f. Pairs: [Matched] [Not Matched]

8. Opaque Finished Doors: Custom grade medium density overlay hardboard.

9. Adhesive and Bonding: Bonding between veneer plies of wood face panels, and between door faces, frame and core unit shall be fabricated with type I waterproof cross-linking emulsion PVA adhesive.

10. Openings: Openings for lights, louvers and grilles, shall be fabricated by manufacturer, or in a certified door service mill in accordance with manufacturer's details, and in compliance with approved testing agency.

11. Louvers:

    a. Louvers for exterior doors shall be furnished with at least 12 gage frame and security grill 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.

    b. Light-proof louvers (at Dark Rooms): Type DRDL by Anemostat, Air Louver Model 1000, L & L Louvers, or equal.

c. Louvers shall be furnished with factory primer.

12. Vision Panels: Vision panels in exterior doors shall be framed with Security Grille Glass Stop: Anemostat Sl-IS, Air Louvers Inc. VLF-SG, L & L Louvers, or equal. Install vision panels with tamperproof-head through bolts. Security Grille shall be supplied with manufacturer's standard baked-on enamel finish.

13. Security Grilles: Refer to Section 08 5656.

B. Interior Flush Doors:

1. Interior doors shall be furnished as follows:

a. Transparent Finished (Stained): NAAWS Custom grade. Solid wood core, 5 ply, veneer faced, fully bonded to core.

b. Opaque Finished (Painted): Custom grade. Solid wood core, 5 ply, MDO hardboard face, fully bonded to core.

2. Edge strips: Kiln-dried birch, maple or other material as indicated.

a. Transparent Finished Doors: Same species as face veneer or similar in overall color, grain, character and contrast as the face veneer.

b. Opaque Finished Doors: Close grain hardwood.

3. Full stile edge strip shall be not less that 1 ½ inches wide, two ply stile. Stiles shall be fully bonded to the core. The outer face stile shall be full length ¾ inch birch or maple. The inner back stile shall be ¾ inch of similar species which may have two finger joints fully bonded to core.

4. Top and bottom edge rails shall be full length and may be of glued up stock of similar species as edge strip, white fir or douglas fir, minimum density 24.33 pounds or higher per cubic foot. Top rail shall be minimum of 2 inches. Bottom rail shall be minimum of 5 inches fully bonded to core.

5. Crossbanding: Doors shall be furnished with full width crossbanding of properly dried hardwood or engineered fiber composite material, 1/16 inch thick, with a density of 52 pounds or higher per cubic foot.

6. Face Veneer for Transparent Finished Doors: Custom grade, veneer shall be Grade"A". Minimum thickness shall be 0.0277 inches before sanding and 0.020 inches after sanding of specified face veneer.

a. Veneer Species:

b. Veneer Cut: [Rotary] [Plain] [Quarter]

c. [Rift-cut]

d. Veneer Match: [Book] [Slip] [Random]

e. [Running] [Balance] [Center]

f. Pairs: [Matched] [Not Matched]

7. Opaque Finished Doors: Custom grade medium density overlay hardboard.

8. Adhesive and Bonding: Bonding between veneer plies of wood face panel, and between door faces, frame and core unit shall be fabricated with type I or II waterproof adhesives for interior doors.

9. Openings: Openings for lights, louvers and grilles shall be performed by the manufacturer, or in a certified door service mill in accordance with manufacturer's details, and in compliance with testing agency requirements.

10. Louvers:

a. Louvers for interior doors shall be furnished with at least 12 gage cold rolled steel frames and security grill welded to 18 gage blades: Anemostat PLSL, Air Louvers Inc. Model 1500-A, L & L Louvers, or equal.

b. For fire rated doors: Anemostat FLDL-UL-SG2, Air Louvers Inc. Model 1900-ASG, L & L Louvers, or equal.

c. Light Proof Louvers (at Dark Rooms): Anemostat Model DRDL, Air Louvers Inc. Model 1000, L & L Louvers, or equal.

d. Install louvers with tamperproof-head through bolts.

11. Vision Panels: Vision panels in fire labeled doors shall be framed with FGS-75 Fire Glass Stop by Anemostat, Air Louvers Inc. Model VLF, or equal and shall be State Fire Marshall listed. Frame shall be supplied with manufacturer's standard baked-on enamel finish. Install with tamperproof-head through bolts.

C. Fire Rated Doors:

1. Fire doors must meet the requirements of recognized fire door tests and bear certifying labels of an approved independent testing agency.

2. With exception to the requirements that would adversely affect the fire rating, rated doors shall meet the specifications listed in this section.

3. Door shall be constructed that when installed as an assembly and tested it will pass ASTM E2074 "Standard Test Method for Fire Test of Door Assemblies Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies," and can be rated as required.

4. Reinforcement Blocking: Provide hardware reinforcement blocking of size as required to secure specified hardware. Reinforcement blocking shall be in compliance with the manufacturer's labeling requirements and shall not be of mineral material.

2.03 FINISHING:

A. FACTORY FINISHING:

1. Factory finishing shall be NAAWSI Custom Grade and include all necessary preparation, materials and labor to provide an [Opaque] [Clear Transparent] [Stained Transparent] finish.

2. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

3. Finish: NAAWS [System 5, conversion varnish] [System 9, UV curable, acrylated epoxy, polyester, or urethane] [System 10, UV curable, water based] [or] [System 11, catalyzed polyurethane].

4. Staining: [Match Architect's sample] [As selected by Architect from manufacturer's full range] [None required].

5. Effect: [Open-grain finish] [Filled finish] [Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores].

6. Sheen: [Satin] [Semigloss].

B. JOB SITE FINISHING:

1. Doors indicated to be job site finished shall be factory back primed.

a. Doors Scheduled for Opaque Paint finish: Prime with one coat of wood primer indicated on Section 09 9000 - Painting and Coating.

b. DoorsSchedules for Transparent Finish: Prime with stain and first coat of finish as indicated in Section 09 9000 - Painting and Coating.

2. Door Finish: Per Section 09 9000 - Painting and Coating.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install Work of this section as specified in ANSI/WDMA I.S. 1-A. Install fire doors in accordance with NFPA 80.

B. Provide each door accurately cut, trimmed, and fitted to its frame and hardware. Clearance at lock and hanging stile and at top shall not exceed 1/8 inch, and bottom shall not exceed 1/4 inch except where otherwise indicated. Arises shall be rounded to a 1/16 inch radius, and lock rail edges shall be slightly beveled. Screws for hardware shall not be driven but screwed into pre-drilled holes.

C. Doors shall operate freely, but not loosely, without sticking or binding, without hinge-bind conditions and with hardware properly adjusted and functioning.

3.02 CLEAN UP

A. Remove rubbish, waste and debris 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 3473

SOUND CONTROL DOORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.

1.02 SUMMARY

A. This Section includes all labor, material, accessories and equipment necessary to provide sound control doors (including door, gaskets, hardware and door frame) where shown on the drawings and as specified below.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Division 0, Conditions of the Contract, and Division 1, General Requirements, apply to the Work of this Section.

B. Section 03 60 00 – Grouting.

C. Section 08 10 00 – Metal Doors and Frames.

D. Section 08 71 00 – Door Hardware.

E. Section 09 91 00 – Painting.

1.04 REFERENCES

A. ASTM E90 – Standard Test Method for laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

B. ASTM E336 – Standard Test Method for Measurement of Airborne Sound Insulation in Buildings.

C. ASTM E413 – Classification for Rating Sound Insulation.

1.05 SUBMITTALS

A. Compliance: Comply with pertinent provisions of Division 1 – General Requirements.

B. Specifications: Submit Manufacturer’s specifications and other data needed to prove compliance with all specified requirements.

C. Installation Instructions: Submit Manufacturer’s recommended installation instructions and procedures.

D. Shop Drawings: Submit large scale shop drawings showing elevation of all sound control doors and frames, jamb and head details, hardware reinforcing details of doors and frames, door and

frame location schedule, complete door and frame descriptive nomenclature, material description and gauges, astragal and meeting stile details, methods of anchorage, hardware preparation locations and gaskets, cam lift hinges and door manufacturer's other proprietary hardware.

E. Acoustical Laboratory Test Reports: Submit Manufacturer's octave band sound transmission loss values from 125 hertz to 4,000 hertz and STC values for each of the specified doors. Sound transmission loss and STC values shall be based on measurements conducted by a laboratory accredited for specific acoustical testing under the National Voluntary Laboratory Accreditation Program (NVLAP) and in accordance with ASTM E 90.

F. Certification: Manufacturer shall certify that the sound control doors (including doors, door frames, hardware and all head, jamb, astragal gaskets, etc) meet or exceed the specified laboratory octave band transmission loss and STC values listed below when tested in accordance with ASTM E90.

1.06 ACOUSTICAL PERFORMANCE REQUIREMENTS

A. Provide sound control doors that comply with the minimum octave band sound transmission loss, Sound Transmission Class (STC) and Noise Isolation Class (NIC) values specified below for doors scheduled on the drawings. Sound transmission loss and STC values shall be based on laboratory acoustical testing, which is performed by a National Voluntary Laboratory Accreditation Program (NVLAP) approved testing laboratory. Testing shall be performed in accordance with ATSM E90. NIC values shall be based on field acoustical testing performed by a qualified acoustical consultant who has a minimum of 5-years' experience in sound isolation measurements. Field testing shall be performed in accordance with ASTM E336 and ASTM E413.

1.07 QUALITY ASSURANCE

A. Manufacturer's Qualifications: The Manufacturer shall have successful experience in the fabrication and installation of sound control doors, including no less than 5 years experience in the fabrication and installation of doors equal to the size and complexity of this work. Upon request, the manufacturer shall provide references and acoustical test reports for three similar recently completed projects.

B. Installer qualifications: Sound control door and frame assemblies must be installed by manufacturer, manufacturer's authorized distributor or an installer qualified in the installation and maintenance of specified equipment as approved by manufacturer.

C. Single Source Responsibility: A single firm shall be responsible for the design, fabrication and installation of the sound control doors (including all accessories and hardware).

1.08 DELIVERY, STORAGE AND HANDLING

A. Comply with pertinent provisions of Division 1 – General Requirements.

B. Protect products during transit, storage and handling to prevent damage, soiling and deterioration. Comply with the requirements of the manufacturer's instructions for storage and handling.

C. Store doors upright, in a protected dry area, at least 1-inch or more off of the ground or floor and provide at least 1/4-inch space between individual doors.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. IAC Acoustics, Naperville, IL, (630) 389-1807.

B. Krieger Steel Products Company, Pico Rivera, CA, (562) 777-4507.

C. Overly Door Company, Greensburg, PA, (724) 834-7300.

D. Noise Barriers, LLC, Lake Forest, IL, (847) 306-4729.

2.02 MATERIALS

A. Type SCD-1: Personnel Doors:

1. Minimum leaf thickness: 1-3/4-inches.

2. Minimum leaf weight: 7.0 psf.

3. Operation: Manual.

4. Opening Sizes: As scheduled on drawings.

5. Threshold gaskets: Adjustable type, using compression gaskets of door manufacturer's proprietary design.

6. Jamb and head gaskets: Adjustable type, using compression gaskets of door manufacturer's proprietary design.

7. Meeting stile gaskets: Adjustable type, using compression gaskets of door manufacturer's proprietary design.

8. Hinges: Cam-lift. Heavy duty butt hinges or cam-lift hinges as required to achieve the STC rating.

9. Vision Glazing: As required to achieve the STC rating.

10. Threshold: Hard, solid flat surface, such as concrete or a flat steel plate caulked and fastened to floor.

11. Door frames: Heavy gauge steel frames sealed to adjacent walls. Hollow cavities of frames (head and jamb) shall be fully grouted in masonry or concrete walls or tightly packed with fiberglass or mineral wool insulation in metal stud walls. Edges of frames shall be caulked or grouted to walls.

12. Laboratory Acoustical Performance: STC-40 Minimum. (Maker Space Classroom)

13. Field Acoustical Performance: NIC 35 Minimum.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Install sound control doors in accordance with manufacturer's recommendations, instructions and under manufacturer's supervision. The door Manufacturer shall work closely with the Contractor and shall have ultimate responsibility for the installations. Manufacturer shall coordinate field installations by providing detailed advice and field supervision.

B. Installer shall examine door openings to verify that openings comply with the indicated requirements for type, size, location and acoustic characteristics. Installer shall also verify that openings are free of defects that could cause the doors to fail the sound isolation performance requirements. Installer shall not proceed with installation until all unsatisfactory conditions have been corrected.

C. Do not install doors or frames that are observed to be warped, bowed, deformed or otherwise damaged or defaced to such an extent as to impair strength, appearance and sound isolation properties. Remove and replace components that have been damaged in the process of installation.

D. Door Frames:

1. Set frames accurately in location, in perfect alignment, plumb, straight and true. Brace frames to prevent displacement. Coordinate installation of built-in anchors for wall and partition construction as required with other work.
2. During installation, fill door frames solid with poured grout in masonry or concrete walls or tightly packed with fiberglass or mineral wool insulation in metal stud walls.

E. Doors:

1. Apply hardware in accordance with hardware manufacturer's templates and instructions.
2. Align and adjust all door components (door frames, panels, gaskets, hardware, etc.) in accordance with Manufacturer's instructions

3.02 ADJUSTING

A. Upon completion of work and before final inspection, adjust all gaskets to provide airtight seals with no visible gaps or spaces around all sound control doors. No light leaks shall be visible at the gasket seals. Once properly adjusted, the door gaskets shall provide a firm uniform compression seal around the perimeters of the doors.

B. Once fully adjusted all sound control doors and associated hardware shall operate smoothly and properly. Adjust or replace doors that do not operate freely or are damaged.

3.03 CLEANING

A. Clean all door surfaces, seals, jambs and thresholds after installation. Exercise care to avoid damage to protective coatings and finishes. Remove excess sealant, grout, dirt and other substances. Lubricate hardware and other moving parts.

3.04 PROTECTION

A. Protection of sound control doors from damage shall be provided in accordance with manufacturer's recommendations such that doors will be undamaged at project completion. Protection from damage by other trades after installation of doors shall be provided by the General Contractor. Gaskets deformed as a result of door shoes or other devices used to hold the sound control doors open shall be replaced at no cost to the owner.

END OF SECTION

SECTION 08 4113

ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Aluminum framed entrances and storefronts.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 07 2719 – Plastic Sheet Air Barriers.
3. Section 07 9200 - Joint Sealants.
4. Section 08 5113 - Aluminum Windows.
5. Section 08 7100 - Door Hardware.
6. Section 08 8000 - Glazing.
7. Section 08 8053 – Security Glazing.
8. Section 09 2423 – Cement Plaster and Metal Lath.

1.02 REFERENCES

A. ASTM International (ASTM):

1. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and tubes.
2. 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.
3. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
4. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

5. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage through Installed Windows and Doors.

6. 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.

B. American Architectural Manufacturers Association (AAMA):

1. AAMA 611 – Voluntary Specification for Anodized Architectural aluminum.

2. AAMA 2605 – Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

C. National Fenestration Council Rating (NFRC):

1. Component Modeling Approach (CMA), CMA Software Tool (CMAST).

2. NFRC-100- Standard Procedure for Determining Fenestration Product U-factors.

3. NFRC-200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

D. Code of Federal Regulations, Title 16, Part 1201 (16 CFR 1201):

1. Consumer Product Safety Commission Safety Standard for Architectural Glazing Materials.

1.03 PERFORMANCE REQUIREMENTS

A. Water-Resistance test: In accordance with ASTM E331. No water leakage when tested at 8 PSF (pounds per square foot) static pressure differential.

B. Air-Infiltration: In accordance with ASTM E283. Air infiltration shall not exceed 0.06 cfm/SF at a static air pressure difference of 6.24 psf.

C. Structural Performance: In accordance with ASTM E330. Deflection under design load shall not exceed L/175 of the clear span.

D. Energy-Related Performance Ratings:

1. Thermal Performance U-Factor:

2. Solar Heat Gain Coefficient (SHGC):

3. Visible Transmittance (VT):

1.04 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings for the Work of this section, prepared and reviewed before fabrication. Include 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, installation, isolation, glazing procedure as well as reglazing procedures, materials, flashing and caulking.

B. Product Data: Submit manufacturer's Product Data.

C. Test Reports: Submit test reports from AAMA accredited laboratories certifying the performance requirements of Article 1.03.

D. Material Samples: Submit the following:

1. Storefront, door and frame sections with specified finish, fasteners and accessories.

2. Cured sealant colors.

E. Calculations: Provide structural calculations, signed and sealed by a structural engineer licensed in the State of California, indicating that materials furnished for installation conform to requirements specified.

F. Deferred Approval by Division of the State Architect:

1. Submit to the OWNER a complete set of drawings, calculations and specifications for approval by the Division of the State Architect (DSA).

2. Documents must be signed by an engineer licensed in the State of California.

3. Allow six months in the schedule for DSA review.

4. Respond to DSA comments and resubmit until final approval is received.

G. Energy Performance: Submit a report or calculation for each system and glass type listing the frame, glazing and spacer components and indicating the U-Factor, solar heat gain coefficient (SHGC) and visible transmittance (VT) of the storefront assembly demonstrating conformance to project energy calculations.

1. Insulated Storefronts: Submit NFRC CMAST Fenestration Calculation Report / Bid Report:

2. Non-Insulated Storefronts: Submit energy calculations.

H. CxSP will review the Submittals of this Section as part of the Commissioning of Thermal and Moisture Protection.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Except for more stringent requirements specified in this Section, manufactured aluminum windows shall comply with the requirements of the CBC Part 6, California Energy Code, Section 110.6, Mandatory Requirements for Fenestration Products and Exterior Doors.

2. Windows shall be designed to withstand the minimum loads prescribed in CBC Section 1609A.

B. Field applied products that release VOC's, such as sealants, caulking, adhesives, primers and paints, shall be approved by the OWNER's Office of Environmental Health and Safety (OEHS).

C. Installer Qualifications:

1. Minimum five-year experience installing windows of the type specified by this Section.

2. Installer shall be approved by the window manufacturer as an approved installer.

D. Manufacturer Qualifications: Minimum 5-year experience in producing aluminum windows of the type specified. Window manufacturer technical representative shall provide field services to verify window installation is in accordance with manufacturer's written instructions.

E. Mock-ups: Provide mock-up of one typical door and window unit for review by the ARCHITECT. Coordinate with mock-up requirements of Section 09 2423, Cement Plaster and Metal Lath, or

F. Pre-Installation Conference: CONTRACTOR shall coordinate and conduct pre-installation conference in accordance with Section 01 3119, Project Meetings, to review the progress of construction activities and preparations for the installation of storefronts and other related work of this Section.

G. Commissioning:

1. Commissioning Services Provider (CxSP) retained by the OWNER shall perform Commissioning (Cx) of building envelope systems and assemblies, including review of submittals, installation compliance, and training materials. CxSP shall witness training and collect all materials for inclusion in the commissioning report. All Cx services shall comply with the requirements indicated in Section 07 0800, Commissioning of Thermal and Moisture Protection.

2. CONTRACTOR shall follow the commissioning responsibilities stated in Section 01 9113, General Commissioning Requirements.

1.06 WARRANTY

A. Manufacturer shall provide a 10-year material warranty for aluminum storefront.

B. Manufacturer shall provide a 10-year material warranty for doors.

C. Anodized finish of storefronts, doors and related components shall be warranted for 10 years against cracking, crazing, flaking, or blistering,

D. Pigmented organic finished storefronts, doors 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 MANUFACTURERS

A. Offset Glazing:

1. Arcadia AG451T Series.
2. EFCO Series 433.
3. Kawneer Co. Trifab 451T.
4. Equal.

B. Centered Glazing:

1. Arcadia AFG-451T Series.
2. EFCO Series 403.
3. Kawneer Co. Trifab 451T.
4. Equal.

2.02 MATERIALS

A. Extrusions shall be 6063-T6 alloy and temper, per ASTM B221.

B. Fasteners: Aluminum, stainless steel, or zinc-plated steel at exposed conditions. Perimeter anchors shall be aluminum or steel. Steel anchors shall be isolated from aluminum members.

C. Glazing Gaskets: EPDM elastomeric extrusions or vinyl reinforced with fiberglass cord.

D. Glazing Sealants: As recommended by manufacturer for joint type.

E. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

F. Joint Sealants: For installation at perimeter of storefront system shall be as specified in Section 07 9200, Joint Sealants.

G. Hardware: Finish hardware shall be as specified in Section 08 7100 - Door Hardware.

H. Glazing: Glazing shall be as specified in Section 08 8000, Glazing.

2.03 FABRICATION

A. Framing sections shall be 2 inches by 4-1/2-inch thermally broken by one inch glazing.

1. Major portions of door sections, except glazing beads, shall be nominal 0.125 inch.

2. Wall thickness of frame members shall be nominal 0.093 inch.

B. Framing system shall provide continuous head and sill channels spliced together with formed brake metal sleeves at center of vertical mullions. The framing system shall provide for flush glazing on sides with no projecting stops. Vertical and horizontal framing members shall have a nominal face dimension and overall depth as noted above. Diverters shall be provided to collect water infiltration and divert to the exterior.

C. Door framing members shall match storefront framing appearance. Door stiles and rails shall be tubular sections, accurately joined at corners with heavy concealed reinforcement brackets secured with bolts and screws and shall be metal inert gas (MIG) welded. Doors shall be furnished with snap-in stops with bulb glazing gasket both sides of glass. Exposed screws are not permitted. Each door leaf shall be furnished with an adjusting mechanism, located in the top rail near the lock stile, which provides for minor clearance adjustments after installation. A hard-backed poly-pile weatherstrip shall be installed in both stiles of center hung single doors.

D. Doors with panic hardware shall be provided with a mid rail. Panel below mid rail shall consist of a composite infill panel with a polystyrene core and 0.032 aluminum sheet on each side, by Mapes Architectural Panels, Alucabond, or equal.

2.04 FINISH

A. Storefronts and accessories shall be furnished with an electronically deposited color anodic finish-Class AAM10C22A44. Thickness shall be 0.7 mil minimum thickness conforming to AAMA 611.

B. Storefronts and accessories shall be furnished with an organic finish applied over a five-stage aluminum pre-treatment. Finish shall be a two-coat PVDF fluorocarbon coating system with a minimum of 1.2 mil thickness and conforming to AAMA 2605. Color as selected by ARCHITECT.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and

operational clearances. Examine wall flashings, air barriers, and other built-in components to ensure a coordinated, weather tight aluminum framed storefront installation.

3.02 INSTALLATION

A. Install storefronts in accordance with approved shop drawings and manufacturers installation instructions. Installation shall be level, square, plumb and in proper relation to wall flashing and adjacent construction.

B. Apply sealants to provide a weather tight installation at joints, intersections and opening perimeters. Tool sealants to fill the joint and provide a smooth finished surface.

C. Install security glazing with Dow 795 sealant, as required by Section 08 8053, Security Glazing.

3.03 FIELD QUALITY CONTROL

A. CONTRACTOR shall retain and pay a testing agency to conduct on-site air and water infiltration tests. On-site tests shall be conducted with CONTRACTOR, storefront manufacturer's representative, OWNER, Project Inspector and ARCHITECT present. The OAR will select the units to be tested.

B. Ten percent of installed storefront panels will be selected for air and water testing. If one or more windows fail, an additional ten percent of windows (not including the ones previously tested) will be selected for further testing. Selection of additional ten percent of units and retesting will be preformed until no leaks occur.

C. Water-Infiltration Test: Test will be conducted according to requirements of ASTM E1105. No water leakage is permitted. Windows will be tested at 6 pounds per square foot test pressure differential.

D. Air-Infiltration Test: Test will be conducted according to requirements of ASTM E783. Allowable infiltration shall not exceed 0.9 cfm/SF when tested at 6.24 pounds per square foot field test pressure differential.

E. Windows within storefronts will be tested per the requirements of Section 08 5113, Aluminum Windows.

F. Field Test report will be submitted to the OWNER, CONTRACTOR and ARCHITECT. Field Test report will 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.

G. CONTRACTOR shall perform field adhesion tests of sealants in accordance with manufacturer's instructions and ASTM C1521, Method A, Tail Procedure. Remove sealants that fail adhesion testing; clean substrates, reapply sealants, and re-test. Test sealants adjacent to failed sealants. Submit field adhesion test report indicating tests, locations, dates, results, and remedial actions taken. Number of tests shall be per ASTM C1521, Destructive Procedure.

3.04 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.05 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

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 0800 – Commissioning of Thermal and Moisture Protection.
3. Section 07 2719 – Plastic Sheet Air Barrier.
4. Section 07 60 00 – Flashing and Sheet Metal.
5. Section 07 9200 - Joint Sealants.
6. Section 08 4113 - Aluminum Entrances and Storefront.
7. Section 08 4413 - Glazed Aluminum Curtain Walls.
8. Section 08 5619 – Pass-Thru Windows.
9. Section 08 5656 – Security Window Screens.
10. Section 08 8000 - Glazing.
11. Section 08 8053 – Security Glazing.
12. Section 09 2423 - Cement Plaster and Metal Lath.

1.02 REFERENCE STANDARDS

A. ASTM International:

1. ASTM A36 - Standard Specification for Carbon Structural Steel.
2. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
4. 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.
5. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

6. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
7. ASTM E547 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference.
8. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage through Installed Windows and Doors.
9. ASTM E972 - Standard Test Method for Solar Photometric Transmittance of Sheet Materials Using Sunlight.
10. 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.
11. ASTM F588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact.

B. American Architectural Manufacturers Association (AAMA):

1. AAMA/WDMA/CSA 101/I.S.2/A440 NAFS – North American Fenestration Standards / Specifications for Windows, Doors and Skylights.
2. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products.
3. AAMA 511 - Voluntary Guideline for Forensic Water Penetration Testing of Fenestration Products.
4. AAMA 513 - Standard Laboratory Test Method for Determination of Forces and Motions Required to Activate Operable Parts of CW and AW Class Operable Windows, Sliding Glass Doors and Terrace Doors in Accessible Spaces.
5. AAMA 609 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum.
6. AAMA 612 - Voluntary Specification, Performance Requirements, and Test Procedures Combined Coatings of Anodic Oxide and Transparent Organic Coatings on Architectural Aluminum.
7. AAMA 701 / 702 – Voluntary Specification for Pile Weatherstripping and Replaceable Fenestration Weatherseals.
8. AAMA 800 - Voluntary Specifications and Test Methods for Sealants.
9. AAMA 803.3 - Narrow-Joint Seam Sealer.
10. AAMA 902 - Voluntary Specification, Performance Requirements and Test Procedures for Sash Balances.

11. AAMA 904.1 – Voluntary Specifications for Friction Hinges in Window Applications.

12. AAMA 910 - Voluntary Life Cycle Specifications and Test Methods for AW Class Architectural Windows and Doors.

13. AAMA 1302.5 - Voluntary Specifications for Forced-Entry Resistant Aluminum Prime Windows.

14. AAMA 2605 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Architectural Extrusions and Panels.

C. National Fenestration Rating Council (NFRC):

1. NFRC-100- Standard Procedure for Determining Fenestration Product U-factors.

2. NFRC-200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

D. Glass Association of North America (GANA):

1. GANA 01-0300 - Proper Procedures for Cleaning Architectural Glass Products.

E. The Aluminum Association (AA):

1. AA DAF-45 – Designation System for Aluminum Finishes.

1.03 AAMA PRIMARY DESIGNATOR

A. Primary Designator: Way in which compliant windows are identified by the American Architectural Manufacturers Association (AAMA). Consists of a four part code:

1. Performance Class: Is the likely target application for a door or window. Four classes are defined by the North American Fenestration Standards (NAFS) and corresponds to the first two letters of the designator. Only Performance Class AW is specified in this Section.

a. AW: Performance Class of windows commonly used in high-rise and mid-rise buildings to meet extreme loading requirements and limits on deflection.

2. Performance Grade (PG): Corresponds to the digits of the designator and represents the Design Pressure, in pounds per square foot, a window specimen was tested to.

3. Test Size: Is the maximum size tested to achieve this rating. Test Size is not used in the window designators specified in this Section.

4. Product Type: Is the abbreviation for the window type specified, corresponds to the last two letters of the Primary Designator.

1.04 PERFORMANCE REQUIREMENTS

A. Windows shall conform to AAMA/WDMA/CSA 101/I.S. 2/A440, Performance Class AW. Performance Grade shall be as indicated on Part 2 Products, for each specific manufacturer and each window type.

B. Performance Requirements: Window manufacturer shall hold a current test report for a window specimen successfully tested to the gateway performance requirements of AAMA/WDMA/CSA 101/I.S. 2/A440, Performance Class AW.

1. Life Cycle Testing: Tested in accordance with AAMA 910. There shall be no damage to fasteners, hardware parts, support arms, activating mechanisms, or any other damage that would cause the window to be inoperable.

2. Structural Performance:

a. Uniform Load Deflection Test:

1) With ventilators closed and locked, test unit in accordance with ASTM E330 at a static air pressure difference of 40 PSF, positive and negative pressure.

2) No member shall deflect over L/175 of its span.

b. Uniform Load Structural Test:

1) With ventilators closed and locked, test unit in accordance with ASTM E330 at a static air pressure difference of 60 PSF, both positive and negative.

2) At conclusion of test there shall be no glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanisms, nor any other damage that would cause the window to be inoperable.

3. Water Penetration Resistance: With ventilators closed and locked, test unit in accordance with ASTM E331 and/or ASTM E547 to twenty percent of the Design Pressure, without exceeding 12 PSF. There shall be no uncontrolled water leakage.

4. Air Leakage Resistance: With ventilators closed and locked, test unit in accordance with ASTM E283 at a static air pressure difference of 6.24 PSF.

a. Single Hung, Double Hung Windows and Horizontal Sliding Windows: Air infiltration rate shall not exceed 0.30 cfm/SF.

b. Fixed, Awning, Hopper Casement and: Air infiltration rate shall not exceed 0.10 cfm/SF.

5. Forced Entry Resistance: Test windows in accordance to ASTM F588 or AAMA 1302.5 and meet the requirements of performance level 40.

1.05 REGULATORY REQUIREMENTS

A. Manufactured windows shall comply with the requirements of the California Energy Code, Section 110.6, Mandatory Requirements for Fenestration Products and Exterior Doors.

1. Air Leakage: As indicated in Article 1.03, Performance Requirements.

2. U-factor: Windows shall be rated in accordance with NFRC-100 or use the applicable default U-factor set forth in table 110.6-A.

3. Solar Heat Gain Coefficient (SHGC): Window SHGC shall be rated in accordance with NFRC-200, or use the applicable SHGC set forth in table 110.6-A.

4. Visible Transmittance (VT): The window VT shall be rated in accordance with NFRC-200 or ASTM E972.

5. Labeling: Conform to Section 110.6 for temporary and permanent labels.

1.06 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings for the Work of this section including plans, elevations, window schedule, opening identification symbols, sizes, and complete details for materials, finishes, sizes, profiles, moldings, dimensioned locations of hardware items with reinforcement, methods of anchoring, size and spacing of anchors, assembly, erection, isolation, glazing procedure as well as re-glazing procedures, materials, caulking and sound transmission class.

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. Window Samples: Submit a window sample fabricated of the materials, finish, fasteners, glazing, panning and caulking system specified.

2. Finish: When factory-finish color coating is specified, submit:

a. Five color charts of standard factory coatings.

b. Five coated six inch long sections of aluminum sheets finished with color selected by ARCHITECT.

D. Certificates:

1. AAMA Certified Test Reports: Window manufacturer shall affix AAMA Quality Certified label on every unit or shall submit a certified test report from an approved testing laboratory, certifying that the specified insulated glass window complies with ANSI/AAMA requirements.

2. Building Energy Efficiency Standards Certified Test Reports: Window manufacturer shall affix a clearly visible temporary label to the non-insulated glass windows or supply a project specific label certificate using

NFRC CMA protocol, listing the U-Factors, solar heat gain coefficients (SHGC), visible transmittance (VT) and air leakage for the fenestration products to adhere to the prescriptive requirements of Title 24, CEC.

3. Submit a certificate bearing official and legal signature of window supplier stating that the finish complies with AAMA 2605 for Organic Coatings and to AAMA 612 for Anodic Finish, as applicable.

4. Submit a certificate bearing official and legal signature of window supplier stating that windows with security glazing had the glass installed in accordance with Section 08 8053, Security Glazing.

E. Written statement signed by the sealant manufacturer or distributor stating that the sealant joints shown on the shop drawings have been reviewed and approved for adhesion and surfaces compatibility.

F. CxSP will review the Submittals of this Section as part of the Commissioning of Thermal and Moisture Protection.

1.07 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Except for more stringent requirements specified in this Section, manufactured aluminum windows shall comply with the requirements of the CBC Part 6, California Energy Code, Section 110.6, Mandatory Requirements for Fenestration Products and Exterior Doors.

2. Windows shall be designed to withstand the minimum loads prescribed in CBC Section 1609A.

B. Field applied products that release VOC's, such as sealants, caulking, adhesives, primers and paints, shall be approved by the OWNER's Office of Environmental Health and Safety (OEHS).

C. Installer Qualifications:

1. Minimum five year experience installing windows of the type specified by this Section.

2. Installer shall be approved by the window manufacturer as an approved installer.

D. Manufacturer Qualifications: Minimum 5 year experience in producing aluminum windows of the type specified. Window manufacturer technical representative shall provide field services to verify window installation is in accordance to manufacturer's written instructions.

E. Pre-Installation Conference: CONTRACTOR shall coordinate and conduct pre-installation conference in accordance to Section 01 3119, Project Meetings, to review the progress of construction activities and preparations for the installation of aluminum windows and other related work of this Section.

F. Commissioning:

1. Commissioning Services Provider (CxSP) retained by the OWNER shall perform Commissioning (Cx) of building envelope systems and assemblies, including review of submittals, installation compliance, and training materials. CxSP shall witness training and collect all materials for inclusion in the commissioning report. All Cx services shall comply with the requirements indicated in Section 07 0800, Commissioning of Thermal and Moisture Protection.

2. CONTRACTOR shall follow the commissioning responsibilities stated in Section 01 9113, General Commissioning Requirements.

1.08 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.

C. Handle in a manner to evenly distribute material load and prevent twisting, ending and cracking of windows doors and associated parts.

1.09 WARRANTY

A. Window installation shall be warranted by CONTRACTOR against defects 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 ten years against blistering, cracking, peeling or chipping or fading beyond AAMA 2605.

D. Anodized finished window and related components shall be warranted for five years against blistering, cracking, peeling or chipping or fading beyond AAMA 612.

E. Factory glazed insulated glass units shall be warranted to be free from obstruction of vision as a result of dust or film formation on the internal glass surfaces caused by failure of the hermetic seal due to defects in material and workmanship for a period of ten years.

PART 2 – PRODUCTS

2.01 MANUFACTURERS, SERIES AND AAMA PRIMARY DESIGNATORS

A. Fixed Windows (FW):

1. Arcadia, T200, AW-PG80-FW.
2. EFCO, 2700, AW-PG140-FW.
3. Kawneer, 8225-TL, AW-PG100-FW.
4. Peerless, G641, AW-PG70-FW.
5. Equal.

B. Projected-Out Windows (AP):
1. Arcadia: T200, AW-PG80-AP.
2. EFCO: 325X, AW-PG125-AP.
3. Kawneer: 8225-TL, AW-PG90-AP.
4. Peerless: G601, AW-PG100-AP.
5. Equal.

C. Projected-In Windows (AP):
1. EFCO: 325X, AW-PG95-AP.
2. Kawneer: 8225-TL, AW-PG90-AP.
3. Peerless: G611, AW-PG100-AP.
4. Equal.

D. Casement (C):
1. Arcadia: T200 AW-PG80-C.
2. EFCO: 325X, AW-PG125-C.
3. Kawneer: 8225-TL, AW-PG90-C.
4. Peerless: G601, AW-PG100-C.
5. Equal.

E. Horizontal Sliding (HS):
1. Arcadia: ULT500, AW-PG40-HS.
2. EFCO: 3500, AW-PG55-HS.
3. Kawneer: 8470-L, AW-PG70-HS.
4. Equal.

F. Hung Window (H):
1. EFCO:
    a. Single Hung: 660 AW-PG50-H.
    b. Double Hung: 670 AW-PG55-H.
2. Kawneer: 8400 TL, AW-PG70-H.

3. Equal.

2.02 FABRICATION

A. Aluminum windows shall conform to AAMA/WDMA/CSA 101/I.S.2/A440.

B. Window frames, sash members and muntin bars, shall be extruded aluminum sections of 6063-T5 or 6063-T6 alloy.

C. Windows shall be factory fabricated for inside glazing, of the types and sizes indicated and specified, and shall include hardware, fastenings, clips, fins, anchors, glazing beads, and other appurtenances necessary for a complete installation and proper operation. Windows shall be fabricated for inside glazing, except for double-hung type windows.

D. Frames and sashes corners shall be a mechanically joined construction by means of two screws secured into integral screw ports. Corner joints shall be "seam sealed" with a quality grade sealant meeting the requirements of AAMA 803.3 and made watertight.

E. When single hung windows are constructed from double hung sash, non-operating section shall be fixed in closed position by means of a welded stop or by screws through section into window frame from inside. Exposed fasteners on exterior surfaces are not permitted.

F. At mullions, frame members of jamb shall be securely interlocked to form continuous watertight mullion. Reinforce with ASTM A36 steel channels or plates or ASTM A653 shaped sheets when required to conform to the CBC and ASCE 7 deflection criteria. Apply zinc rich primer or other AAMA acceptable methods to protect dissimilar metals.

G. Sash Design:

1. Sash shall allow for insulated glass of the thickness specified. 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.

2. Sash shall be removable from window frames after installation.

3. Weatherstrips and weatherseals shall conform to AAMA 701. Provide replaceable woven pile fin weather-stripping contained in extruded grooves around entire perimeter of vents.

4. Hung windows: Lift rail on bottom sash interior; mechanical meeting rail interlock; with weep holes for drainage.

5. Sliding windows: Continuous extruded pull rail on operable sash interior; mechanical meeting rail interlock; with weep holes for drainage.

H. Reinforcing members, if used, shall be made from aluminum, stainless steel, or another corrosion-resistant base material compatible with aluminum.

I. Weatherstrips / weatherseals: Shall be secured in position, replaceable, and meet the design qualification provisions of the following Standards, as applicable:

2.03 GLAZING

1. Glazing shall be 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. Glazing beads shall be extruded aluminum of window manufacturer's standard design, 5/8 inch minimum height, cut to proper length.

3. For glass and glass setting materials refer to Section 08 8000, Glazing.

J. Fasteners: Provide concealed anchors conforming to AAMA/WDMA/CSA 101/I.S.2/A440 of the type recommended by the window manufacturer for the specific type of construction. Anchors and fasteners shall be compatible with the aluminum window and the adjoining construction materials.

2.04 HARDWARE

A. Provide hardware of suitable design and of sufficient strength to perform the function for which it is used. Equip operating ventilators with locks or latching devices which can be secured from the inside.

1. Hardware fasteners penetrating frames or inside plane of window shall be factory sealed with resilient, non-hardening compound.

2. Hardware shall be installed with non-magnetic stainless steel round Phillips- head screws.

B. ADA accessible hardware shall be capable of operating with one hand using a force of five pounds or less, to unlock, open, close, and lock, without tight grasping, pinching or twisting of the wrist and shall conform with AAMA 513.

C. Pole hardware shall be Bronze Craft Series, 234-007-0122 (7 feet long) or equal. Pole hangar shall be Bronze Craft 273-001-0122, or equal. Provide one of each for each room or area.

D. Hung Windows Hardware:

1. windows shall have balances of appropriate size and capacity to hold sash in any open position shall be used. Balances shall be metal cased block and tackle style spring balances or torsion spring balances. Sash balances shall meet AAMA 902 performance specifications. Windows with sash weight in excess of 60 pounds shall be equipped with Class 5 balances.

2. Furnish each hung window with two white bronze sash locks, stainless steel or white bronze keeper, and continuous lift rail. Provide pole operated hardware where sash locks are greater than 72 inches above finished floor. Provide two aluminum handles attached to bottom rail of the upper sash, except windows less than 3-foot wide shall be furnished with only one pull

down handle or a continuous pull down rail provided on upper sash rail. Provide a pole socket on inside of top rail of double hung windows.

3. Single or double hung windows shall be furnished with a side load feature, permitting sash to be removed and cleaned from the interior. Window shall not be removable without the use of a maintenance-only release mechanism.

E. Casement and Projected Window Hardware:

1. Hinge hardware: Heavy duty Annenberg 301 stainless steel or Bronze Craft 300 Senator Series or Advantage Manuf. Corp. Magnum 4 bar hinge conforming to AAMA 904.1. Hinges shall have a limit stop and an adjustable friction shoe.

2. Locking hardware, pull, strikes, keepers and pole rings shall be factory cast white bronze. Pole operated hardware shall be furnished on operable sections where the bottom of the operable sash is equal to or greater than 72 inches above finished floor

F. Horizontal Sliding Window: Sliding panels shall be furnished with locking hardware consisting of aluminum, stainless steel, or other corrosion resistant materials compatible with aluminum. Vent stiles shall be furnished with continuous integral pulls.

2.05 INSECT SCREENS

A. Screen frames shall be of extruded aluminum sections with reinforced corners fixed type for mounting on outside, fitted with continuous removable plastic or aluminum splines for wire cloth replacement. Finished screens shall be square, flat in one plane and not distorted by stretching of wire.

B. Screen cloth shall be standard aluminum 18 by 16 mesh, 0.011 inch thickness.

C. Screen frames shall have the same color and finish as specified for windows.

D. Screens shall be fastened so that they are easily removable and replaced but remain insect proof. Fastening devices shall be of aluminum or other metal compatible with aluminum.

2.06 FINISH

A. Organic finish applied over a five stage aluminum pre-treatment. Finish shall be a Two coat pigmented organic coating system applied over a five stage aluminum pre-treatment to a minimum of 1.2 mil thickness and conforming with AAMA 2605. Color shall be selected by the ARCHITECT.

B. Electronically deposited color anodic finish-Class AAM10C22A44 Class I per AA DAF-45. Thickness shall be 0.7 mil minimum conforming to AAMA 612.

2.07 SEALANTS

A. Sealants shall be approved by the OWNERS's OEHS and shall be of the type recommended by the window manufacturer.

B. Sealants shall conform with AAMA 800 and shall be compatible with aluminum finish and adjacent materials.

C. Sealants used to seal mechanically fixed joints, it shall conform to AAMA 800 or ASTM C920, Type S, Grade S, Class 25.

D. Refer to Section 07 9200, Joint Sealants, for additional information.

2.08 GLASS

A. Refer to Section 08 8000, Glazing.

PART 3- EXECUTION

3.01 EXAMINATION

A. Verify that conditions of substrate are acceptable for aluminum window installation in accordance with manufacturer’s written recommendations.

B. Verify openings are dimensionally correct and within allowable tolerances, and substrates are plumb, level and clean.

C. Verify that anchoring surface is in accordance with approved shop drawings.

D. Inform OAR of unacceptable conditions immediately upon discovery.

E. Proceed with installation only after unacceptable conditions have been remedied.

3.02 INSTALLATION

A. Windows and operators shall be installed in accordance with the window manufacturer's printed instructions and details. Set windows 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.

B. Aluminum in contact with plaster, concrete or steel shall be separated from dissimilar materials as recommended in the Appendix to AAMA/WDMA/CSA 101/I.S.2/A440. Screws, rivets, bolts and other fastening devices shall be of aluminum, non-magnetic stainless steel or other non-corrosive materials compatible with aluminum.

C. Apply sealant in conformance to Section 07 9200, Joint Sealants, in sufficient quantity at joints and intersections to provide a weathertight seal between the window and surrounding construction. Wipe off excess and leave exposed sealant surfaces clean and smooth.

D. Security glazing shall be installed with Dow 795 sealant as indicated on Section 08 8053, Security Glazing.

E. Upon completion of the Work of this section, 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. Lubricate hardware and operating parts as necessary.

F. Where indicated on the Drawings a two piece snap together receptor shall be furnished to fasten windows in place. The receptor aluminum finish shall match the window frame. When snapped together, system shall fasten window securely in place with no water penetration at specified test pressure.

G. Where indicated on the Drawings provide panning, which shall be either a receiver or attached type. The panning extrusions shall be field 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 frames.

H. Limit the opening of windows without security screens to 6 inches where window sills are at a height of ten feet or more above grade, balconies, stairs or lower roofs.

3.03 FIELD QUALITY CONTROL

A. Conduct on-site tests in conformance with AAMA 502, with the OAR, ARCHITECT, Project Inspector and CxSP present. The OAR will select units to be tested. Testing shall be performed by an AAMA accredited testing agency paid by the CONTRACTOR.

B. Testing shall be performed as soon as possible after window installation and before drywall installation to allow visual access. AAMA 502 cannot be used for windows that have been installed for more than six months. In the case windows have been installed for more than six months the procedures of AAMA 511 shall be followed.

C. Ten percent of installed windows shall be selected for testing. If one or more windows fail, additional ten percent of windows, not including the ones previously tested, will be selected for further testing. Selection of additional ten percent of windows and retesting shall be performed until no leaks occur.

1. Air-Infiltration Test: Test set-up and equipment requirements for the test shall be in accordance to the requirements of ASTM E783. Windows shall be tested at 6.24 PSF field test pressure differential. Allowable rates for air leakage shall be 1.5 times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for AW performance class when testing according to AAMA 502, as follows:

   a. Compression Seal and Fixed Windows: 0.15 cfm/ft^2.

   b. Sliding Seal Windows: 0.45 cfm/ft^2.

2. Water-Resistance Test: Test set-up and equipment requirements for the water penetration portion of the test shall be in accordance to the requirements of ASTM E1105, Method A, using a non-cyclic static pressure difference, and shall test the entire window assembly including perimeter joints. No water penetration is allowed.

a. The test pressure used shall be equal to two thirds of the tested and rated laboratory performance test pressure (twenty percent of the Performance Grade listed in Part 2 for each window type; however, shall not exceed twelve pounds per square feet.)

b. Windows with accessible hardware are permitted certain reductions in air infiltration and water resistance performance requirements in accordance with AAMA 513.

c. If water leakage occurs and source cannot be determined, a forensic evaluation using the procedures stated in AAMA 511 shall follow.

D. Windows failing to meet specified air or water infiltration testing:

1. CONTRACTOR shall submit proposed remedial work to ARCHITECT for review.

2. CONTRACTOR shall complete remedial work as revised by the ARCHITECT.

3. When test results meet specified requirements, CONTRACTOR shall incorporate remedial work into other work on the Project.

E. Field Test report shall be submitted to the OWNER, CONTRACTOR, CxSP 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.

F. CONTRACTOR shall perform field adhesion tests of sealants in accordance with manufacturer's instructions and ASTM C1521, Method A, Tail Procedure. Remove sealants that fail adhesion testing; clean substrates, reapply sealants, and re-test. Test sealants adjacent to failed sealants. Submit field adhesion test report indicating tests, locations, dates, results, and remedial actions taken. Number of tests shall be per ASTM C1521, Destructive Procedure.

3.03 CLEANING

A. Clean interior and exterior surfaces of window frames of mortar, plaster, paint spattering spots, and other foreign matter in conformance with AAMA 609 and manufacturer's written recommendations.

B. Clean glass using methods complying with GANA 01-0300.

C. Touch-up, repair or replace damaged products before Substantial Completion.

3.04 CLEAN UP

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 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Door hardware.
2. Gate 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.
4. Toilet accessories, including grab bars.
5. Installation.
6. Rough hardware.
7. Conduit, junction boxes & wiring.
8. Corner Guards.
9. 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.
2. BHMA – Builders Hardware Manufacturers Association
3. 2022 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 2016 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.

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. Items listed with no substitute manufacturers have been requested by Owner to meet existing standard.

G. 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 hardware consultant, 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. Electrified hardware: Electrical drawings and electrical specifications are based on the specific electrified hardware components specified in hardware sets. These electronic hardware components have been specified as an assembly. Changes to these components shall be submitted to the Architect for approval.

B. 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.

C. 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 outswinging exteriors, and throughout where adhesive-mounted seals occur.
7. Manufacturers' templates to door and frame fabricators.

D. Check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation.

E. Environmental considerations**:** segregate unused recyclable paper and paper product packaging, uninstalled metals, and plastics, and have these sent to a recycling center.

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 to validate warranty information, required for Owner in making future warranty claims:

C. Minimum warranties:

1.	Locksets**:**	Ten years
2.	Exit Devices**:**	Ten years mechanical
3.	Closers**:**	Thirty years mechanical
4.	Hinges**:**	One year
5.	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-2022 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. 2022 California Building Code Section 11B-309.4.
2. Force required to activate the operable parts: 5.0 pounds maximum, per 2022 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 2022 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.

D. Low-energy powered doors: comply with ANSI/BHMA A156.19. Reference: 2022 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 100 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 2022 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 2022 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. Adjust door closer sweep periods so that from an open position of 90 degrees, the door will take at least 5 seconds to move to a point 12 degrees from the latch, measured to the landing side of the door, per 2022 California Building Code Section 11B-404.2.8.

1. Spring hinges: adjust for 1.5 seconds minimum for 70 degrees to fully-closed.

F. Smooth surfaces at bottom 10 inches of push sides of doors, facilitating push-open with wheelchair footrests, per 2022 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. 2022 California Building Code Section 11B-404.2.3.

1. Exception: In alterations, a projection of 5/8 inch (15.9 mm) maximum into the required clear width shall be permitted for the latch side stop.
2. Door closers and overhead stops: not less than 78 inches above the finished floor or ground, per 2022 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 2022 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). 2022 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 2022 California Building Code Section 11B-703.4.2.

K. Door and door hardware encroachment: Doors, when fully open, shall not reduce the required width by more than 7 inches. Doors in any position shall not reduce the required width by more than one-half. 2022 California Building Code, Section 1005.7.1.

1. In I-2 occupancies, surface mounted latch release hardware is not permitted to project in the required egress width, regardless of its mounting height, per 2022 California Building Code, Section 1005.7.1 at Exception 1.

L. In groups I-2 or I-2.1 occupancies, doors serving as a means of egress where used for the movement of beds and stretcher patients shall provide a minimum clear opening width of 44 inches. At pair openings that includes two door leaves without a mullion, one leaf shall provide a minimum clear opening width of 44 inches. 2022 California Building Code, Section 1010.1.1.

M. In group I-2 or I-2.1 occupancies, there shall be no projections into the clear width of doors used for the movement of beds and stretcher patients in the means of egress. 2022 California Building Code, Section 1010.1.1.1 at Exception 2.

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	Stanley
Key System	(SCH) Schlage	District Standard
Mechanical Locks	(SCH) Schlage	District Standard
Exit Devices	(VON) Von Duprin	District Standard
Closers	(LCN) LCN	District Standard
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, Pemko
Seals & Bottoms	(ZER) Zero	NGP, Pemko

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, 06A design.
12. Certifications:
    a) ANSI A156.13, Grade 1 Operational.
    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 2022 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 2022 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. Provide testing lab certification confirming that the mechanical device is independent third-party tested to meet this 5 lb requirement.

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. Rod and latch guards with sloped full-width kickplates for doors fitted with surface vertical rod devices with bottom latches.
4. Fire-Labeled Devices: UL label indicating "Fire Exit Hardware". Vertical rod devices less bottom rod (LBR) unless otherwise scheduled.
5. Inpact recessed devices: 1.25 inch projection when push-pad is depressed. Sloped metal end caps to deflect carts, etc. No pinch points to catch skin between touchbar and door.
6. Delayed Egress Devices: Function achieved within single exit device component, including latch, delayed locking device, request-to-exit switch, nuisance alarm, remote alarm, key switch, indicator lamp, relay, internal horn, door position input, external inhibit input plus fire alarm input. NFPA 101 "Special Locking Arrangement" compliant.
7. Electrically Operated Devices: Single manufacturer source for electric latch retraction devices, electrically controlled trim, power transfers, power supplies, monitoring switches and controls.
8. 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.
9. Accepted substitutions: None, District Standard.

2.5 CLOSERS

A. Surface Closers: [4041XP]

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 2022 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.
    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.
13. Accepted substitutions: None, District Standard.

2.6 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. Seals**:** Four-fingered type at head & jambs. Inelastic, rigid back, not subject to stretching. Self-compensating for warp, thermal bow, door settling, and out-of-plumb. Adhesive warranted for life of installation.

1. Proposed substitutions**:** submit for approval.
2. Three-fingered type at hinge jambs of doors fitted with continuous hinges where jamb leaf of hinge is fastened to the frame reveal.

F. Sound-reducing adjustable seals: coordinate lockset backsets, rim exit device strikes, and parallel arm closers. Fabricate 7ga “Z”-brackets as bridging pieces to facilitate installation. Brackets: mild carbon steel, or stainless steel.

G. 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.

H. Thresholds**:** As scheduled and per details. Comply with CBC 2022 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. Fire-rated openings, 3-hour duration**:** Thresholds, where scheduled, to extend full jamb depth.
6. Acoustic openings**:** Set units in full bed of Division-7-compliant, leave no air space between threshold and substrate.
7. Plastic plugs with wood or sheet metal screws are not an acceptable substitute for specified fastening methods.
8. 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.

I. 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.

J. 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.

1. 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.

2.8 KEYING REQUIREMENTS:

A. Key System: Schlage keyway, interchangeable core. For estimate use factory GMK charge. Initiate and conduct meeting(s) with Owner and Supplier representatives to determine system requirements and keybow styles. Furnish Owner's written approval of the system; do not order keys or cylinders without written confirmation of actual requirements from the Owner. Owner will receive permanent cores. Contractor will install permanent cores.

B. Keys:

1. Existing factory registered master key system.
2. Construction keying: furnish temporary keyed-alike cores. Remove at substantial completion and install permanent cores in Owner's presence. Demonstrate that construction key no longer operates.
3. Furnish 10 construction keys.
4. Furnish 2 Emergency keys per each L9485 Faculty Restroom Lock
5. Furnish 2 construction control keys.

C. Key Cylinders: furnish 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".

F. 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.
2. Locate latching hardware between 34 inches to 44 inches above the finished floor, per California Building Code, Section 1010.1.9.2 and 11B-404.2.7.
3. Locate panic hardware between 36 inches to 44 inches above the finished floor.
4. 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.

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 that 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.

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.

B. Inspection of fire door assemblies and means-of-egress panic-hardware doors**:** Per 2016 NFPA-80 5.2.1: hire an independent third-party inspection service to prepare a report listing these doors, and include a statement that there are zero deficiencies with the fire-rated assemblies and the openings with panic hardware.

C. Fire-rated doors**:**

1. Wood doors**:** adjust to 0.125 inches clearance at heads, jambs, and meeting stiles.
2. Steel doors**:** adjust to 0.063 inches minimum to 0.188 inches maximum clearance at heads, jambs, and meeting stiles.
3. Adjust wood and steel doors to 0.75 inches maximum clearance (undercut) above threshold or finish floor material under door.

D. Final inspection**:** Installer to provide letter to Owner that upon completion installer has visited the Project and has accomplished the following**:**

1. Has re-adjusted hardware.
2. Has evaluated maintenance procedures and recommend changes or additions, and instructed Owner's personnel.
3. Has identified items that have deteriorated or failed.
4. Has submitted written report identifying problems.

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. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

119740 OPT0387597 Version 1

HARDWARE GROUP NO. 01

For use on Door #(s):
102A 103A 104A 111 112 113

3	EA	HINGE	5BB1HW 4.5 X 4.5		630	IVE
1	EA	CLASSROOM SECURITY W/ INSIDE INDICATOR	L9071T 06A IS-LOC		626	SCH
2	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	4040XP		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS439		630	IVE
1	SET	SET SEAL	429AA-S (@ HEAD & JAMBS)		AA	ZER
1	EA	DOOR SWEEP	111AA		AA	ZER
1	EA	THRESHOLD	103A-223 (OR AS REQ'D. OR PER DETAILS/CONDITIONS)		A	ZER

HARDWARE GROUP NO. 02

For use on Door #(s):
101A 101B

3	EA	HW HINGE	5BB1HW SH 4.5 X 4.5 NRP		630	IVE
1	EA	PANIC HARDWARE	CDSI-PA-AX-98-L-NL-06		626	VON
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX X XQ11-948 36-083		626	SCH
2	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA (OMIT @ OVERHANG)		AA	ZER
1	SET	SET SEAL	429AA-S (@ HEAD & JAMBS)		AA	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	103A-223 (OR AS REQ'D. OR PER DETAILS/CONDITIONS)		A	ZER

MOUNT HEAD SEAL BEFORE CLOSER ARM(S).

HARDWARE GROUP NO. 03

For use on Door #(s):
107 110

3	EA	HINGE	5BB1HW 4.5 X 4.5		630	IVE
1	EA	CLASSROOM DEAD LOCK	L9463T XB11-720		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	PUSH PLATE	8200 6" X 16" CFC		630	IVE
1	EA	PULL PLATE	8303 10" 6" X 16" CFT		630	IVE
1	EA	SURFACE CLOSER	4040XP		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX AS REQ'D		630	IVE
1	SET	SET SEAL	429AA-S (@ HEAD & JAMBS)		AA	ZER
1	EA	DOOR SWEEP	111AA		AA	ZER
1	EA	THRESHOLD	103A-223 (OR AS REQ'D. OR PER DETAILS/CONDITIONS)		A	ZER

HARDWARE GROUP NO. 04

For use on Door #(s):
106

3	EA	HW HINGE	5BB1HW SH 4.5 X 4.5 NRP		630	IVE
1	EA	PANIC HARDWARE	LD-PA-AX-98-L-NL-06		626	VON
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA (OMIT @ OVERHANG)		AA	ZER
1	SET	SET SEAL	429AA-S (@ HEAD & JAMBS)		AA	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	103A-223 (OR AS REQ'D. OR PER DETAILS/CONDITIONS)		A	ZER

MOUNT HEAD SEAL BEFORE CLOSER ARM(S).

HARDWARE GROUP NO. 05

For use on Door #(s):
108

3	EA	HINGE	5BB1HW 4.5 X 4.5		630	IVE
1	EA	STOREROOM LOCK	L9080T 06A		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	4040XP		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX AS REQ'D		630	IVE
1	SET	SET SEAL	429AA-S (@ HEAD & JAMBS)		AA	ZER
1	EA	DOOR SWEEP	111AA		AA	ZER
1	EA	THRESHOLD	103A-223 (OR AS REQ'D. OR PER DETAILS/CONDITIONS)		A	ZER

HARDWARE GROUP NO. 06

For use on Door #(s):
105

3	EA	HW HINGE	5BB1HW SH 4.5 X 4.5 NRP		630	IVE
1	EA	STOREROOM LOCK	L9080T 06A		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	LOCK GUARD	LG10		US32D	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA (OMIT @ OVERHANG)		AA	ZER
1	SET	SET SEAL	429AA-S (@ HEAD & JAMBS)		AA	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	103A-223 (OR AS REQ'D. OR PER DETAILS/CONDITIONS)		A	ZER

MOUNT HEAD SEAL BEFORE CLOSER ARM(S).

HARDWARE GROUP NO. 07

For use on Door #(s):
109

3	EA	HINGE	5BB1HW 4.5 X 4.5		630	IVE
1	EA	CORRIDOR LOCK W/ OUTSIDE INDICATOR W/ INSIDE INDICATOR	L9456T 06A L583-363 OS-OCC IS-LOC		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	4040XP		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX AS REQ'D		630	IVE
1	SET	SET SEAL	429AA-S (@ HEAD & JAMBS)		AA	ZER
1	EA	DOOR SWEEP	111AA		AA	ZER
1	EA	THRESHOLD	103A-223 (OR AS REQ'D. OR PER DETAILS/CONDITIONS)		A	ZER

HARDWARE GROUP NO. 08

For use on Door #(s):
102B 103B 104B

3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	INSTITUTION LOCK	L9082T 06A		626	SCH
2	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	4040XP HEDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS439		630	IVE
2	EA	GASKETING	As Required To Achieve STC Rating		BK	ZER
1	EA	DOOR BOTTOM	As Required To Achieve STC Rating		AA	ZER
1	EA	THRESHOLD	164A-223		A	ZER

END OF SECTION

Inglewood Unified School District
Door Hardware Specifications

Attention: Architects, Design Professionals, Hardware Specifiers, Contractors, Project Managers and other concerned parties:

Inglewood Unified School District has standardized on the following door and hardware products. Please adhere to the following when specifying hardware for Specification Section 08710 in new construction, in renovation and tenant improvement work:

Key System	Schlage Everest Primus Level 9G.Factory registered and Schlage classic key ways. No subs.	No Subs
Locksets	Schlage ND Series Levers RHO. No Subs.	No Subs
Mortise Lock	Schlage LV9000J 06. No Subs.	No Subs
Rim Cyls	Schlage FSIC: No Subs.	No Subs
Deadbolts	Schlage B700Jor B600J Series: No Subs.	No Subs
Cabinet Lock	Olympus Schlage Style 777J or 888J Series or Equals	Equals
Padlocks	Schlage Kryptonite Portables FSIC or Equals	Equals
Exit Devices	Von Duprin CD98XP w/996RV No Subs.	No Subs
Mullions	Von Duprin key removable center mullions KR4954 with MT54 storage brackets	No Subs
Surface Closer	LCN 4040XP for exteriors and multi purpose rooms. LCN 4040 for interiors. No Subs.	No Subs
Floor Closers	Not Specified.	
Flush Bolts	Ives FB50/60 Series or Equals.	Equals
Hinges	Ives 5BB1HW Knuckle Bearing, wide throw swing clear where applicable. 630 finish Ives 700 Continuous Hinge Stainless Steel US32D. Ives Pivots 7200 Series	No Subs
Overhead Stops	Glynn Johnson 90 Series. Use only where floor or wall stops are not advisable. When used, use heavy weight hinges or continuous	Equals
Floor/Wall Stops	Ives FS18S of FS18L for heavy use doors. Ives Dome stops for low frequency doors. Wall Stops WS402CCV	Equals
Access Control	Schlage CO200 No Sub.	No Subs
Door plates:	Ives 8400 Series US32D or Equals.	Equals
Thresholds	Zero International or equal	Equals
Door Seals	Zero International or equal.	Equals
Doors & Frames	Exterior: Steelcraft “L” series 16ga honeycomb core, galvanized with galvanized 14ga frame. Doors are to be reinforced for closers and caps to be installed for exterior doors. Doors are to be label accordingly.	No Subs

Catalog Cuts

For

IUSD Bennett-Kew P-8 Academy

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VON	LD-PA-AX-98-L-NL-06	PANIC HARDWARE	31	VON_DUPRIN_98_99_SERIES_CUT_SHEET_113139.PDF
SCH	20-057 ICX	RIM CYLINDER	47	SCH_0121.PDF
SCH	20-061 ICX X XQ11-948 36-083	MORTISE CYLINDER	48	SCH_CYL_FSIC.PDF
SCH	23-030	FSIC CORE	48	SCH_CYL_FSIC.PDF
IVE	LG10	LOCK GUARD	52	IVE_0164.PDF
IVE	8200 6" X 16" CFC	PUSH PLATE	54	IVE_0127.PDF
IVE	8303 10" 6" X 16" CFT	PULL PLATE	55	IVE_0128.PDF
LCN	4040XP	SURFACE CLOSER	56	LCN_4040XP_CUT_SHEET_113110.PDF
LCN	4040XP HEDA	SURFACE CLOSER	56	LCN_4040XP_CUT_SHEET_113110.PDF
LCN	4040XP SCUSH	SURFACE CLOSER	56	LCN_4040XP_CUT_SHEET_113110.PDF
IVE	8400 10" X 2" LDW B-CS	KICK PLATE	66	IVE_0223.PDF
IVE	8400 4" X 1" LDW B-CS	MOP PLATE	66	IVE_0223.PDF
IVE	WS406/407CVX AS REQ'D	WALL STOP	68	IVE_0141.PDF
IVE	FS439	FLOOR STOP	69	IVE_0272.PDF
ZER	142AA (OMIT @ OVERHANG)	RAIN DRIP	70	ZERO_142_DATA_SHEET_112650.PDF
ZER	188SBK PSA	GASKETING	71	ZERO_188S_DATA_SHEET_112809.PDF
ZER	429AA-S (@ HEAD & JAMBS)	SET SEAL	72	ZERO_429_DATA_SHEET_012741.PDF
ZER	111AA	DOOR SWEEP	73	ZERO_111_DATA_SHEET_112675.PDF
ZER	369AA-Z49	DOOR BOTTOM	74	ZERO_369_DATA_SHEET_112632.PDF
ZER	39A	DOOR SWEEP	75	ZERO_39_DATA_SHEET_112652.PDF

Mfr	Catalog Number	Description	Page #	Cut
ZER	103A-223 (OR AS REQ'D. OR PER DETAILS/CONDITIONS)	THRESHOLD	76	ZERO_THRESHOLDS_103_DATA_SHEET_012547.PDF
ZER	164A-223	THRESHOLD	77	ZERO_THRESHOLDS_164_DATA_SHEET_012523.PDF



Meets ANSI/BHMA A156.1
A8133 – Steel
A5133 – Stainless Steel
A2133 – Brass

5PB1 5 Knuckle, Plain Bearing Full Mortise Hinge

- For standard weight doors
- Low frequency usage
- Packed with wood and metal screws

Not for use with a door closer.

Options

- NRP, Non-Removable Pin
- SH, Security Stud
- HT, Hospital Tip
- RC, Round Corners - 1/4" or 5/8" Radius
- SEC, Security Fastners - Pin-in-Socket

Dimensions

Size (Inches)	Size (mm)	Gauge
3.5 x 3.5	89 x 89	0.123
4 x 4	102 x 102	0.134
4.5 x 4	114 x 102	0.134
4.5 x 4.5	114 x 114	0.134
5 x 4.5	127 x 114	0.134



Meets ANSI/BHMA A156.1
A8112 – Steel
A5112 – Stainless Steel
A2112 – Brass

5BB1 5 Knuckle, Ball Bearing Full Mortise Hinge

- For standard weight doors
- Medium frequency usage
- 2 ball bearing
- Packed with wood and metal screws

Options

- NRP, Non-Removable Pin
- SH, Security Stud
- HT, Hospital Tip
- RC, Round Corners - 1/4" or 5/8" Radius
- SEC, Security Fastners - Pin-in-Socket

Dimensions

Size (Inches)	Size (mm)	Gauge	Size (Inches)	Size (mm)	Gauge
3.5 x 3.5	80 x 102	0.130	5 x 4.5	127 x 114	0.146
4 x 4	102 x 102	0.130	5 x 5	127 x 127	0.146
4.5 x 4	114 x 102	0.134			
4.5 x 4.5	114 x 114	0.134			

Finishes *brass*

Ives Finish	US3	US4	US10	US10B	US10A	US11	US15	US26	US26D
BHMA	605	606	612	613	614	616	619	625	626

Finishes *steel*

Ives Finish	USP	US3	US4	US10	US10B	US10A	US11	US15	US26	US26D
BHMA	600	632	633	639	640	641	643	646	651	652

Finishes *stainless steel*

Ives Finish	US32	US32D
BHMA	629	630



Meets ANSI/BHMA A156.1
A8111 – Steel
A5111 – Stainless Steel
A2111 – Brass

5BB1HW 5 Knuckle, Ball Bearing, Heavy Weight Full Mortise Hinge

- For heavy weight doors
- High frequency usage
- 4 ball bearing
- Packed with wood and metal screws

Options

- NRP, Non-Removable Pin
- SH, Security Stud
- HT, Hospital Tip
- RC, Round Corners - 1/4" or 5/8" Radius
- SEC, Security Fastners - Pin-in-Socket

Dimensions

Size (Inches)	Size (mm)	Gauge	Size (Inches)	Size (mm)	Gauge
4.5 x 4	114 x 102	0.180	5 x 4.5	127 x 114	0.190
4.5 x 4.5	114 x 114	0.180	5 x 5	127 x 127	0.190



Meets ANSI/BHMA A156.1
A8111 – Steel

5BB1WT 5 Knuckle, Ball Bearing, Wide Throw Full Mortise Hinge

- For medium weight doors
- Medium frequency usage
- 2 ball bearing
- Packed with wood and metal screws

Options

- NRP, Non-Removable Pin
- SH, Security Stud
- HT, Hospital Tip
- RC, Round Corners - 1/4" or 5/8" Radius
- SEC, Security Fastners - Pin-in-Socket

Dimensions

Size (Inches)	Size (mm)	Gauge
4.5 x 5	114 x 127	0.134
4.5 x 6	114 x 152	0.134
5 x 6	127 x 152	0.146
5 x 7	127 x 178	0.146
5 x 8	127 x 203	0.146

Finishes *brass*

Ives Finish	US3	US4	US10	US10B	US10A	US11	US15	US26	US26D
BHMA	605	606	612	613	614	616	619	625	626

Finishes *steel*

Ives Finish	USP	US3	US4	US10	US10B	US10A	US11	US15	US26	US26D
BHMA	600	632	633	639	640	641	643	646	651	652

Finishes *stainless steel*

Ives Finish	US32	US32D
BHMA	629	630

L Series

Grade 1, Mortise Locks



OVERVIEW

The Schlage® L Series has long been the benchmark for Grade 1 mortise locks. Beyond strength and security–it offers flexibility to meet most needs. Sixty-one mechanical functions include ten non-levered small- and large-case deadbolt functions and nine electrified functions that are regularly used as part of electronic access control systems. L Series locks have the ability to suite across electronic, tubular, exit trim, and multi-point locks to integrate seamlessly into any environment. The series features an array of security options including patented, 180-degree high visibility lock status indication trim, key override of a thumbturn being held, and support for multiple keyway families and cylinder types including Primus® XP high-security cylinders.



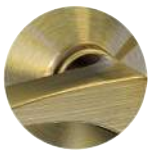
FINISHES



605
Bright Brass



606
Satin Brass



609
Antique Bronze



612[1]
Satin Bronze



613[1]
Oil Rubbed Bronze



619
Satin Nickel



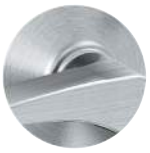
622
Matte Black



625
Bright Chrome



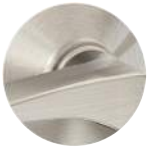
626
Satin Chrome



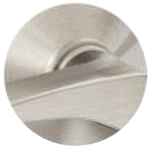
626AM
Satin Chrome Antimicrobial



629[2]
Bright Stainless Steel



630[2]
Satin Stainless Steel



630AM[2]
Satin Stainless Steel Antimicrobial



643e
Aged Bronze



1. Available on standard levers only, not available on Latitude, Longitude, Accent, Asti, or Merano.
2. Not available on Accent, Asti, or Merano.

M COLLECTION DECORATIVE LEVER STYLES[1]



M51
851 - Knurled tactile warning[2]



M52 (Broadway)
852 - Knurled tactile warning[2]



M53



M54



M55



M56



M57[3]



M61
Handed

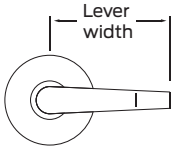


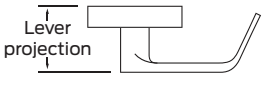
M62[3]
Handed



M63
Handed

Dimensions		
Lever	**Width**	**Projection**
M51	4.5"	3.2"
M52 (Broadway)	4.5"	3"
M53	4.35"	3.2"
M54	4.35"	2.75"
M55	4.3"	3"
M56	4.6"	3"
M57	4.5"	2.9"
M61	4.5"	3.2"
M62	4.5"	2.7"
M63	4.5"	3.2"





1. M Collection not available in 612 and 613 finishes.
2. Knurled tactile warning available on 609, 612, 613, 625, 626, 629, and 630 finishes only.
3. Available in 629, 630, and 630AM only.

Note: Images shown with Schlage L mortise 'A' rose; additional rose and escutcheon designs available.

M COLLECTION DECORATIVE LEVER STYLES[1]



M81 (Boardwalk)
881 - Knurled tactile warning[2]



M82



M83



M84



M85
Handed



ME1
8ME1 - Milled tactile warning
Handed



ME2
8ME2 - Milled tactile warning
Handed

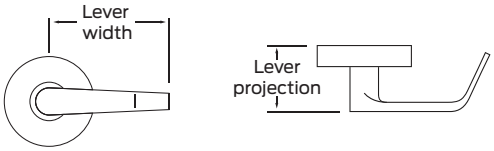


ME3
8ME3 - Milled tactile warning

Dimensions

Lever	Width	Projection
M81 (Boardwalk)	4.8"	2.9"
M82	4.8"	2.9"
M83	4.6"	2.9"
M84	5.1"	3"
M85	4.9"	3.3"
ME1	5.5"	3"
ME2	5.2"	2.8"
ME3	5.1"	3.2"

Return to door meets 1/2" requirement for all levers shown on this page.



1. M Collection not available in 612 and 613 finishes.
2. Knurled tactile warning available on 609, 612, 613, 625, 626, 629, and 630 finishes only.

Note: Images shown with Schlage L mortise 'A' rose; additional rose and escutcheon designs available. ME1, ME2 and ME3 ergonomic levers designed with Gensler as product design consultant.

STANDARD LEVER AND KNOB STYLES



01
801 - Milled tactile warning



02
802 - Knurled tactile warning[1]



03 (Tubular)
803 - Knurled tactile warning[1]



05
805 - Milled tactile warning



06 (Rhodes)
806 - Milled tactile warning



07 (Athens)
807 - Milled tactile warning



12
812 - Milled tactile warning
Handed



17 (Sparta)
817 - Milled tactile warning

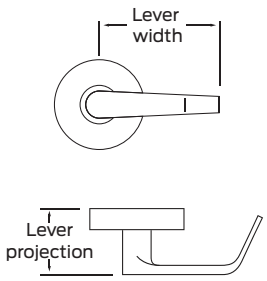


18
818 - Milled tactile warning

Dimensions

Lever	Width	Projection
01	3.88"	2.69"
02	4.75"	2.81"
03 (Tubular)	4.75"	2.81"
05	3.75"	2.88"
06 (Rhodes)	4.63"	2.5"
07 (Athens)	4.63"	2.88"
12	4.63"	3.06"
17 (Sparta)	4.75"	3"
18	4.88"	2.69"

Return to door meets 1/2" requirement for 03, 06 and 17 levers.



1. Knurled tactile warning available on 609, 612, 613, 625, 626, 629, and 630 finishes only.

Note: Images shown with Schlage L mortise 'A' rose; additional rose and escutcheon designs available.

STANDARD LEVER AND KNOB STYLES



ACC (Accent)[1]
Handed



AST (Asti)[1]
Handed



LAT (Latitude)[2]



LON (Longitude)[2]



MER (Merano)[1]
Handed



OME (Omega)



41

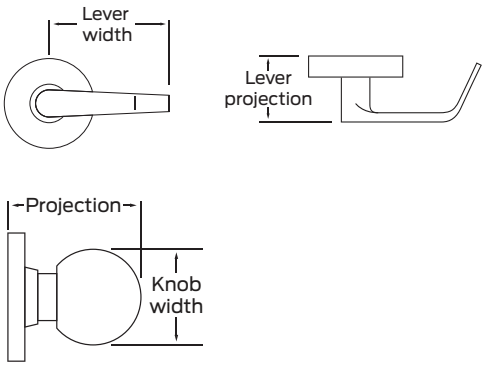


42

Dimensions

Lever	Width	Projection
ACC (Accent)	4.13"	3.13"
AST (Asti)	4"	2.63"
LAT (Latitude)	4.75"	2.56"
LON (Longitude)	4.88"	2.56"
MER (Merano)	4"	3.13"
OME (Omega)	5.06"	3.31"
41	2.21"	2.34"
42	2.13"	2.54"

Return to door meets 1/2" requirement for Longitude and Omega levers.



1. Not available in 612, 613, 629, or 630 finishes.
2. Not available in 612 or 613 finishes.

Note: Images shown with Schlage L mortise 'A' rose; additional rose and escutcheon designs available.

ESCUTCHEONS



L full face
Specify by adding 'L' after lever design.

Finishes: available in all L Series finishes.



L concealed
Specify by adding 'C' suffix to function and by adding 'L' after lever design.

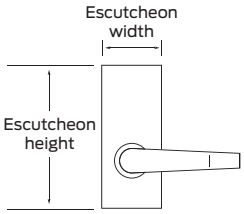
Finishes: available in all L Series finishes.



N full face
Specify by adding 'N' after lever design.

Finishes: available in all L Series finishes.

Escutcheon	Width	Height
L full face	1.75"	7.938"
L concealed	1.75"	7.938"
N full face	2.5"	7.875"



ROSES



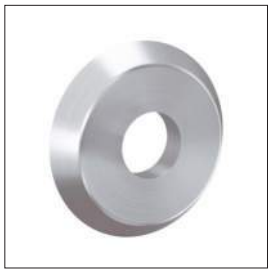
A rose
Available for use on L Series knob and lever designs. Specify by adding 'A' after lever design.

Finishes: available in all L Series finishes.



B rose
Available for use on L Series knob and lever designs. Specify by adding 'B' after lever design.

Finishes: available in all L Series finishes.



C rose
Available for use on L Series knob and lever designs. Specify by adding 'C' after lever design.

Finishes: 605, 606, 609, 619, 622, 625, 626, 629, 630, 643e.



AVA rose
Available for use with AST lever only. Specify as ASTAVA.

Finishes: 605, 606, 609, 619, 622, 625, 626, 643e.



MER rose
Available for use with MER lever only. Specify as MERMER.

Finishes: 605, 606, 609, 619, 622, 625, 626, 643e.

Rose	Diameter
A	2.125"
B	2.562"
C	2.625"
AVA	2.625"
MER	2.625"



THUMBTURNS



ADA thumbturn (standard)
09-544



Large ADA thumbturn
09-509 x L583-363
Not available with L9463 and L463



Basic thumbturn

INDICATORS

Inside Trims



Thumbturn



Key cylinder



Chevron

Standard for lock functions L9486, L9496 and L496, used with A or B roses only. Available messages: "OCCUPIED", "DO NOT DISTURB" or "LOCKED".

Outside Trims



Emergency key



Coin turn



Key cylinder

Available messages

	LOCKED	OCCUPIED	DO NOT DISTURB	
	UNLOCKED	VACANT		
Inside trim	IS-LOC	IS-OCC	IS-DND	IS-SYM
Outside trim	OS-LOC	OS-OCC	OS-DND	OS-SYM
Inside trim	IS-LOCFR	IS-OCCFR	–	–
Outside trim	OS-LOCFR	OS-OCCFR	–	–

Note: Spanish language options available via RFQ.

Dimensions

	Width	Height
Escutcheon	2.6"	9.7"
Sectional	2.6"	6.1"
Main window	2"	0.6"
Side windows	0.3"	0.6"

LIGATURE-RESISTANT SOLUTIONS



SL1[1,2]



SK1[1,2]



HSLR[2,3]
Handed

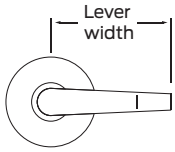
Specifications and certifications

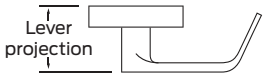
	SL1	SK1	HSLR
Accepted by OHM	●	●	●
ADA compliant	●	-	●
Suitable for:			
High risk areas	-	●	●
Medium risk areas	●	●	●
Low risk areas	●	●	●

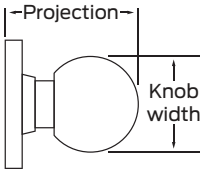
Caution: Cone shaped door knobs and thumbturns do not compliant with ADA requirements for graspability.

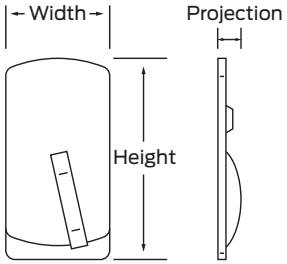
Dimensions

	Width	Height	Projection
SL1	4.5"		3.13"
SK1	3.19"		2.3125"
HSLR	6"	13.17"	2.27"





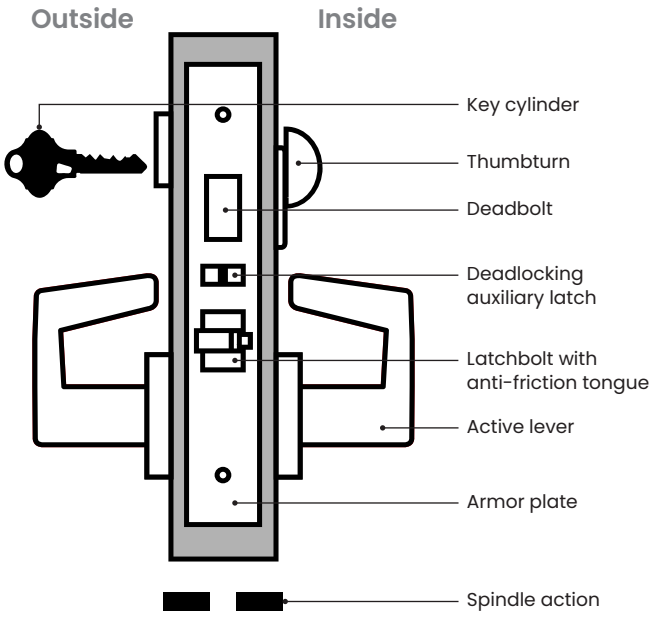




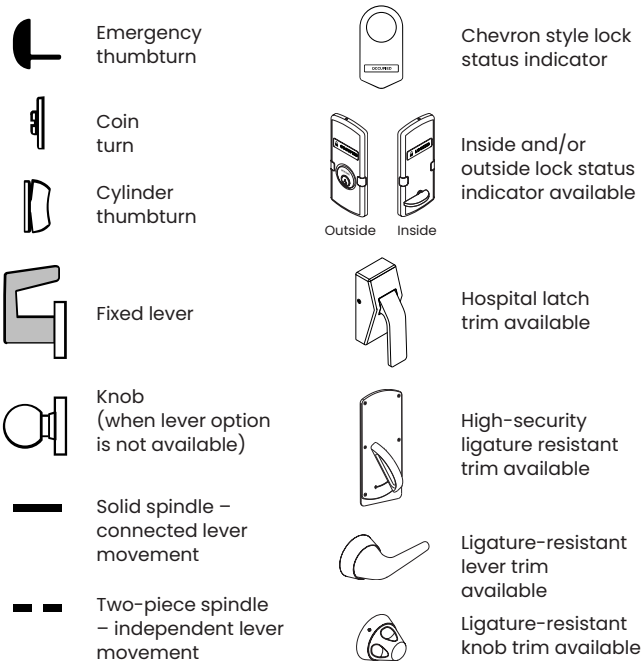
1. Only available in 630 and 630AM finishes.
2. Not available with Vandlgard option.
3. Only available in 630 finish.

MECHANICAL LOCK FUNCTIONS

Legend



Key



Product identification guide

LV9460 with XL11-635

Lock series and function code
L = standard
LV = Vandlgard® option
LM = multi-latch
LMV = multi-latch with Vandlgard

0 = no lock case (dummy trim)
9 = functions with lock case

0 = no deadbolt
1 = dummy trim
4 = with deadbolt

Function code

Functions requiring special ordering nomenclature

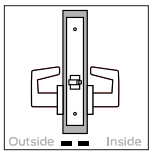


Vandlgard® feature helps protect the lock chassis from damage.

The Vandlgard optional feature available on many functions allows the outside lever to rotate freely down when in a locked state. This limits the ability of vandals to apply excessive force to the lever helping to prevent damage to internal components.

NON-KEYED FUNCTIONS

Schlage **ANSI**
L9010 **F01**

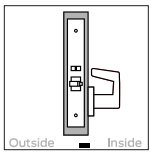


Passage latch



- Levers (or knobs) only-both sides; latchbolt only
- Latchbolt retracted by lever (or knob) from either side at all times
- Inside lever always free for immediate egress

Schlage **ANSI**
L9025 **F31**

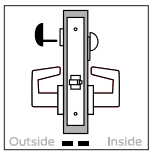


Exit or communicating lock

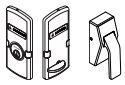
- No outside trim; lever (or knob) only-inside; latchbolt and deadlocking auxiliary latch
- Latchbolt retracted by lever (or knob) from inside only
- Inside lever always free for immediate egress

When ordering, specify door handing.

Schlage **ANSI**
L/LV9040 **F22**



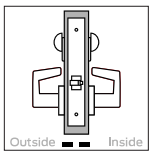
Bath/bedroom privacy lock



- Emergency thumbturn access outside; thumbturn inside; latchbolt only
- Latchbolt retracted by lever (or knob) from either side
- Outside lever is made inoperative by rotating inside thumbturn; Vandlgard® option allows outside lever to rotate freely down while locked
- To unlock from outside, remove access hole cover, insert emergency thumbturn (furnished) and rotate
- Rotating inside thumbturn unlocks outside lever; turning inside lever retracts latchbolt and unlocks outside lever; closing door also unlocks preventing lock-out
- Inside lever always free for immediate egress

Note: Hospital latch trim not available with Vandlgard option.

Schlage **ANSI**
L/LV9040 with XL11-446 **-**



Privacy with thumbturn both sides

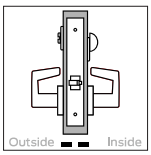


- Thumbturn both sides; latchbolt only
- Latchbolt retracted by lever (or knob) from either side
- Outside lever is made inoperative by rotating either thumbturn; Vandlgard® option allows outside lever to rotate freely down while locked
- Rotating either thumbturn unlocks outside lever
- Rotating inside lever retracts latchbolt and unlocks outside lever; closing door also unlocks
- Inside lever always free for immediate egress

Note: Available in rose or L escutcheon trim only.

To order, specify function and note XL11-446 as a special option.

Schlage **ANSI**
L/LV9044 **-**



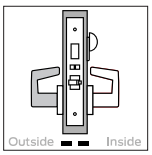
Privacy with coin turn outside



- Coin turn outside; thumbturn inside; latchbolt only
- Latchbolt retracted by lever (or knob) from either side
- Outside lever is made inoperative by rotating outside coin turn or inside thumbturn; Vandlgard® option allows outside lever to rotate freely down while locked
- Rotating outside coin turn unlocks outside lever
- Rotating inside thumbturn unlocks outside lever; turning inside lever retracts latchbolt and unlocks outside lever; closing door also unlocks preventing lock-out
- Inside lever always free for immediate egress

Note: Ligature-resistant trims not available with Vandlgard option.

Schlage **ANSI**
L9412 with XL11-907 **-**



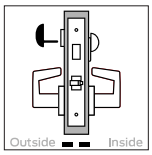
Exit lock with deadbolt

- Lever (or knob) only-outside; thumbturn inside with lever; deadbolt, latchbolt and deadlocking auxiliary latch
- Outside lever (or knob) always fixed; latchbolt retracted by inside lever
- Deadbolt thrown or retracted by rotating inside thumbturn
- Rotating inside lever retracts both deadbolt and latchbolt
- Inside lever always free for immediate egress

To order, specify function and note XL11-907 as a special option.

NON-KEYED FUNCTIONS

Schlage **ANSI**
L/LV9440 **F19**

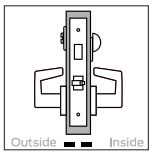


Privacy with deadbolt



- Emergency thumbturn access outside; thumbturn inside; deadbolt and latchbolt
- Latchbolt retracted by lever (or knob) from either side
- Outside lever is made inoperative when deadbolt is thrown by rotating inside thumbturn; Vandlgard® option allows outside lever to rotate freely down while locked
- To unlock from outside, remove access hole cover, insert emergency thumbturn (furnished) and rotate
- Rotating inside thumbturn unlocks outside lever; turning inside lever retracts both deadbolt and latchbolt and unlocks outside lever
- Inside lever always free for immediate egress

Schlage **ANSI**
L/LV9444 **-**



Privacy with deadbolt and coin turn outside

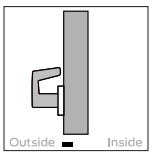


- Coin turn outside; thumbturn inside; deadbolt and latchbolt
- Latchbolt retracted by lever (or knob) from either side
- Outside lever is made inoperative when deadbolt is thrown by rotating inside thumbturn or outside coin turn; Vandlgard® option allows outside lever to rotate freely down while locked
- Rotating outside coin turn retracts deadbolt and unlocks outside lever
- Rotating inside thumbturn unlocks outside lever; turning inside lever retracts both deadbolt and latchbolt and unlocks outside lever
- Inside lever always free for immediate egress

Note: Ligature-resistant trims not available with Vandlgard option.

NON-KEYED DUMMY FUNCTIONS

Schlage **ANSI**
L0170 **-**



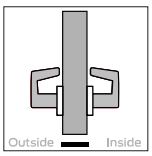
Half dummy trim

- Lever (or knob) only-one side; no armor front or mortise case
- Lever always fixed

Note: Do not use on hollow core wood doors. All metal door applications require reinforcement.

Ordering: Specify door handing. Additionally, when ordering with escutcheon trim, an inside escutcheon with through bolts will be provided.

Schlage **ANSI**
L0172 **-**

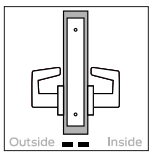


Full dummy trim

- Levers (or knobs) only-both sides; no armor front or mortise case
- Both levers always fixed

Note: All metal door applications require reinforcement.

Schlage **ANSI**
L9110 with XL11-741 **-**



Full dummy trim with active levers

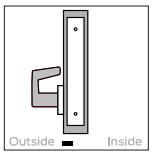
- Levers (or knobs) only-both sides; blank armor front without latchbolt
- Both levers always active

Note: Includes blank armor front and lock case.

To order, specify function and note XL11-741 as a special option. May be ordered with optional XL11-743 armor front with cutout to receive deadbolt.

NON-KEYED DUMMY FUNCTIONS

Schlage **ANSI**
L9175 **-**



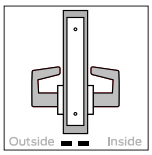
Half dummy trim with lock case

- Lever (or knob) only-one side; blank armor front without latchbolt
- Lever always fixed

Note: Includes blank armor front and lock case.

Door handing must be specified. May be ordered with optional XL11-743 armor front with cutout to receive deadbolt.

Schlage **ANSI**
L9176 **-**



Full dummy trim with lock case

- Levers (or knobs) only-both sides; blank armor front without latchbolt
- Both levers always fixed

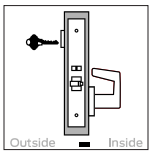
Note: Includes blank armor front and lock case.

May be ordered with optional XL11-743 armor front with cutout to receive deadbolt.

Ordering: In a double-door application where dummy is used as the strike, order 10-091 armored front strike separately.

SINGLE CYLINDER NON-DEADBOLT FUNCTIONS

Schlage **ANSI**
L9026 **-**



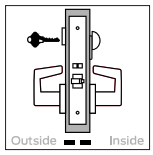
Exit lock with cylinder

- Key cylinder only, no lever (or knob) outside; lever only-inside; latchbolt and deadlocking auxiliary latch
- Latchbolt retracted by lever from inside
- Key outside retracts latchbolt
- Inside lever always free for immediate egress

Note: Available in rose or L escutcheon trim only.

When ordering, specify door handing.

Schlage **ANSI**
L/LV9050 **F04**



Entrance/office lock

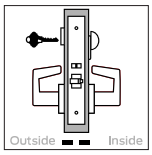


- Key cylinder outside; thumbturn inside; latchbolt and deadlocking auxiliary latch
- Latchbolt retracted by lever (or knob) from either side
- Outside lever is made inoperative by key outside or by turning inside thumbturn; Vandlgard® option allows both levers to rotate freely down while locked
- Key outside unlocks outside lever and retracts latchbolt
- Rotating inside thumbturn unlocks outside lever; turning inside lever retracts latchbolt but does not unlock
- Inside lever always free for immediate egress

Caution: Egress without fully rotating the thumbturn to vertical position can result in lock-out situations.

Note: Hospital latch and ligature-resistant trims not available with Vandlgard option.

Schlage **ANSI**
L/LV9056 **-**
L/LV9056 with XL13-439



Entrance/office lock with automatic unlocking



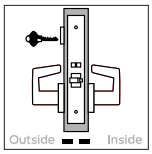
- Key cylinder outside; thumbturn inside; latchbolt and deadlocking auxiliary latch
- Latchbolt retracted by lever (or knob) from either side
- Outside lever is made inoperative by key outside or by turning inside thumbturn; Vandlgard® option allows outside lever to rotate freely down while locked
- Key outside unlocks outside lever and retracts latchbolt; XL13-439 option also allows key override of thumbturn if being held in locked position
- Rotating inside thumbturn unlocks outside lever; turning inside lever retracts latchbolt and unlocks outside lever; closing door also unlocks preventing lock-out
- Inside lever always free for immediate egress

Note: Ligature-resistant trims not available with Vandlgard option.

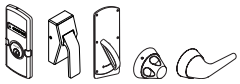
To order with key override, specify function and note XL13-439 as a special option.

SINGLE CYLINDER NON-DEADBOLT FUNCTIONS

Schlage **ANSI**
L/LV9070 **F05**



Classroom lock, exterior lockdown only

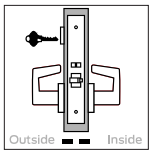


- Key cylinder outside with lever (or knob); lever only-inside; latchbolt and deadlocking auxiliary latch
- Latchbolt retracted by lever from either side
- Outside lever is made inoperative by key outside; Vandlgard® option allows outside lever to rotate freely down while locked
- Key outside unlocks outside lever and retracts latchbolt
- Inside lever always free for immediate egress

Note: Outside lever remains inoperative until unlocked by key.

Note: Hospital latch and ligature-resistant trims not available with Vandlgard option.

Schlage **ANSI**
L/LV9076 **F06**



Classroom holdback lock, exterior lockdown only



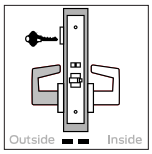
- Key cylinder outside with lever (or knob); lever only-inside; latchbolt and deadlocking auxiliary latch
- Latchbolt retracted by lever from either side
- Outside lever is made inoperative by key outside; Vandlgard® option allows outside lever to rotate freely down while locked
- Key outside unlocks outside lever and retracts latchbolt
- Rotate inside lever while turning key 360° to activate retracted latch holdback feature; to deactivate, reverse key rotation 360°
- Inside lever always free for immediate egress

Note: Outside lever remains inoperative until unlocked by key.

Note: Locks with holdback feature are not UL listed. Installation should be in accordance with existing codes only.

Note: Ligature-resistant trims not available with Vandlgard option.

Schlage **ANSI**
L/LV9080 **F07**



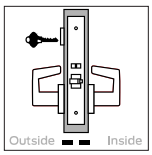
Storeroom lock



- Key cylinder outside with lever (or knob); lever only-inside; latchbolt and deadlocking auxiliary latch
- Outside lever always fixed; latchbolt retracted by inside lever; Vandlgard® option allows outside lever to rotate freely down while locked
- Key outside retracts latchbolt
- Inside lever always free for immediate egress

Note: Hospital latch and ligature-resistant trims not available with Vandlgard option.

Schlage **ANSI**
L/LV9081 **-**



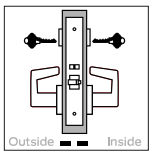
Accessible storeoom lock

- Key cylinder outside with lever (or knob); lever only-inside; latchbolt and deadlocking auxiliary latch
- Latchbolt retracted by lever from either side
- Outside lever is made inoperative by key outside; Vandlgard® option allows outside lever to rotate freely down while locked
- Key outside inserted and turned 280° unlocks allowing outside lever to retract latchbolt
- Inside lever always free for immediate egress

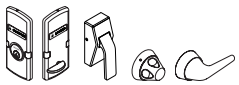
When ordering, specify door handing.

DOUBLE CYLINDER NON-DEADBOLT FUNCTIONS

Schlage **ANSI**
L/LV9060 **F09**



Apartment entrance lock

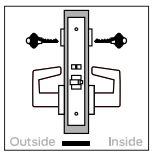


- Key cylinder both sides; latchbolt and deadlocking auxiliary latch
- Latchbolt retracted by lever (or knob) from either side
- Outside lever is made inoperative by key inside; Vandlgard® option allows outside lever to rotate freely down while locked
- Key outside retracts latchbolt but cannot lock or unlock outside lever
- Rotating inside lever retracts latchbolt; key inside retracts latchbolt and unlocks outside lever
- Inside lever always free for immediate egress

Note: Outside lever remains inoperative until unlocked by key inside.

Note: Hospital latch and ligature-resistant trims not available with Vandlgard option.

Schlage **ANSI**
L9066 with XL11-897 **-**



Store lock



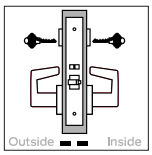
- Key cylinder both sides; latchbolt and deadlocking auxiliary latch
- Latchbolt retracted by lever (or knob) from either side
- Both levers are made inoperative by key from either side
- Key use on either side unlocks both levers and retracts latchbolt

Caution: Double cylinder locks on any door, in any structure which is used for egress are a life safety hazard in times of emergency and their use is not recommended. Installation should be in accordance with existing codes only.

Note: Ligature-resistant trims not available with Vandlgard option.

To order, specify function and note XL11-897 as a special option.

Schlage **ANSI**
L/LV9071 **F32**



Classroom security lock, interior/exterior lockdown

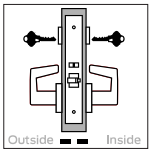


- Key cylinder both sides; latchbolt and deadlocking auxiliary latch
- Latchbolt retracted by lever (or knob) from either side
- Outside lever is made inoperative by key from either side; Vandlgard® option allows outside lever to rotate freely down while locked
- Rotating inside lever retracts latchbolt; key on either side unlocks outside lever and retracts latchbolt
- Inside lever always free for immediate egress

Note: Outside lever remains inoperative until unlocked by key.

Note: Ligature-resistant trims not available with Vandlgard option.

Schlage **ANSI**
L/LV9077 **-**



Classroom security holdback lock, interior/exterior lockdown



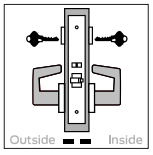
- Key cylinder both sides; latchbolt and deadlocking auxiliary latch
- Latchbolt retracted by lever (or knob) from either side
- Outside lever is made inoperative by key from either side; Vandlgard® option allows outside lever to rotate freely down while locked
- Key outside retracts latchbolt but cannot unlock outside lever
- Rotating inside lever retracts latchbolt; key inside retracts latchbolt and unlocks outside lever
- Rotate inside lever while turning key 360° to activate retracted latch holdback feature; to deactivate, reverse key rotation 360°
- Inside lever always free for immediate egress

Note: Outside lever remains inoperative until unlocked by key inside.

Note: Locks with holdback feature are not UL listed. Installation should be in accordance with existing codes only.

Note: Ligature-resistant trims not available with Vandlgard option.

Schlage **ANSI**
L/LV9082 **F30**



Institution lock



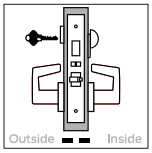
- Key cylinder both sides; latchbolt and deadlocking auxiliary latch
- Both levers (or knobs) always fixed; Vandlgard® option allows both levers to rotate freely down while locked
- Key on either side retracts latchbolt

Caution: Double cylinder locks on any door, in any structure which is used for egress are a life safety hazard in times of emergency and their use is not recommended. Installation should be in accordance with existing codes only.

Note: Hospital latch and ligature-resistant trims not available with Vandlgard option.

SINGLE CYLINDER DEADBOLT FUNCTIONS

Schlage **ANSI**
L/LV9453 **F20**



Entrance/office lock with deadbolt

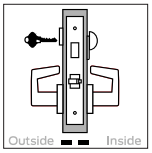


- Key cylinder outside; thumbturn inside; deadbolt, latchbolt and deadlocking auxiliary latch
- Latchbolt retracted by lever (or knob) from either side
- Outside lever is made inoperative when deadbolt is thrown by key outside; rotating thumbturn 20° locks outside lever only; rotating thumbturn 90° also throws deadbolt; Vandlgard® option allows outside lever to rotate freely down while locked
- Key outside retracts deadbolt and latchbolt, however, outside lever remains locked
- Rotating inside lever retracts deadbolt and latchbolt; outside lever unlocked when thumbturn is returned to vertical position
- Inside lever always free for immediate egress

Caution: Egress without fully rotating the thumbturn to vertical position can result in lock-out situations.

Note: Hospital latch and ligature-resistant trims not available with Vandlgard option.

Schlage **ANSI**
L/LV9456 **F13**
L/LV9456 with XL13-439



Corridor lock with deadbolt

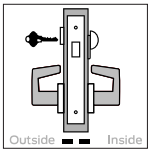


- Key cylinder outside; thumbturn inside; deadbolt and latchbolt
- Latchbolt retracted by lever (or knob) from either side
- Outside lever is made inoperative when deadbolt is thrown by key outside or by inside thumbturn; Vandlgard® option allows outside lever to rotate freely down while locked
- Key outside retracts deadbolt and unlocks outside lever; XL13-439 option allows key to retract deadbolt overriding thumbturn if being held in locked position
- Rotating inside lever retracts both deadbolt and latchbolt and unlocks outside lever
- Inside lever always free for immediate egress

Note: Hospital latch and ligature-resistant trims not available with Vandlgard option.

To order with key override, specify function and note XL13-439 as a special option.

Schlage **ANSI**
L9460 with XL11-635 **-**



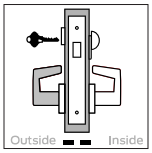
Cylinder x thumbturn deadbolt with fixed levers



- Key cylinder outside; thumbturn inside; deadbolt only
- Both levers (or knobs) always fixed
- Deadbolt thrown or retracted by key outside or by inside thumbturn

To order, specify function and note XL11-635 as a special option.

Schlage **ANSI**
L9460 with XL11-886 **-**



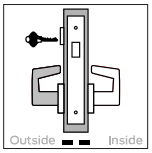
Cylinder x thumbturn deadbolt with inside active lever



- Key cylinder outside; thumbturn inside; deadbolt only
- Outside lever (or knob) always fixed; inside lever always active
- Deadbolt thrown or retracted by key outside or by inside thumbturn
- Rotating inside lever retracts deadbolt
- Inside lever always free for immediate egress

To order, specify function and note XL11-886 as a special option.

Schlage **ANSI**
L9464 with XL11-886 **-**



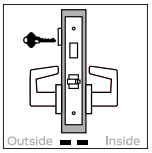
Single cylinder deadbolt with inside active lever



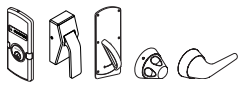
- Key cylinder outside with lever (or knob); lever only-inside; deadbolt only
- Outside lever always fixed; inside lever always active
- Deadbolt thrown or retracted by key outside
- Rotating inside lever retracts deadbolt
- Inside lever always free for immediate egress

To order, specify function and note XL11-886 as a special option.

Schlage **ANSI**
L9465 **-**



Closet/storeroom lock



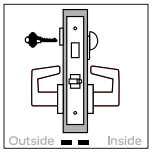
- Key cylinder outside with lever (or knob); lever only-inside; deadbolt and latchbolt
- Latchbolt retracted by lever from either side at all times
- Deadbolt thrown or retracted by key outside

Caution: Deadbolt locks with outside key retraction only can result in situations where occupants can be locked in.

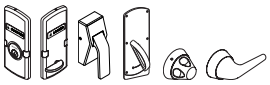
Note: Hospital latch and ligature-resistant trims not available with Vandlgard option.

SINGLE CYLINDER DEADBOLT FUNCTIONS

Schlage **ANSI**
L9473 **F21**



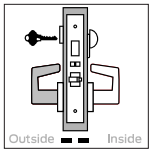
Dormitory/bedroom lock



- Key cylinder outside; thumbturn inside; deadbolt and latchbolt
- Latchbolt retracted by lever (or knob) from either side at all times
- Deadbolt thrown or retracted by key outside or by inside thumbturn

Note: Hospital latch and ligature-resistant trims not available with Vandlgard option.

Schlage **ANSI**
L/LV9480 **-**
L/LV9480 with XL13-439



Storeroom lock with deadbolt

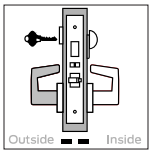


- Key cylinder outside; thumbturn inside; deadbolt, latchbolt and deadlocking auxiliary latch
- Outside lever (or knob) always fixed; latchbolt retracted by inside lever; Vandlgard® option allows outside lever to rotate freely down while locked
- Deadbolt thrown or retracted by key outside or by inside thumbturn
- Key outside retracts deadbolt and latchbolt, however, outside lever remains locked; XL13-439 option allows key to retract deadbolt and latchbolt overriding thumbturn if being held in locked position
- Rotating inside lever retracts both deadbolt and latchbolt
- Inside lever always free for immediate egress

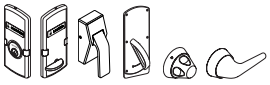
Note: Ligature-resistant trims not available with Vandlgard option.

To order with key override, specify function and note XL13-439 as a special option.

Schlage **ANSI**
L/LV9485 **-**
L/LV9485 with XL13-439



Faculty/hotel restroom lock with deadbolt



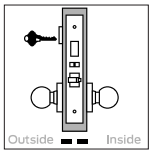
- Key cylinder outside; thumbturn inside; deadbolt, latchbolt and deadlocking auxiliary latch
- Outside lever (or knob) always fixed; latchbolt retracted by inside lever; Vandlgard® option allows outside lever to rotate freely down while locked
- Deadbolt thrown or retracted by rotating inside thumbturn
- Key outside retracts latchbolt but does not retract deadbolt unless using an emergency key (sold separately); XL13-439 option allows emergency key to retract deadbolt and latchbolt overriding thumbturn if being held in locked position
- Rotating inside lever retracts both deadbolt and latchbolt
- Inside lever always free for immediate egress

Note: Not available in SFIC or Everest SL formats.

Note: Hospital latch and ligature-resistant trims not available with Vandlgard option.

To order with key override, specify function and note XL13-439 as a special option.

Schlage **ANSI**
L9485 with XL11-557 **-**



Prison function lock

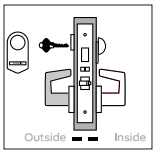
- Key cylinder outside with knob; knob only-inside; deadbolt, latchbolt and deadlocking auxiliary latch
- Outside knob always free spinning; latchbolt retracted by inside knob
- Inside knob is made inoperative (fixed) when deadbolt is thrown by guard key outside
- Guard key outside retracts deadbolt and unlocks inside knob; in unlocked state use of prisoner's key outside retracts latchbolt only

Note: Available with knobs in rose or L escutcheon trim only. Tamper-resistant Torx screws standard.

To order, specify function and note XL11-557 as a special option.

SINGLE CYLINDER DEADBOLT FUNCTIONS

Schlage **ANSI**
L/LV9486 -
L/LV9486 with XL13-439



Faculty/hotel restroom lock with chevron indicator



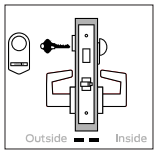
- Key cylinder outside; thumbturn inside; deadbolt, latchbolt and deadlocking auxiliary latch
- Outside lever (or knob) always fixed; latchbolt retracted by inside lever; Vandlgard® option allows outside lever to rotate freely down while locked
- Deadbolt thrown or retracted by rotating inside thumbturn, when thrown-indicator message changes from blank to "DO NOT DISTURB"
- Key outside retracts latchbolt but does not retract deadbolt unless using an emergency key (sold separately); XL13-439 option allows emergency key to retract deadbolt and latchbolt overriding thumbturn if being held in locked position
- Rotating inside lever retracts both deadbolt and latchbolt
- Inside lever always free for immediate egress

Note: Not available in SFIC or Everest SL formats. Hospital latch trim not available with Vandlgard option.

To order with key override, specify function and note XL13-439 as a special option.

Available with A, B or C roses only; to order chevron indicator with "OCCUPIED" message specify L583-375.

Schlage **ANSI**
L/LV9496 -
L/LV9496 with XL13-439



Corridor lock with chevron indicator

- Key cylinder outside; thumbturn inside; deadbolt and latchbolt
- Latchbolt retracted by lever (or knob) from either side
- Outside lever is made inoperative when deadbolt is thrown by key outside or by inside thumbturn, when thrown-indicator message changes from blank to "OCCUPIED"; Vandlgard® option allows outside lever to rotate freely down while locked
- Key outside retracts deadbolt and unlocks outside lever; XL13-439 option allows key to retract deadbolt overriding thumbturn if being held in locked position
- Rotating inside lever retracts both deadbolt and latchbolt and unlocks outside lever
- Inside lever always free for immediate egress

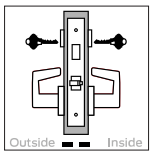
Note: Available in rose trim only.

To order with key override, specify function and note XL13-439 as a special option.

Adds chevron style occupancy indicator (09-611) to sectional trim lock with A or B roses only.

DOUBLE CYLINDER DEADBOLT FUNCTIONS

Schlage **ANSI**
L/LV9457 **F33**



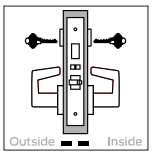
Classroom security lock with deadbolt



- Key cylinder both sides; deadbolt and latchbolt
- Latchbolt retracted by lever (or knob) from either side
- Outside lever is made inoperative when deadbolt is thrown by key from either side; Vandlgard® option allows outside lever to rotate freely down while locked
- Key either side retracts both latchbolt and deadbolt and unlocks outside lever
- Rotating inside lever retracts both deadbolt and latchbolt and unlocks outside lever
- Inside lever always free for immediate egress

Note: Ligature-resistant trims not available with Vandlgard option.

Schlage **ANSI**
L/LV9458 **F34**



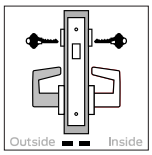
Classroom security lock with deadbolt and auxiliary latch



- Key cylinder both sides; deadbolt, latchbolt and deadlocking auxiliary latch
- Latchbolt retracted by lever (or knob) from either side
- Outside lever is made inoperative when deadbolt is thrown by key from either side; Vandlgard® option allows outside lever to rotate freely down while locked
- Key either side retracts both latchbolt and deadbolt and unlocks outside lever
- Rotating inside lever retracts both deadbolt and latchbolt and unlocks outside lever
- Inside lever always free for immediate egress

Note: Ligature-resistant trims not available with Vandlgard option.

Schlage **ANSI**
L9462 with XL11-886 **-**



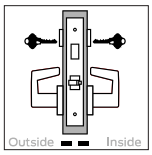
Double cylinder deadbolt with active inside lever



- Key cylinder both sides; deadbolt only
- Outside lever (or knob) always fixed; inside lever always active
- Deadbolt thrown or retracted by key from either side
- Rotating inside lever retracts deadbolt
- Inside lever always free for immediate egress

To order, specify function and note XL11-886 as a special option.

Schlage **ANSI**
L9466 **F14**



Utility room/ storeroom lock

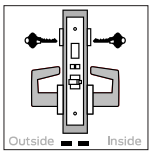


- Key cylinder both sides; deadbolt and latchbolt
- Latchbolt retracted by lever (or knob) from either side
- Deadbolt thrown or retracted by key from either side

Caution: Double cylinder locks on any door, in any structure which is used for egress are a life safety hazard in times of emergency and their use is not recommended. Installation should be in accordance with existing codes only.

Note: Hospital latch and ligature-resistant trims not available with Vandlgard option.

Schlage **ANSI**
L/LV9482 x XL11-543 **-**



Institution lock with deadbolt

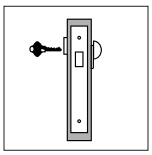
- Key cylinder both sides; deadbolt, latchbolt and deadlocking auxiliary latch
- Both levers always fixed; Vandlgard® option allows both levers to rotate freely down while locked
- Deadbolt thrown or retracted by key from either side
- Key on either side retracts both deadbolt and latchbolt

Caution: Double cylinder locks on any door, in any structure which is used for egress are a life safety hazard in times of emergency and their use is not recommended. Installation should be in accordance with existing codes only.

To order, specify function and note XL11-543 as a special option.

MORTISE DEADBOLT FUNCTIONS

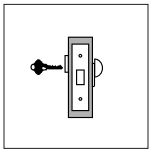
Schlage L9460 — **ANSI** F17



Cylinder x thumbturn mortise deadbolt



Schlage L460 — **ANSI** E06071



Cylinder x thumbturn small case mortise deadbolt

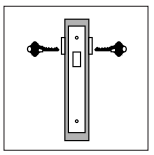


- Key cylinder only, no lever (or knob) outside; thumbturn only, no lever inside; deadbolt only
- Deadbolt thrown or retracted by key outside or by inside thumbturn

Note: L9000 mortise deadbolts available in L escutcheon or sectional trim only.

Note: L400 small case not available with escutcheon trim.

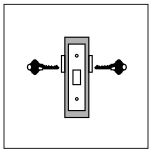
Schlage L9462 — **ANSI** F16



Double cylinder mortise deadbolt



Schlage L462 — **ANSI** E06061



Double cylinder small case mortise deadbolt



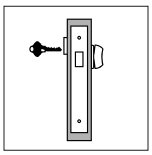
- Key cylinder both sides, no levers (or knobs); deadbolt only
- Deadbolt thrown or retracted by key from either side

Caution: Double cylinder locks on any door, in any structure which is used for egress are a life safety hazard in times of emergency and their use is not recommended. Installation should be in accordance with existing codes only.

Note: L9000 mortise deadbolts available in L escutcheon or sectional trim only.

Note: L400 small case not available with escutcheon trim.

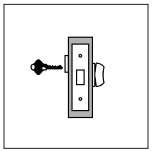
Schlage L9463 — **ANSI** F29



Cylinder x cylinder thumbturn mortise deadbolt



Schlage L463 — **ANSI** E06091



Cylinder x cylinder thumbturn small case mortise deadbolt

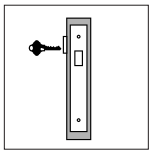


- Key cylinder only, no lever (or knob) outside; cylinder thumbturn only, no lever inside; deadbolt only
- Deadbolt thrown or retracted by key outside
- Rotating inside thumbturn retracts deadbolt but cannot project it

Note: L9000 mortise deadbolts available in L escutcheon or sectional trim only.

Note: L400 small case not available with escutcheon trim.

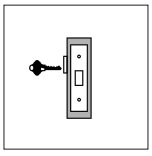
Schlage L9464 — **ANSI** F18



Cylinder only mortise deadbolt



Schlage L464 — **ANSI** E06081



Cylinder only small case mortise deadbolt

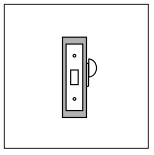


- Key cylinder only, no lever (or knob) outside; no interior trim; deadbolt only
- Deadbolt thrown or retracted by key

Note: L9000 mortise deadbolts available in L escutcheon or sectional trim only.

Note: L400 small case not available with escutcheon trim.

Schlage L480 — **ANSI** -



Thumbturn only small case mortise deadbolt

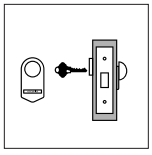


- No outside trim; thumbturn only, no lever inside; deadbolt only
- Deadbolt thrown or retracted by rotating inside thumbturn

Note: When ordered with indicator, the indicator is applied to the thumbturn side.

Note: L400 small case not available with escutcheon trim.

Schlage L496 — **ANSI** -

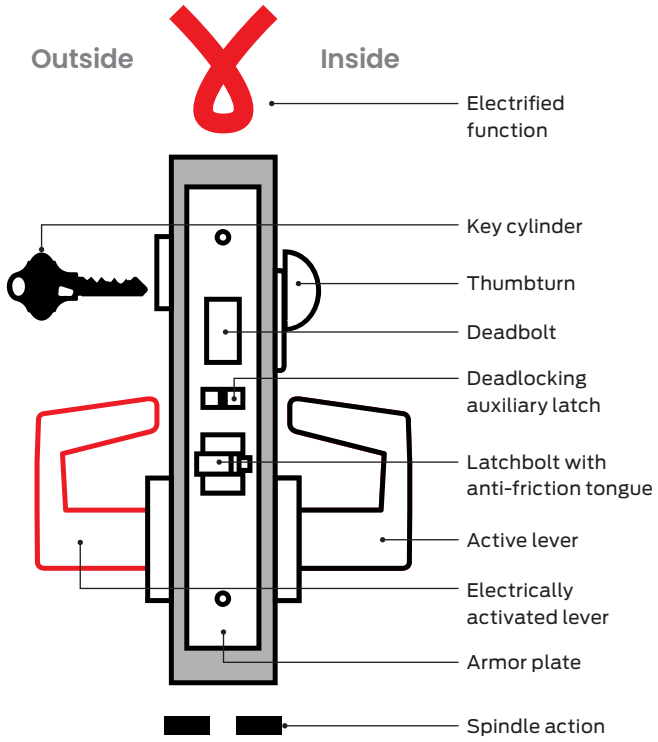


Cylinder x thumbturn small case mortise deadbolt with chevron indicator

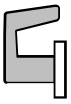
- Key cylinder only, no lever (or knob) outside; thumbturn only, no lever inside; deadbolt only
- Deadbolt thrown or retracted by key outside or by inside thumbturn, when thrown-indicator message changes from blank to "OCCUPIED"

WIRED ELECTRIFIED LOCK FUNCTIONS

Legend



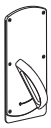
Key


Fixed lever

Solid spindle – connected lever movement

Two-piece spindle – independent lever movement


Hospital latch trim available


High-security ligature resistant trim available


Ligature-resistant lever trim available


Ligature-resistant knob trim available

Available electrified options include:

RX	Request to Exit
LX	Latch bolt monitor
DPS	Door Position Switch
DM	Deadbolt monitor (DM)

Product identification guide

LV9492EL with XL13-439

Lock series and function code
L = standard
LV = Vandlgard® option
LM = multi-latch
LMV = multi-latch with Vandlgard

0 = no lock case (dummy trim)
9 = functions with lock case

0 = no deadbolt
4 = with deadbolt

Function code

Electrified functions
EL = electrically locked
EU = electrically unlocked

Functions requiring special ordering nomenclature

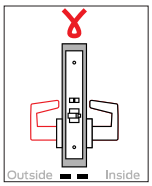


Vandlgard® feature helps protect the lock chassis from damage.

The Vandlgard optional feature available on many functions allows the outside lever to rotate freely down when in a locked state. This limits the ability of vandals to apply excessive force to the lever helping to prevent damage to internal components.

NON-KEYED ELECTRIFIED FUNCTIONS

Schlage **ANSI**
L/LV9090EL/EU **-**



Electrically locking/ unlocking outside lever, no cylinder



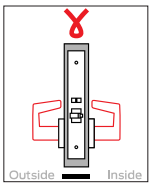
- Levers (or knobs) only both sides; latchbolt and deadlocking auxiliary latch
- Powered state: outside lever continuously locked (EL mode) or unlocked (EU mode); Vandlgard® option allows outside lever to rotate freely down while locked
- When power is removed (or power fails): in EL mode either lever will retract latchbolt; in EU mode outside lever is locked
- Inside lever always free for immediate egress

Note: Auto detects 12 or 24V DC.

Note: Ligature-resistant trims not available with Vandlgard option.

Ordering: Case-mounted switch allows field selectable EL/EU setting however, when ordering, please specify EL or EU.

Schlage **ANSI**
L/LV9091EL/EU **-**



Electrically locking/ unlocking both levers, no cylinder



- Levers (or knobs) only both sides; latchbolt and deadlocking auxiliary latch
- Powered state: both levers continuously locked (EL mode) or unlocked (EU mode); Vandlgard® option allows both levers to rotate freely down while locked
- When power is removed (or power fails): in EL mode either lever will retract latchbolt; in EU mode both levers are locked

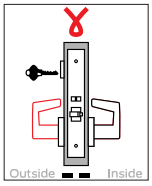
Note: Auto detects 12 or 24V DC.

Note: Ligature-resistant trims not available with Vandlgard option.

Ordering: Case-mounted switch allows field selectable EL/EU setting however, when ordering, please specify EL or EU.

KEYED NON-DEADBOLT ELECTRIFIED FUNCTIONS

Schlage **ANSI**
L/LV9092EL/EU **-**



Electrically locking/ unlocking outside lever, outside cylinder



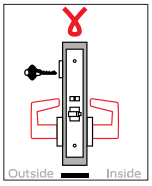
- Key cylinder outside with lever (or knob); lever only-inside; latchbolt and deadlocking auxiliary latch
- Powered state: outside lever continuously locked (EL mode) or unlocked (EU mode); Vandlgard® option allows outside lever to rotate freely down while locked
- Key outside retracts latchbolt but cannot change the normal locked or unlocked state of outside lever
- When power is removed (or power fails): in EL mode either lever will retract latchbolt; in EU mode outside lever is locked
- Inside lever always free for immediate egress

Note: Auto detects 12 or 24V DC.

Note: Hospital latch and ligature-resistant trims not available with Vandlgard option.

Ordering: Case-mounted switch allows field selectable EL/EU setting however, when ordering, please specify EL or EU.

Schlage **ANSI**
L/LV9093EL/EU **-**



Electrically locking/ unlocking both levers, outside cylinder



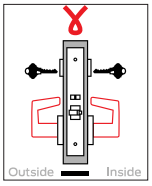
- Key cylinder outside with lever (or knob); lever only-inside; latchbolt and deadlocking auxiliary latch
- Powered state: both levers continuously locked (EL mode) or unlocked (EU mode); Vandlgard® option allows both levers to rotate freely down while locked
- Key outside retracts latchbolt but cannot change the normal locked or unlocked state of either lever
- When power is removed (or power fails): in EL mode either lever will retract latchbolt; in EU mode both levers are locked

Note: Auto detects 12 or 24V DC.

Note: Ligature-resistant trims not available with Vandlgard option.

Ordering: Case-mounted switch allows field selectable EL/EU setting however, when ordering, please specify EL or EU.

Schlage **ANSI**
L/LV9095EL/EU **-**



Electrically locking/ unlocking both levers, double cylinder



- Key cylinder both sides; latchbolt and deadlocking auxiliary latch
- Powered state: both levers (or knobs) continuously locked (EL mode) or unlocked (EU mode); Vandlgard® option allows both levers to rotate freely down while locked
- Key on either side retracts latchbolt but cannot change the normal locked or unlocked state of levers
- When power is removed (or power fails): in EL mode either lever will retract latchbolt; in EU mode both levers are locked

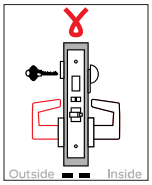
Note: Auto detects 12 or 24V DC.

Note: Hospital latch and ligature-resistant trims not available with Vandlgard option.

Ordering: Case-mounted switch allows field selectable EL/EU setting however, when ordering, please specify EL or EU.

DEADBOLT ELECTRIFIED FUNCTIONS

Schlage **ANSI**
L/LV9492EL/EU -
L/LV9492EL/EU with XL13-439



Electrically locking/unlocking outside lever, outside cylinder, inside thumbturn with deadbolt



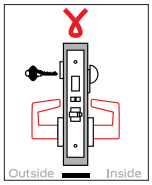
- Key cylinder outside; thumbturn inside; deadbolt, latchbolt and deadlocking auxiliary latch
- Powered state: outside lever (or knob) continuously locked (EL mode) or unlocked (EU mode); Vandlgard® option allows outside lever to rotate freely down while locked
- Deadbolt thrown or retracted by key outside or by inside thumbturn; XL13-439 option allows key to retract deadbolt overriding thumbturn if being held in locked position
- When power is removed (or power fails): in EL mode either lever will retract latchbolt; in EU mode outside lever is locked; deadbolt projection is independent of electrically locked or unlocked state of outside lever
- Rotating inside lever retracts both deadbolt and latchbolt
- Inside lever always free for immediate egress

Note: Auto detects 12 or 24V DC; supplied deadbolt monitor allows option to prevent ingress with card use when deadbolt is thrown.

Note: Ligature-resistant trims not available with Vandlgard option.

Ordering: Case-mounted switch allows field selectable EL/EU setting however, when ordering, please specify EL or EU.

Schlage **ANSI**
L/LV9493EL/EU -
L/LV9493EL/EU with XL13-439



Electrically locking/unlocking both levers, outside cylinder, inside thumbturn with deadbolt



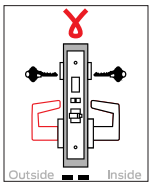
- Key cylinder outside; thumbturn inside; deadbolt, latchbolt and deadlocking auxiliary latch
- Powered state: both levers (or knobs) continuously locked (EL mode) or unlocked (EU mode); Vandlgard® option allows both levers to rotate freely down while locked
- Deadbolt thrown or retracted by key outside or by inside thumbturn; XL13-439 option allows key to retract deadbolt overriding thumbturn if being held in locked position
- When power is removed (or power fails): in EL mode either lever will retract latchbolt; in EU mode both levers are locked; deadbolt projection is independent of electrically locked or unlocked state of either lever
- When unlocked, rotating inside lever retracts both deadbolt and latchbolt

Note: Auto detects 12 or 24V DC; supplied deadbolt monitor allows option to prevent ingress with card use when deadbolt is thrown.

Note: Ligature-resistant trims not available with Vandlgard option.

Ordering: Case-mounted switch allows field selectable EL/EU setting however, when ordering, please specify EL or EU.

Schlage **ANSI**
L/LV9494EL/EU -



Electrically locking/ unlocking outside lever, double cylinder with deadbolt



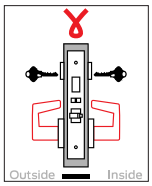
- Key cylinder both sides; deadbolt, latchbolt and deadlocking auxiliary latch
- Powered state: outside lever (or knob) continuously locked (EL mode) or unlocked (EU mode); Vandlgard® option allows outside lever to rotate freely down while locked
- Deadbolt thrown or retracted by key from either side
- When power is removed (or power fails): in EL mode either lever will retract latchbolt; in EU mode outside lever is locked; deadbolt projection is independent of electrically locked or unlocked state of outside lever
- Rotating inside lever retracts both deadbolt and latchbolt
- Inside lever always free for immediate egress

Note: Auto detects 12 or 24V DC; supplied deadbolt monitor allows option to prevent ingress with card use when deadbolt is thrown.

Note: Ligature-resistant trims not available with Vandlgard option.

Ordering: Case-mounted switch allows field selectable EL/EU setting however, when ordering, please specify EL or EU.

Schlage **ANSI**
L/LV9495EL/EU -



Electrically locking/ unlocking both levers, double cylinder with deadbolt



- Key cylinder both sides; deadbolt, latchbolt and deadlocking auxiliary latch
- Powered state: both levers (or knobs) continuously locked (EL mode) or unlocked (EU mode); Vandlgard® option allows both levers to rotate freely down while locked
- Deadbolt thrown or retracted by key from either side
- When power is removed (or power fails): in EL mode either lever will retract latchbolt; in EU mode both levers are locked; deadbolt projection is independent of electrically locked or unlocked state of either lever
- When unlocked, rotating inside lever retracts both deadbolt and latchbolt

Note: Auto detects 12 or 24V DC; supplied deadbolt monitor allows option to prevent ingress with card use when deadbolt is thrown.

Note: Ligature-resistant trims not available with Vandlgard option.

Ordering: Case-mounted switch allows field selectable EL/EU setting however, when ordering, please specify EL or EU.

CYLINDERS

Conventional mortise cylinder options	
P6	6-pin cylinder (default) with Schlage logo
P	6-pin cylinder, keyed 5
Z	Everest SL cylinder, 7-pin (A2 pinning) with Schlage logo
L	Less conventional cylinder
C6	Concealed mortise, 6-pin
C	Concealed mortise, 6-pin cylinder, keyed 5
W	Less concealed mortise cylinder

Full size interchangeable core (FSIC) mortise cylinder options	
R	6-pin FSIC with Schlage logo
M	Everest SL FSIC, 7-pin (A2 pinning) with Schlage logo
J	Less FSIC
F	6-pin FSIC less Schlage logo
T	Refundable FSIC construction core

Small format interchangeable core (SFIC) mortise cylinder options	
G	7-pin SFIC (A2 pinning) with Schlage logo
B	Less SFIC
BDC	Disposable SFIC construction core
H	Refundable SFIC construction core

SPECIFICATIONS

Chassis	
Case material	Cold Rolled Steel (CRS) with zinc dichromate plating
Case size	L9000 Series: 4-7/16" x 6-1/16" x 1" (113 mm x 154 mm x 25 mm) L400 Series: 4-7/16" x 3-5/8" x 1" (113 mm x 92 mm x 25 mm)
Spacing	Knob or lever to cylinder: 3-7/8" (98 mm); Knob or lever to thumbturn hub: 2-11/16" (68 mm)
Door thickness	Standard: 1-3/4" (44 mm) Optional: 1-3/8" (35 mm) Over 1-3/4" (44 mm) specify door thickness and position in door EE, EI, EO, ED
Backset	2-3/4" (70 mm) only

Trim	
Handing	L9000 Series: Field-reversible without disassembly L400 Series: Non-handed
Lever/knob	**33 lever designs (see pages 2-5):** Forged brass and cast stainless steel **Two knob designs (see page 5):** Heavy-duty wrought brass or stainless steel Ligature resistant lever (SL1) and knob (SK1), High Security Ligature Resistant (HSLR) trim, HL6 hospital latch Tactile warning applied to outside lever; available on 01, 02, 03, 05, 06, 07, 12, 17, 18, M51, M52, M81, ME1, ME2, ME3 lever designs
Rose/ escutcheon	L escutcheons: 7-15/16" x 1-3/4" x 7/16" (202 mm x 44 mm x 11 mm); cold-forged brass and stainless steel N escutcheons: 7-7/8" x 2-1/2" x 7/16" (200 mm x 64 mm x 11 mm); heavy-wrought, reinforced brass and stainless steel Roses: A, B, C: wrought brass and stainless steel; AVA and MER: forged brass
Finishes	14 available: 605, 606, 609, 612, 613, 619, 622, 625, 626, 626AM, 643e
Combinations	Available with knob both sides, lever both sides, or knob/lever combinations. Roses cannot be combined with escutcheons.

Latches, Armors, & Strikes	
Armor	**L9000 Series:** Standard: 1-1/4" x 8" x 7/32" (32 mm x 203 mm x 6 mm) Optional: 1-1/16" x 8" x 7/32" (27 mm x 203 mm x 6 mm) **L400 Series:** Standard: 1-1/4" x 5-9/16" x 7/32"(32 mm x 141 mm x 6 mm)
Latch	3/4" (19 mm) throw stainless steel latch with anti-friction tongue
Deadbolt	1" (25 mm) throw stainless steel deadbolt
Strike	**L9000 Series:** Standard: ANSI curved lip strike 1-1/4" x 4-7/8" (32 mm x 124 mm) x 1-3/16" (30 mm) lip with dust box; Optional: Extended lip strike options (7/8", 1", 1-1/2", 1-3/4", 2") **L400 Series:** Standard: 1-1/8" x 3-1/2" (29 mm x 89 mm) with dust box; Optional: 1-1/4" x 4-7/8" (32 mm x 124 mm) with dust box

Keying	
Cylinder format	6-pin Conventional mortise cylinder (standard); also available in concealed mortise cylinder, FSIC, SFIC and 7-pin SL cylinder formats plus less cylinder options. Two nickel silver cut keys per lock.
Keyway	Patented Everest 29 S123 (standard); also available in open, restricted, and Primus XP security levels with available master keying and construction keying.

SPECIFICATIONS

Wired electrified	
Input voltage	12V or 24V DC
Operating mode	Fail Safe or Fail Secure via switch on chassis
Peak current	12V operating voltage: 1A 24V operating voltage: 0.4A
Holding current	0.1 amp
Request to Exit	Modular option on L909X and L949X electrified functions (when ordering or added in field) Rating: 3A @ 125V AC/2A @ 30V DC Available on all L909x and L949x electrified functions. Also available option for the following mechanical functions: L9010/25/26/50/56/70/71/80 and L9453/56/58/65/66/80/85/96.
Latch bolt monitor	Available on all L909x and L949x electrified and L9010/25/26/50/56/70/71/80/82 and L9453/56/65/66/80/85/96 mechanical functions.
Door position sensor	Internal available on L909x electrified and L9010/25/26/80/82 mechanical functions; external available on all functions
Deadbolt monitor	Standard on L949x electrified and available on L9453/56/57/58/80/85/96 mechanical functions

Warranty	
	3-year limited mechanical and 1-year limited electromechanical

Certifications	
ANSI/BHMA	**L/LV9000:** ANSI/BHMA A156.13-2017 Series 1000, Grade 1 Operational and Security **With FSIC Interchangeable Core Cylinders:** Grade 1 Operational, Grade 2 Security **With SFIC Interchangeable Core Cylinders:** Grade 1 Operational, Grade 3 Security **L400:** ANSI/BHMA A156.36-2010, Grade 1
ICC	Complies with ICC A117.1 Accessible and Usable Buildings and Facilities
UL/cUL	UL 10C and CAN/ULC-S104 3-hour fire door (except L9076 and L9077) Electrified functions are UL/ULC Listed for single-point locking applications UL 437 Listed when using UL 437 Primus cylinder UL Listed for 3-Hour fire door (except L9076 and L9077) L400 UL Listed Auxiliary Lock for 3-hour fire door
UL 294	UL 294 Access Control Performance Levels: Destructive Attack, Level 1; Line Security, Level 1; Standby Power, Level 1; Endurance, Level IV (with DM, or LX, Endurance, Level I). ULC-S319 Class III (L909x and L949x functions only)
CA Fire Code	All levers with a return to door of 1/2" (13 mm) or less comply (Formerly Title 19, California State Fire Marshal Standard)
Building codes	Miami-Dade NOA and Florida Building Commission listings Texas Department of Insurance (TDI) for impact and non-impact applications
Federal	BAA compliant, all functions

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013141, Rev. 06/24

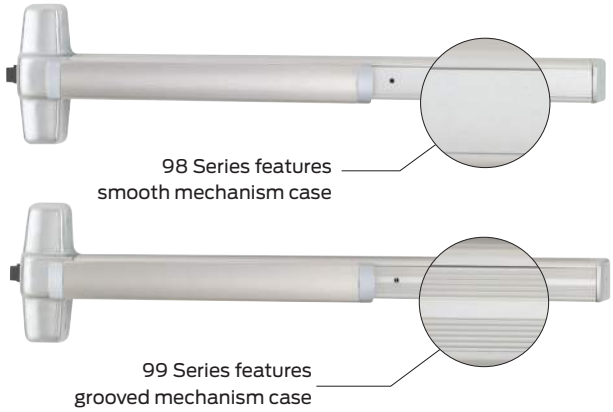
VON DUPRIN®

Exit device

98/99 Series

Overview

The 98/99 Series devices are heavy-duty push pads. The 98 Series has a smooth mechanism case, while the 99 Series has a grooved mechanism case. The 98/99 Series has been certified to the highest industry standards and are used in schools, hospitals and government buildings.



Device types



Rim device



75 Mortise lock device



27 Surface mounted vertical rod device [1]



47 Concealed vertical rod device, 5/16" throw [1]

48 Concealed vertical rod device, 5/8" top, 1 1/2" bottom throw



47WDC Concealed vertical rod wood door device [1]



49 Concealed vertical cable device [2]



50WDC Concealed vertical cable wood door device



57 Three-point latch device

[1] Also available less bottom rod (LBR)
[2] Also available less bottom latch (LBL)

ALLEGION™

VON DUPRIN®

Exit device
98/99 Series

Finishes



605
Bright Brass



606
Satin Brass



612
Satin Bronze



619
Satin Nickel



622
Matte Black

625
Bright Chrome



626
Satin Chrome



626AM
Satin Chrome, Antimicrobial



628
Aluminum, Clear Anodized



630
Satin Stainless



630AM
Satin Stainless, Antimicrobial



643e
Aged Bronze



693
Black



710
Dark Brown, Anodized

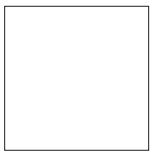
Due to the many variations in monitors and printers, color samples may appear different than the physical product. Contact your local sales representative for a physical color sample.

ALLEGION™

VON DUPRIN®

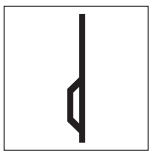
Exit device
98/99 Series

Trim functions



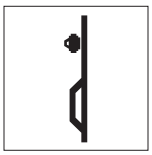
EO **No outside trim**

- Exit only



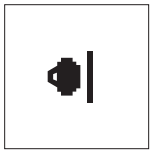
DT **Dummy trim**

- Pull when dogged (not recommended for fire device)



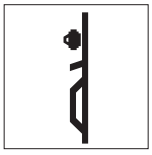
NL **Night latch**

- Key retracts latchbolt
- Rim and 1 ¼" mortise cylinder



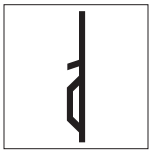
NLOP **Night latch**

- Key retracts latchbolt, pull required



TP **Thumbpiece**

- Key locks and unlocks
- Rim and 1 ¼" mortise cylinder



TPBE **Thumbpiece, blank escutcheon**

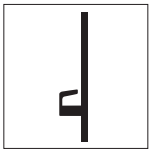
- Blank escutcheon always operable (no cylinder, use with DT trim)



L **Lever**

K **Knob**

- Key locks and unlocks
- Rim and 1 ¼" mortise cylinder
- Handed, reversible lever
- Electrified lever operation available



LDT **Lever, dummy trim**

KDT **Knob, dummy trim**

- Pull when dogged



LNL **Lever, night latch**

KNL **Knob, night latch**

- Key retracts latchbolt
- Rim and 1 ¼" mortise cylinder
- Handed, reversible lever



LBE[1] **Lever, blank escutcheon**

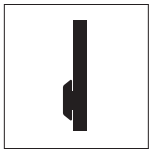
KBE **Knob, blank escutcheon**

- Always operable (no cylinder)



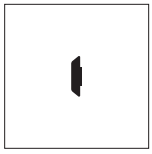
TL **Turn lever**

- Key locks and unlocks (use with DT trim)
- 1 ¼" mortise cylinder



TLBE **Turn lever, blank escutcheon**

- Blank escutcheon always operable (no cylinder, use with DT trim)



TLOP **Turn lever, optional pull**



HL **Hospital latch**

- Key locks and unlocks
- 1 ¼" mortise cylinder

ALLEGION™

VON DUPRIN®

Exit device
98/99 Series

Trim styles



990



996



696



697
3/4" (19mm) diameter pull



392-7



HL



374



VR910



VR914

Dimensions

Trim style	Width	Height	Thickness	Projection
990	3"	14 3/16"	3/32"	2"
996 Knob	2 3/4"	10 3/4"	27/32"	3 1/4"
996 Lever	2 3/4"	10 3/4"	27/32"	2 7/8"
696	1 5/8"	13 1/2"	3/16"	2 1/6"
697	1 5/8"	13 1/2"	3/16"	3"
392-7	3/4" inch round stainless steel with 7" center to center that matches the 98/99 center case. 3 1/2" offset with 1 1/2" clearance.			
HL	2 9/16"	7 7/8"	-	2 5/8"
374	2 3/4"	10 3/4"	27/32"	
VR910/914 with RIM/verticals	5 1/2"	11"	-	
VR910/914 with mortise	7 1/4"	11"	-	

ALLEGION™

Lever styles

Decorative levers



M51
- Knurling available



M52
- Knurling available



M53



M54



M55



M56



M57[1]



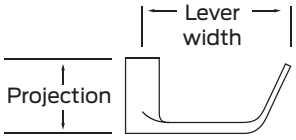
M61
- Handed



M62[1]
- Handed

Dimensions

Lever	Width	Projection
M51	4.5"	2.5"
M52	4.5"	2.4"
M53	4.4"	2.4"
M54	4.4"	2.3"
M55	4.4"	2.7"
M56	4.5"	2.3"
M57	4.5"	2.7"
M61	4.5"	2.7"
M62	4.6"	2.4"



[1] Available in stainless steel substrate only

Lever styles

Decorative levers



M63
- Handed



M81
- Knurling available



M82



M83



M84



M85
- Handed



ME1[1]
- Handed



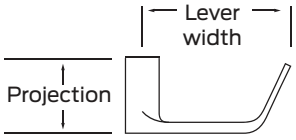
ME2[1]
- Handed



ME3[1]

Dimensions

Lever	Width	Projection
M63	4.6"	2.6"
M81	4.8"	2.5"
M82	4.9"	2.5"
M83	4.7"	2.25"
M84	5.1"	2.2"
M85	4.9"	2.7"
ME1	5.4"	2.6"
ME2	5.2"	2.4"
ME3	5"	2.8"



[1] Designed with Gensler as product design consultant

VON DUPRIN®

Exit device
98/99 Series

Lever styles

Standard levers



01



02
- Knurling available



03
- Knurling available



05



06
- Default lever
- Suites with Schlage Rhodes
- Knurling available



07
- Suites with Schlage Athens



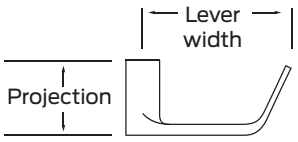
12
- Handed



16
- Suites with Schlage Omega

Dimensions

Lever	Width	Projection
01	4.0"	2.1"
02	4.75"	2.3"
03	4.75"	2.813"
05	3.75"	2.8"
06	4.7"	2.1"
07	4.6"	2.3"
12	4.3"	2.9"
16	5.05"	2.66"



ALLEGION™

Lever styles

Standard levers



17
- Suites with Schlage Sparta
- Knurling available



18



Accent (ACC)
- Handed



Asti (AST)
- Handed



Merano (MER)
- Handed



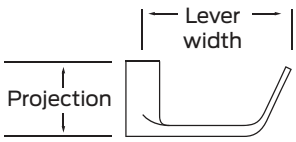
Latitude (LAT)



Longitude (LON)

Dimensions

Lever	Width	Projection
17	4.7"	2.3"
18	4.75"	2.4"
Accent (ACC)	4.4"	3.1"
Asti (AST)	4.2"	2.5"
Merano (MER)	4.1"	2.5"
Latitude (LAT)	4.6"	2.3"
Longitude (LON)	4.9"	2.3"



Electromechanical device options

Switches

LX — **Latchbolt monitoring**

LX-LC — **Latchbolt monitoring, low current**
- Signals use of an opening
- SPDT switch to monitor latch bolt
- 2 A maximum @ 24VDC; below 50 mA @ 24VDC for low current option

RX — **Request to exit**

RXLC — **Request to exit - low current**

RX2 — **Double request to exit - 2 RX switches**

WP-RX — **Waterproof request to exit**

RX-AUX — **RX to RX-2 conversion**
- Signals use of an opening
- SPDT switch to monitor pushpad
- 2 A maximum @ 24VDC; below 50 mA @ 24VDC for low current option

LX-RX — **Request to exit/latchbolt monitoring combination**

LX-RX-LC — **Request to exit/latchbolt monitoring combination, low current**
- 2 A maximum @ 24VDC; below 50 mA @ 24VDC for low current option

SS — **Signal switch**
- Monitors pushpad and latchbolt
- Signals unauthorized use of an opening
- Switch makes latch bolt tamper-resistant
- Up to 2.0 A @ 24VDC

Latch retraction

EL — **Electric latch retraction**

SD-EL — **Electric latch retraction with special center case dogging**
- Enables remote unlatching
- Alternative to manual dogging
- Voltage: 24VDC (continuous duty)
- Current: 16.0 A inrush / 0.3 A holding

QEL — **Quiet electric latch retraction**

HD-QEL — **Quiet electric latch retraction with hex dogging**

SD-QEL — **Quiet electric latch retraction with special center case dogging**
- Bolt retraction via switch
- Converts exit door to push-pull operation
- Voltage: 24VDC
- Current: 1.0 A inrush (0.5 sec.) / 0.14 A holding

Delayed egress

CX — **Chexit delayed exit**
- Meets NFPA 101 requirements
- Self-contained controls, locking, alarm
- Input voltage: 24VDC
- Input current inrush: 1.25 A
- Input current holding: 390 mA
- Alarm relay and secure relay contact ratings: 24 VDC, 1 A

CX-RCM — **Chexit remote module**
- Chexit for smaller doors that can not accommodate a standard Chexit device
- Size: 3.75” x 5.57” x 2.50”
- Input voltage: 24VDC
- Input current inrush: 1.25A
- Input current holding: 390mA
- Alarm relay and secure relay contact ratings: 24 VDC, 1 A

Miscellaneous

ALK — **Alarm exit kit**
- Unauthorized opening triggers 85-decibel horn
- Set in armed or disarmed mode by key
- Assembly includes both a 24VDC input and external inhibit

Electromechanical device options

CON — **Allegion Connect**

- Common connectors to connect various door hardware all the way to the power supply

E996 — **Electric locking and unlocking trim**

- Remains latched while unlocked
- Remote electrical control
- Voltage: 24VDC (Continuous Duty)
- Current: 0.22 amps

E7500 — **Electric mortise lock device**

- Voltage: 12 or 24VDC
- Current: 0.60 amps @ 12VDC, 0.30 amps @ 24VDC

Electromechanical device options

Matrix shows available options per device type but does not represent compatibly across multiple options.

	Switches									Latch retraction					Delayed egress		Misc			
	LX	LX-LC	RX	RXLC	RX2	WP-RX	LX-RX	LX-RX-LC	SS	EL	SD-EL	QEL	HD-QEL	SD-QEL	CX	CX-RCM	ALK	CON	E996	Mortise
98 99	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
98F 99F	■	■	■	■	■	■	■	■	■	■		■			■	■	■	■	■	
XP98 XP99		■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	
XP98-F XP99-F		■	■	■	■	■	■	■		■		■			■	■	■	■	■	
9875 9975			■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■
9875-F 9975-F			■	■	■	■			■	■		■			■	■	■	■	■	■
9827 9927	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
9827-F 9927-F	■	■	■	■	■	■	■	■	■	■		■			■	■	■	■	■	
9857 9957	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
9857-F 9957-F	■	■	■	■	■	■	■	■	■	■		■			■	■	■	■	■	
9847 9947	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
9847-F 9947-F	■	■	■	■	■	■	■	■	■	■		■			■	■	■	■	■	
9848 9948	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
9848-F 9948-F	■	■	■	■	■	■	■	■	■	■		■			■	■	■	■	■	
9849 9949	■[1]	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
9849-F 9949-F	■[1]	■	■	■	■	■	■	■	■	■		■			■	■	■	■	■	
9847WDC 9947WDC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
9847WDC-F 9947WDC-F	■	■	■	■	■	■	■	■	■	■		■			■	■	■	■	■	
9850WDC 9950WDC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
9850WDC-F 9950WDC-F	■	■	■	■	■	■	■	■	■	■		■			■	■	■	■	■	

[1] For 98/9949 devices, LX switch monitors trim input or electric dogging of EL/QEL devices. LX switch does not monitor latchbolt condition.

Mechanical device options

Dogging

CD — **Cylinder dogging, panic only**

CD-CX — **Center case cylinder dogging for Chexit devices**

CI — **Cylinder dogging indicator**
- Battery-operated dogging indicator in cylinder format with red light visible from over 75 feet away

DI — **Dogging indicator**
- Battery-operated dogging indicator in hex format with red light visible from over 75 feet away

LD — **Less dogging**

SD — **Special center case dogging**
- Center case cylinder dogging

Classroom security

-2 — **Double cylinder**
- Inside key cylinder locks/unlocks outside trim

-2SI — **Double cylinder with security indicator**
- Inside key cylinder locks/unlocks outside trim with visible indicators that provide status of door

CDSI — **Cylinder dogging with indicator**
- Provides visible lock/unlock indicators showing whether device is dogged or undogged

HDSI — **Hex dogging with indicator**
- Provides visible lock/unlock indicators showing whether device is dogged or undogged

Environmental

PN — **Pneumatic latch retraction**
- For areas where electrical devices banned
- Special linkage for mechanical or pneumatic dogging

QM — **Quiet mechanical option**
- Provides damper-controlled relatching of device

INS — **Insulclad kits**
- Kits with longer fasteners or parts for Insulclad doors

AM — **Anti-microbial finish**

Weatherized

WH — **Weep holes**
- Drainage (weep) holes in mechanism case

WS — **Windstorm**
- Severe weather certified/tested
- FEMA and ICC compliant
- Tornado and hurricane tested

California code

AX — **Accessible device**
- UL certified to meet new 5 lb. maximum operating force requirement
- Exceeds ANSI/BHMA requirements

Latches

PL — **Pullman latch**
- Latches are always extended
- Most commonly used in conjunction with electric strikes and LBR-less bottom rod application

Mechanical device options

Touch bar trim

RSS — **Red silk screen**
- Red silk-screened lettered touchbar trim

PUSH — **PUSH**
- Touchbar trim embossed PUSH

SG — **Safety glow**
- Self-illuminating touchpad
- Glows brightly during low or no light conditions

KN — **Knurled touchbar**
- Tactile warning applied to device

BRAILLE — **Braille**
- Vision impaired touchpad
- Raised letter and Braille

Mechanical device options

Matrix shows available options per device type but does not represent compatibly across multiple options.

	Dogging						Classroom security				Environmental				Weatherized		CA code
	CD	CD-CX	CI	DI	LD	SD	-2	-2SI	CDSI	HDSI	PN	QM	INS	AM	WH	WS	AX
98 99	■	■	■	■	■	■	■	■	■	■	■	■		■	■		■
98F 99F							■	■			■	■		■	■		■
XP98 XP99	■	■	■	■	■	■	■	■	■	■				■	■		■
XP98-F XP99-F							■	■						■	■		■
9875 9975	■	■	■	■	■	■	■		■	■	■			■	■		
9875-F 9975-F							■				■			■	■		
9827 9927	■	■	■	■	■	■			■	■	■	■		■	■	■	■ LBR
9827-F 9927-F											■	■		■	■	■	■ LBR
9857 9957	■	■	■	■	■	■			■	■	■			■	■	■	
9857-F 9957-F											■			■	■	■	
9847 9947	■	■	■	■	■	■			■	■	■		■	■	■		■ LBR
9847-F 9947-F											■			■	■		■ LBR
9848 9948	■	■	■	■	■	■			■	■	■			■	■		
9848-F 9948-F											■			■	■		
9849 9949	■	■	■	■	■	■			■	■	■		■	■	■		■ LBL
9849-F 9949-F											■			■	■		■ LBL
9847WDC 9947WDC	■	■	■	■	■	■			■	■	■			■	■		
9847WDC-F 9947WDC-F											■			■	■		
9850WDC 9950WDC	■	■	■	■	■	■			■	■	■			■	■		■ LBL
9850WDC-F 9950WDC-F											■			■	■		■ LBL

Mechanical device options

Matrix shows available options per device type but does not represent compatibly across multiple options.

	Latches	Touch bar trim				
	PL	RSS	PUSH	SG	KN	BRAILLE
98 99		■	■	■	■	■
98F 99F		■	■	■	■	■
XP98 XP99		■	■	■	■	■
XP98-F XP99-F		■	■	■	■	■
9875 9975		■	■	■	■	■
9875-F 9975-F		■	■	■	■	■
9827 9927	■	■	■	■	■	■
9827-F 9927-F		■	■	■	■	■
9857 9957		■	■	■	■	■
9857-F 9957-F		■	■	■	■	■
9847 9947	■	■	■	■	■	■
9847-F 9947-F		■	■	■	■	■
9848 9948		■	■	■	■	■
9848-F 9948-F		■	■	■	■	■
9849 9949		■	■	■	■	■
9849-F 9949-F		■	■	■	■	■
9847WDC 9947WDC		■	■	■	■	■
9847WDC-F 9947WDC-F		■	■	■	■	■
9850WDC 9950WDC		■	■	■	■	■
9850WDC-F 9950WDC-F		■	■	■	■	■

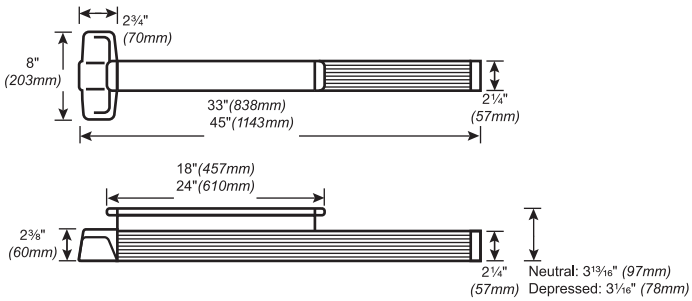
VON DUPRIN®

Exit device
98/99 Series

Specifications

Accessibility	▪ Force to depress push pad – AX device: 5 lbs – Standard device: 15 lbs ▪ Push pad projection – Neutral: 3 13/16" (97 mm) – Depressed: 3 1/16" (78 mm)
Certifications/ approvals	All Von Duprin 98/99 exit devices are ANSI/BHMA Certified. Please refer to the BHMA Certified Products Directory for specific listings.
Mounting height	39 13/16" (1011 mm) 39 11/16" (1008 mm) with mullion
Warranty	36 months from the date of placing the product in operation

Dimensions

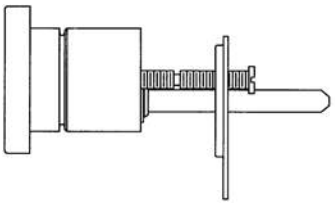


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ALLEGION™

Full size interchangeable core cylinders for exit devices, aluminum door, etc.





Interchangeable core rim cylinders for exit devices	
Number	**Core mechanism**
20-057	Conventional core
20-757	Primus core
20-757-XP	Primus XP core
20-079	Housing only, less core

Available in 605, 606, 609, 612, 613, 619, 625, 626, and 643e finish.



Cylinders for Adams Rite MS and 4700 Series Lori 4500 Series and Corbin Russwin DL3000 Series		
Number	**Core mechanism**	**Collar**
26-098	Conventional core	Compression ring & spring
20-062	Conventional core	3/16" + 3/8" blocking rings
20-766	Primus core	3/16" + 3/8" blocking rings
20-766-XP	Primus XP core	3/16" + 3/8" blocking rings
20-060	Housing less core	None

These cylinders include set screw pack B220-050 for Adams Rite locks.



K510-711
Adams Rite
MS cam

Cylinders for Adams Rite 4070 Series deadlocks		
Number	**Core mechanism**	**Collar**
20-091	Conventional core	3/16" + 3/8" blocking rings
20-722	Primus core	3/16" + 3/8" blocking rings
20-722-XP	Primus XP core	3/16" + 3/8" blocking rings
20-090	Housing less core	None



B520-378
Adams Rite
4070 cam

Notes
1. Mortise cylinders available 605, 606, 609, 612, 613, 619, 625, 626, and 643e finish. Cores furnished 606 and 626 only.
2. To differentiate between Classic and Everest 29, specify keyway. Example: C or CP (Classic), S123 (Everest 29).
3. All cylinders are 1 1/2" long.
4. Specify LKB if 0-bitted Primus XP cylinders are required less key blanks.

Full Size Interchangeable Core Availability



A-Series
Orbit design



ND-Series lever
all designs

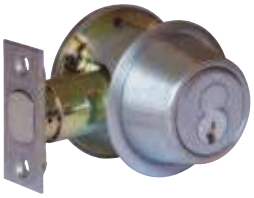


AL-Series
Saturn design



H-Series knob
Orbit design





B500-Series



L-Series
all designs
except concealed



B600 / 700-Series



S-Series
all designs
except Flair



D-Series knob
Orbit design

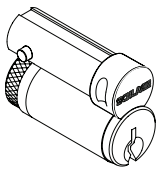


S200-Series
all designs for S210

All except Flair for other functions



Full Size Interchangeable Core Cylinders for Schlage Locksets



Full Size Core Only

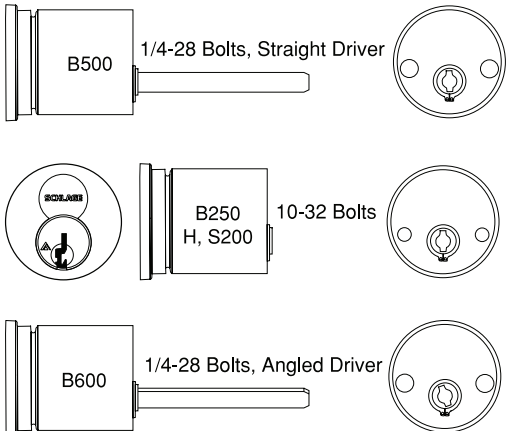
Number	Mechanism
23-030	Conventional core
30-120	Conventional core for hotel function (specify hand)
20-740-XP	Primus XP core (not available in hotel function)

Available 606 and 626 finish only. Order control keys separately.

Full Size IC Housings for Bored Deadlocks, Less Core

Lockset Series	Description	Number	Specify Finish
B500-Series	Outside	B610-203, B610-205	605, 609, 612, 613, 619, 625, 626, and 716
	Inside	B610-028**	605, 609, 612, 613, 619, 625, 626, and 716
B250, H, S200-Series	Outside	22-061	605, 606, 609, 610, 611, 612, 613, 616, 625, 626
	Inside of B252	22-062	
B600 / 700-Series	Outside	B610-027	605, 606, 609, 612, 613, 625, 626
	Inside	B610-028	See Note Below

Specify finish of B610-031 inside snap-on faceplate ordered separately for BC162 and B662/762.
**Inside housing does not include snap-on faceplate

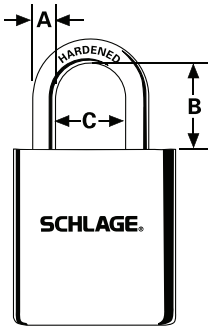




KS43F KS72F KS92M

Full Size Interchangeable Core Padlocks

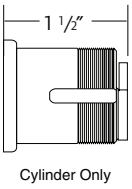
Part #	Shackle Dimensions		
	A	B	C
LESS CYLINDER - FULL SIZE INTERCHANGEABLE CORE			
BRASS BODY			
KS43A3200	3/8″	3/4″	3/4″
KS43D3200	3/8″	1 1/2″	3/4″
KS43F3200	3/8″	2″	3/4″
KS43G3200	3/8″	4″	3/4″
STEEL BODY			
KS72M3200	7/16″	1″	7/8″
KS72F3200	7/16″	2″	7/8″
KS92M3200	3/8″	1″	3/4″



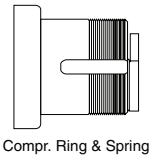
Note: To order Primus XP add the suffix - XP to the Primus part number. (Example: 12-345-XP)

Full Size Interchangeable Core Mortise Cylinders

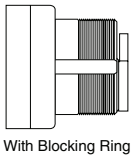




Cylinder Only



Compr. Ring & Spring



With Blocking Ring



Cylinders for Schlage L-Series Mortise Locks

	Design	Function	Core Mechanism		
			Conventional	Primus, Primus XP	Housing Less Core
	**L & N Escutcheons** (cylinders with compression ring)	All Except Below	30-008	20-798, 20-798-XP	30-007
		L9060P Outside	30-030	20-782, 20-782-XP	30-032 + 36-083
		L9485P, L9486P Hotel Funtions	30-010*	N/A	30-007
	**Sectional Trim** (cylinder with compression ring, spring and 3/8" blocking ring). 9060 requires 1/2" blocking ring.	All Except Below	30-138	20-776, 20-776-XP	30-137
		L9060P Outside	30-030 + 36-083 + 35-082-030	20-783, 20-783-XP	30-032 + 36-083 + 36-082-050
		L9485P, L9486P Hotel Funtions	30-040*	N/A	30-137

* Hotel function cores are handed. Specify hand of door.



L583-489
Cam for All Functions Except L9060 Outside



K510-680
Cam for L9060 Outside

Mortise Cylinders with Straight Cam for Exit Devices

Number	Core Mechanism	Collar
26-091	Conventional core	Compression ring & spring
20-061		3/8" blocking rings + compression ring & spring
20-763, 20-763-XP	Primus/Primus XP core	Compression ring & spring
20-771, 20-771-XP		3/8" blocking rings + compression ring & spring
20-059	Housing less core	None
26-064		Compression ring & spring

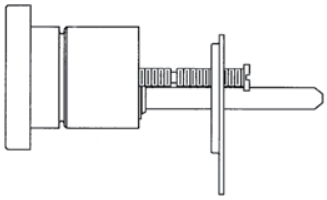


K510-730
Straight Cam, Other Applications

Notes 1. Available 605, 606, 609, 610, 612, 613, 625, and 626 finish. Cores furnished 606 and 626 only.
2. To differentiate between Classic and Everest, specify keyway. Example: C or CP (Classic), C123 (Everest). Everest C123 keyway standard.
3. All cylinders are 1 1/2" long.
4. Specify LKB if 0-bitted Primus XP cylinders are required less key blanks.

Full Size Interchangeable Core Cylinders for Exit Devices, Aluminum Doors, etc.





Interchangeable Core Rim Cylinders for Exit Devices

Number	Core Mechanism
20-057	Conventional core
20-757	Primus core
20-757-XP	Primus XP core
20-079	Housing only, less core

Available 605, 606, 609, 610, 612, 613, 625 and 626 finish.



Cylinders for Adams Rite MS and 4700 Series Lori 4500 Series and Corbin Russwin DL3000 Series

Number	Core Mechanism	Collar
26-098	Conventional core	Compression ring & spring
20-062	Conventional core	3/16″ + 3/8″ blocking rings
20-766	Primus core	3/16″ + 3/8″ blocking rings
20-766-XP	Primus XP core	3/16″ + 3/8″ blocking rings
20-060	Housing less core	None

These cylinders include set screw pack B220-050 for Adams Rite locks.



K510-711
Adams Rite
MS Cam

Cylinders for Adams Rite 4070 Series Deadlocks

Number	Core Mechanism	Collar
20-091	Conventional core	3/16″ + 3/8″ blocking rings
20-722	Primus core	3/16″ + 3/8″ blocking rings
20-722-XP	Primus XP core	3/16″ + 3/8″ blocking rings
20-090	Housing less core	None



B520-378
Adams Rite
4070 Cam

Notes
1. Mortise cylinders available 605, 606, 609, 610, 612, 613, 625, and 626 finish. Cores furnished 606 and 626 only.
2. To differentiate between Classic and Everest, specify keyway. Example: C or CP (Classic), C123 (Everest).
3. All cylinders are 1 1/2″ long.
4. Specify LKB if 0-bitted Primus XP cylinders are required less key blanks.



LG1 LG7 Lock Guard

- Units are non-handed and incorporate security frame pin to prevent separation of the door and frame. LG7 does not incorporate the security frame pin
- Unit covers the latch bolt area of the door and lock, thereby providing added protection from burglars, vandals or normal abuse.
- Ideal for use with mortise or cylindrical locks.
- Easy installation.
- Through bolted with carriage bolts and nuts.
- Available in a variety of materials, 13 gauge stainless steel, 12 gauge steel and brass material.

Dimensions

3" Wide x 11-1/2" High

Bolt center to center: 10-1/2"

Finishes

Ives Number	USP*	US2G*	US4*	US10*	US32D	SP313*
BHMA	600	603	606	612	630	695

** not available on LP7*



LG10 Lock Guard

- Ideally suited for use with rose or escutcheon 2-3/4" wide or less.
- For use with Type 86 Mortise and Type 161 Cylindrical Locks (ANSI 156.13 Series 1000 and ANSI 156.2 Series 4000).
- No exposed fasteners on face of unit.
- Unique design provides maximum security, virtually eliminating the opening between door and frame at the latch point.
- Available in 13 Gauge Stainless Steel or 12 Gauge Steel.

Dimensions

2-1/2" Wide x 9-1/2" High

Stud center to center: 8-1/2"

Finishes

Ives Number	USP	US32D
BHMA	600	630



LG11 Lock Guard

- Designed for use on aluminum doors with latch-type locks or doors equipped with electric strikes.
- Unit is Handed - Specify left or right hand when ordering.
- No exposed fasteners on face of unit.
- Unique design provides maximum security, virtually eliminating the opening between door and frame at latch point.
- Available in 13 Gauge Stainless Steel or 12 Gauge Steel.

Dimensions

2-1/2" Wide x 9-1/2" High

Stud center to center: 8-1/2"

Finishes

Ives Number	US32D	SP313
BHMA	630	695



LG12 Lock Guard

- Narrow design unit for use on rose or escutcheon 3-1/2" or less.
- For use with Type 86 Mortise and Type 161 Cylinder Locks (ANSI 156.13 Series 1000 and ANSI 156.2 Series 4000).
- No exposed fasteners on face of unit.
- Unique design provides maximum security, virtually eliminating the opening between door and frame at the latch point.
- Available in 13 Gauge Stainless Steel or 12 Gauge Steel

Dimensions

1-1/2" Wide x 9-1/2" High

Stud center to center: 8-1/2”

Finishes

Ives Number	USP	US32D
BHMA	600	630



8200 Push Plate
8300 Pull Plate, Prep for Pull (less pull)

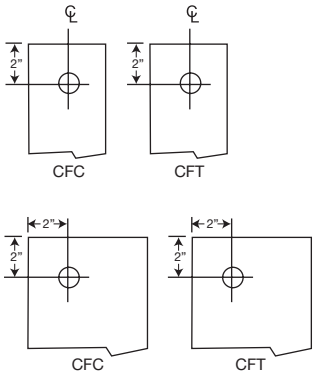
Available Sizes
3" x 12"
3.5" x 15"
4" x 16"
6" x 16"
8" x 16"
Special sizes are available. Consult factory.

Plates Cut for Cylinder or Thumbturns

Plates are available with cutout for cylinder or thumbturn; standard cutout is 2" from top and centered on plates up to 4" wide. For plates wider than 4" cutout is located 2" from outer edge, specify LH or RH. When pull location interferes with standard cutout location a detail drawing should be furnished with the order.

Standard cutout is 1-1/4" for cylinder and 3/8" for thumbturn.

Specify CFC for cutout for cylinder or CFT for cutout for thumbturn.



Finishes *brass*

US Number	US3	US4	US10	US10B	US15	US26	US26D*
BHMA	605	606	612	613	619	625	626

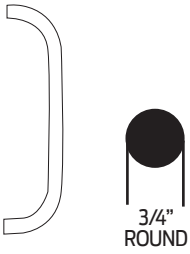
Finishes *stainless steel*

US Number	US32D*
BHMA	630

Finishes *aluminum*

US Number	US28
BHMA	628

** Available with Antimicrobial Coating, use suffix AM*





8302 Pull plate

Available mounting – Standard, F, G, H-I-L, or J see pages B15 and B16
Pulls have new heavy duty 5/16-18" mounting.

8300 Plate	**8102 Pull**
3-1/2" x 15"	6" centers
4" x 16"	8" centers
6" x 16"	10" centers

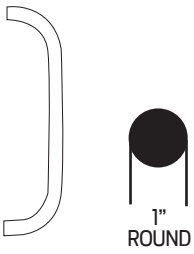
Finishes *brass*

US Number	US3	US4	US10	US10B	US26	US26D*
BHMA	605	606	612	613	625	626

Finishes *stainless steel*	
US Number	US32D*
BHMA	630

Finishes *aluminum*	
US Number	US28
BHMA	628

** Available with Antimicrobial Coating, use suffix AM*





8303 Pull plate

Available mounting – Standard, F, G, H-I-L, or J see pages B15 and B16
Pulls have new heavy duty 3/8-16" mounting.

8300 Plate	**8103 Pull**
3-1/2" x 15"	8" centers
4" x 16"	10" centers
6" x 16"	7" centers

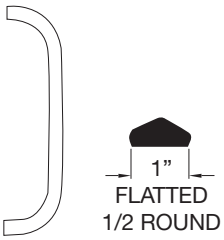
Finishes *brass*

US Number	US3	US4	US10	US10B	US26	US26D*
BHMA	605	606	612	613	625	626

Finishes *stainless steel*	
US Number	US32D*
BHMA	630

Finishes *aluminum*	
US Number	US28
BHMA	628

** Available with Antimicrobial Coating, use suffix AM*





8305 Pull plate

Available mounting – Standard or F see page B15
Pulls have 1/4 - 20" mounting

8300 Plate	**8105 Pull**
3-1/2" x 15"	6" centers
4" x 16"	8" centers
6" x 16"	10" centers

Finishes *brass*

US Number	US3	US4	US10	US10B	US26	US26D
BHMA	605	606	612	613	625	626

Finishes *stainless steel*	
US Number	US32D
BHMA	630

Finishes *aluminum*	
US Number	US28
BHMA	628

** Available with Antimicrobial Coating, use suffix AM*

LCN®



Surface mounted closer

4040XP Series



Overview

The 4040XP Series is LCN's most popular door closer—and for good reason. This durable non-handed, surface-mounted heavy-duty closer, is designed for the most demanding high-use-and-abuse applications.

- ANSI/BHMA A156.4 Grade 1 rated
- Meets ADA reduced opening force requirements
- cUL listed and UL listed for self-closing doors without hold-open

The beauty of the 4040XP is that it goes way beyond the required standards. And in doing so, it has set the standard for reliability, longevity, and value.

- Stronger materials designed to go the distance.
- Proven production processes and technology, such as, forging steel and heat-treating certain components, that ensure a tougher, bolder construction.
- Abuse-cycle and temperature tests that mimics what door closers encounter in high-abuse environments.
- Well-marked adjustment valves and built-in preventative measures for adjusting too far and breaking the closer.
- 30-year limited warranty

Our relationship with you doesn't end at the sale. LCN supports you throughout the life of your facility with all your technical and application needs. Bottom line, the 4040XP is a closer you can count on that's built to last a lifetime—all while delivering remarkable value in a variety of applications.

Cylinder

4040XP-3071
Cast iron cylinder assembly

Handing	Sizing
Non-handed	Adjustable spring size 1–6, includes LCN Green Dial



Available cylinder options

DEL	Delayed action cylinder

ALLEGION™

Adjustments

There are several design features that make installation or adjustment of the 4040XP easier and more intuitive.

- **LCN Green Dial** provides a visual reference of the spring power setting, taking the guesswork out of spring power adjustments.
- **Additional adjustments** can be made to the back check, main, and latch regulation valves which are labeled for easy identification.
  - **Note:** Labels correspond to a diagram with door swing zones located on the closer body.
- **A patent-pending positive stop feature** on all regulation valves. The improved staking feature prevents the screw from being backed out and causing accidental damage to the product.
  - The patent-pending regulation valve indicators provide visual color indicators of how far a screw is backed out—the more visible the component, the faster the speed.
  - This makes adjustments simpler and more intuitive.
- **New QR code** that provides on-the-spot access to interactive installation and maintenance instructions and tech support.

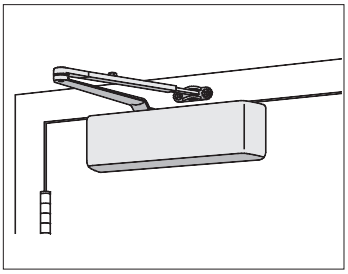




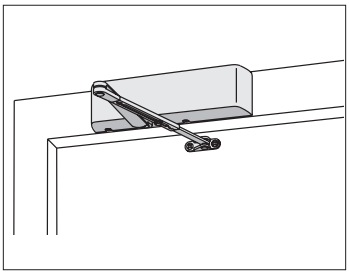




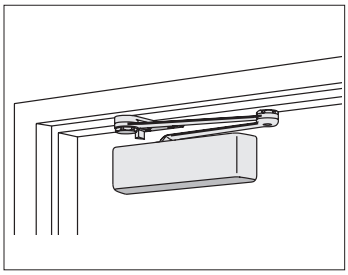
Mounting



Hinge (pull side)



Top jamb (push side)



Parallel arm (push side)

Finishes

Powder coat finishes

622
Matte Black

689
Aluminum

690
Statuary Bronze

691
Light Bronze

693
Black

695
Dark Bronze

696
Brass

150+ additional custom colors available using the RAL numbering system

Metal plated finishes

632
Bright Brass

633
Satin Brass

639
Satin Bronze

616
Satin Bronze, Blackened

646
Satin Nickel

651
Bright Chrome

652
Satin Chrome

Available finish options

MTLPC	Brite metallic: Custom powder coat finish, which resembles that of 651 or 652 plated finish.
SRI	For installations where a higher level of protection against weather conditions, or the effects of a potentially corrosive atmosphere is required, LCN offers a special rust inhibiting (SRI) process. Ferrous metal components receive an SRI pretreatment and a standard powder coat finish of your choice, or a custom powder coat finish for a nominal additional cost. Closers treated with the SRI process exceed the 100 hour protection level available with standard LCN powder coated finishes.

Covers

Standard cover



Front view



Back view

4040XP-72
plastic cover (PC)
- Non-handed
- Includes 4040XP-54 snap-on cover clip
- Redesigned snap-fit cover with improved patent-pending retention fit

Optional cover



4040XP-72MC
metal cover (MC)
- Handed
- Required for plated finishes and custom powder coat finishes
- Optional

Arms



4040XP-3077
Regular Arm (REGARM)
- Non-handed
- Mounts pull side or top jamb with shallow reveal P4041 closer includes PA shoe, 4040XP-62PA required for parallel arm mounting



4040XP-3077L
Long Arm (LONG)
- Non-handed
- Includes long rod and shoe, 4040XP-79LR for top jamb mount
- Optional



4040XP-3077ELR
Extra Long Arm (XLONG)
- Non-handed
- Includes extra long rod and shoe, 4040XP-79ELR for top jamb mount with deep reveal
- Optional



4040XP-3049
Hold Open Arm (H)
- Non-handed
- Mounts pull side or top jamb with shallow reveal, hold open adjustable shoe
- 4040XP closer includes 4040XP-62PA shoe required for parallel arm mounting
- Optional



4040XP-3049L
Hold Open Long Arm (HLONG)
- Non-handed
- Includes long head and tube, 4040XP-3048L for top jamb mount
- Optional



4040XP-3077EDA
Extra Duty Arm (EDA)
- Non-handed
- Features forged, solid steel main and forearm for potentially abusive installations
- Optional



4040XP-3049EDA
Hold Open Extra Duty Arm (HEDA)
- Handed
- Parallel arm features forged, solid steel main and forearm for potentially abusive installations
- Hold open function is adjusted at the shoe
- Optional



4040XP-3077EDA/62G
Extra Duty Arm with 62G Thick Hub Shoe (EDAW62G)
- Non-handed
- Features forged, solid steel main and forearm for potentially abusive installations
- 62G shoe provides additional blade stop clearance
- Optional



4040XP-3049EDA/62G
Hold Open Extra Duty arm with 62G Thick Hub Shoe (HEDA62G)
- Handed
- Features forged, solid steel main and forearm for potentially abusive installations
- 62G shoe provides additional blade stop clearance; hold open function is adjusted at the shoe
- Optional



4040XP-3077CNS
Cush-n-Stop Arm (CUSH)
- Non-handed
- Features solid forged steel main arm and forearm with stop in soffit shoe.
- Optional



4040XP-3049CNS
Hold Open Cush-n-Stop Arm (HCUSH)
- Non-handed
- Hold open function with templated stop/hold open points
- Handle controls hold open function
- Optional



4040XP-3077SCNS
Spring Cush-n-Stop Arm (SCUSH)
- Non-handed
- For potentially abusive applications features solid forged steel main arm and forearm with spring loaded stop in the soffit shoe
- Optional

Arms



4040XP-3049SCNS
Spring Hold Open Cush-n-Stop Arm (SHCUSH)

- Non-handed
- For potentially abusive applications features solid forged steel main arm and forearm with spring loaded stop in the soffit shoe
- Handle controls hold open function
- Optional

Installation accessories



4040XP-18
Plate
- Required for hinge side mount where top rail is less than 3 3/4" (95 mm)
- Requires minimum 2" (51 mm) minimum top rail



4040XP-18G
Plate
- Locates top jamb mounted closer flush with top of head frame face in flush ceiling condition
- Requires 1 3/4" (44 mm) minimum head frame



4040XP-18TJ
Plate
- Centers top jamb mounted closer vertically on head frame where face is less than 3 1/2" (89 mm). Plate requires 1 3/4" (44 mm) minimum head frame



4040XP-18PA
Plate
- Required for parallel arm mounting where top rail is less than 5 1/2" (140 mm), measured from the stop
- Requires 2" (51 mm) minimum top rail



4040XP-62PA
PA shoe
- Required for parallel arm mounting



4040XP-30
CUSH shoe support
- Provides anchorage for fifth screw used with CUSH arms, where reveal is less than 3 1/16" (78 mm)
- Optional



4040XP-61
Blade stop spacer
- Required to lower parallel arm shoe to clear 1/2" (13 mm) blade stop
- Optional



4040XP-419
PA flush panel adapter
- Provides horizontal mounting surface for parallel arm shoe on single rabbeted or flush frame
- Optional

Installation accessories



4040XP-62A
Auxiliary shoe
- Requires a top rail of 7" (178 mm)
- Shoe replaces -62PA for parallel arm mounting of regular arm with overhead holder/stop
- Optional



4040XP-54
Snap-on cover clip
- Used to secure 4040XP-72 plastic cover to cylinder body

Fasteners

Self-reaming and tapping screws included standard

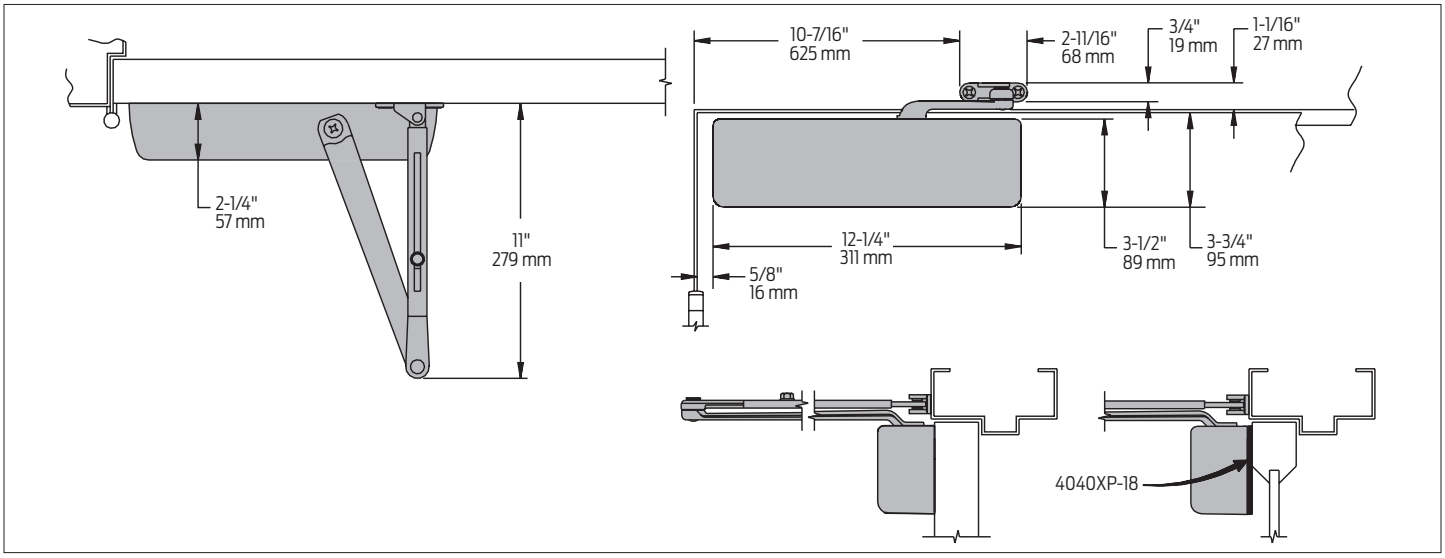
Fastener pack options

TBSRT	TB[1] with self-reaming and tapping screws
WMS	Wood and machine screw
TBWMS	TB[1], wood and machine screw
TORX	TORX machine screw
TBTRX	TB[1] and TORX machine screw

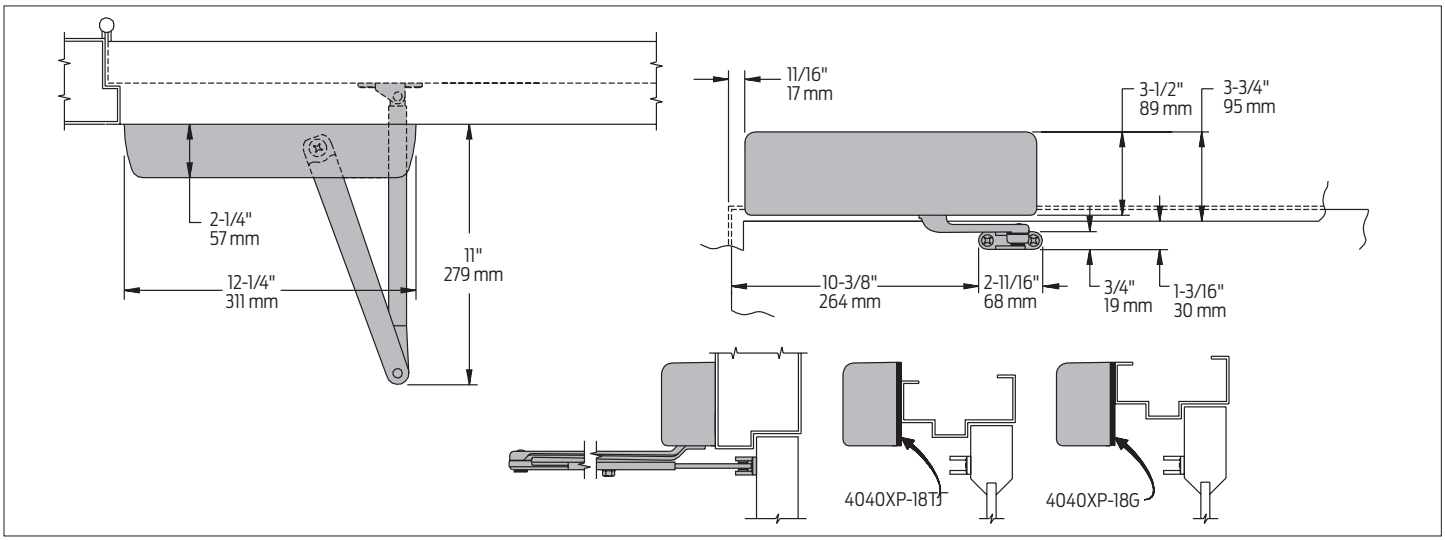
[1] Specify door thickness if other than 1 3/4"

Dimensions and mounting

Hinge (pull) side mounting

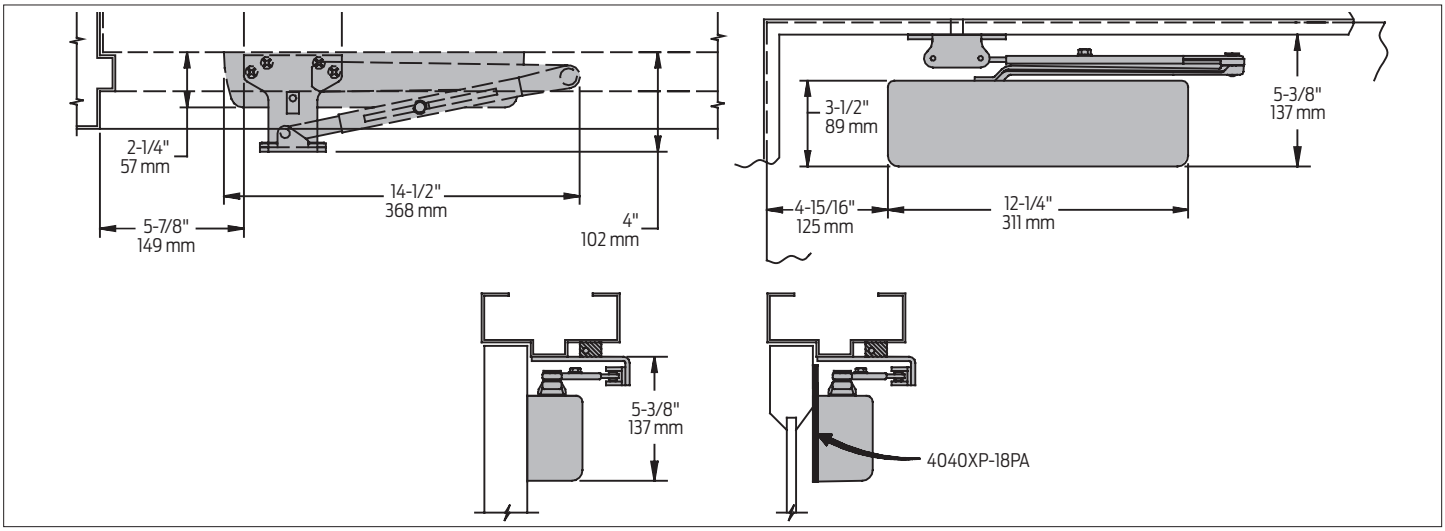


Top jamb (push side) mounting

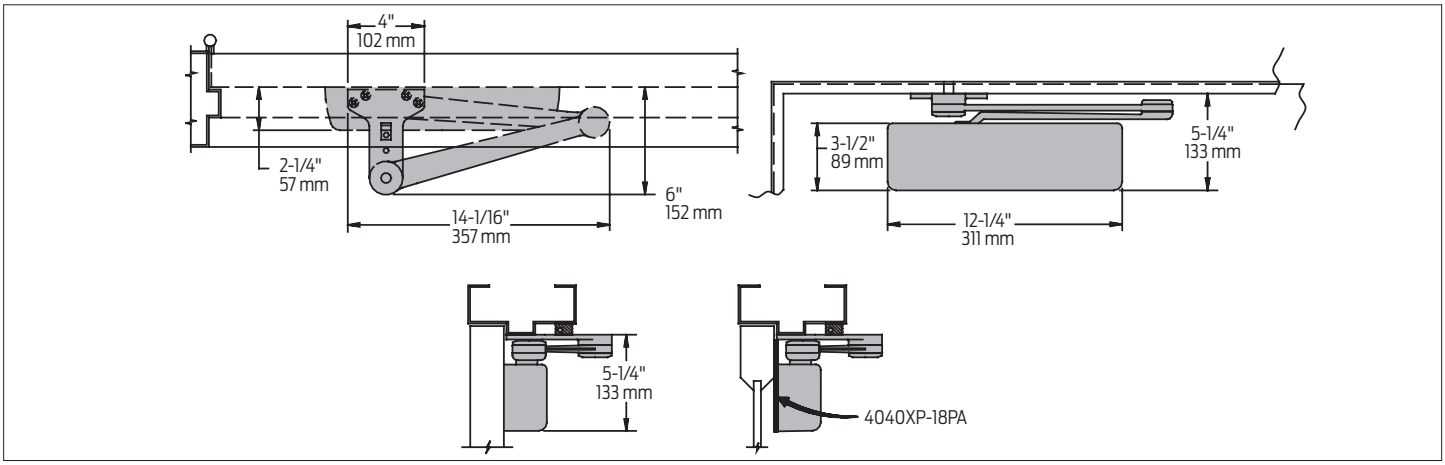


Dimensions and mounting

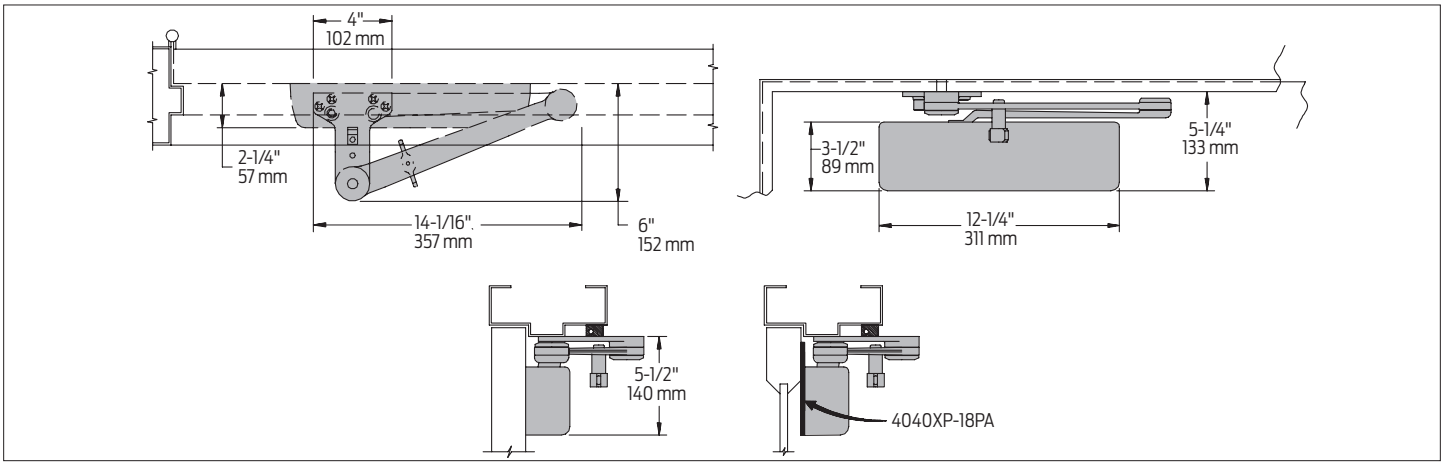
Parallel arm (push side) mounting



EDA mount



CUSH mount



Specifications

Accessibility	Available with less than 5.0 lbs. opening force on 36" door
Certifications/ approvals	▪ Grade 1 – ANSI A156.4 ▪ UL 10C ▪ Meets BAA – Buy American Act
Degree of operation	Hinge (pull) side Max opening: 120° Hold open: 90–120° Top jamb (push side) mount Max opening: 120° Hold open: 85–120° Parallel arm with 62PA Max opening: 180° Hold open: 180° EDA Max opening: 180° Hold open: 180° Cush and spring cush Max opening: 110° Hold open: 110°
Environmental conditions	▪ Approved for interior use ▪ Approved for exterior use (SRI coated only) ▪ LCN's standard all weather fluid performs to temperature ranges from 120°F (49°C) to -30°F (-35°C) ▪ LCN's powder coat finish surpasses 100 hours of salt spray which is over four times the ANSI standard for corrosion resistance.
Warranty	30 years
Standard features	Quality and durability ▪ **Cast iron cylinder** for rugged performance ▪ **Single-piece, heat-treated forged steel arms** to withstand greater forces ▪ **Heat-treated 1 1/2" diameter piston** for extra hardness and strength ▪ **Double heat-treated steel pinion 11/16" journal diameter** for greater wear-resistance
Standard features	▪ **Full complement bearings with minimum 0.5" height** to help withstand abuse ▪ **All-weather Liquid X fluid** for consistent performance through every season ▪ **Non-PRV (pressure relief valve) design** to minimize risk of property damage, injury, increased maintenance, and liability exposure ▪ **Snap-on cover with patent-pending retention improvement** to protect the products ▪ **Powder coat finish** that lasts longer than spray lacquer ▪ **30-year warranty** Ease of installation and adjustment ▪ **Tight tolerances in manufacturing** for accuracy and precision ▪ **LCN Green Dial** to take the guesswork out of spring force adjustments ▪ **Peel-n-stick template** for quick and accurate installation ▪ **Patent-pending positive stop** to prevent the screw from being backed out ▪ **Patent-pending regulation valve indicators** for visual color indicators ▪ **Independent speed adjustments** for greater door control ▪ **Graphic visuals and indicators** to make adjustments faster, easier, and consistent ▪ **QR code** for on-the-spot access to interactive instructions and tech support Flexibility ▪ **Universal** non-handed design ▪ **Full ranges** of mounts ▪ **Adjustable** spring sizes 1–6

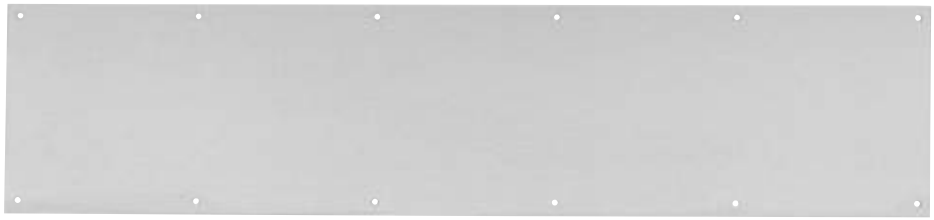
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ALLEGION™

8400 Series Protection Plates

- Door protection plates are available in .050" thick brass, stainless steel or aluminum; and 1/8" thick high impact polyethylene in clear or black.
- Bevel edge options; specify B4E for all four edges.
- Mounting screw pack furnished standard, 16 screws per pack. Optional screw packs are available for TEK or TORK screw heads. Refer to the following chart for ordering.
- Specify NMH for no mounting holes. (Not available on 8402)
- Specify NMH-A for no mounting holes with adhesive. (Not available on 8402)
- Specify CS for counter sunk mounting holes.
- Specify ERS prepped with extra row of screws.

Kickplate Gasket Tape Tape is recommended when using a brass plate on a metal door to reduce tarnishing from electrolytic oxidation. One tape pack will cover an the perimeters of a 8" x 34" kickplate. Order 8401 Gasket Tape.



8400 Protection Plate
8402 (UL)* Protection Plate

**UL mark appears in upper right corner. Factory supplied screws must be used.*

Number of screw packs required by plate size (specify TEK Screws or TORK screws).

	22"-25"	26"-33"	34"-41"	42"-48"
4"-8"	1	1	1	1
9"-16"	1	1	1	1
17"-24"	1	1	1	2
25"-32"	1	1	2	2
33"-40"	1	2	2	2
41"-48"	2	2	2	2

Finishes *brass 24" x 48" max. size*

US Number	US3	US4	US10	US10B	US15	US26	US26D
BHMA	605	606	612	613	619	625	626

Finishes *stainless steel*

US Number	US32	US32D
BHMA	629	630

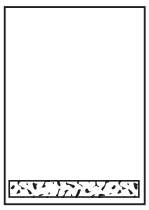
Finishes *aluminum*

US Number	US28
BHMA	628

Finishes *plastic*

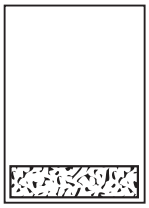
Clear and Black

Residential Grade Kickplates available Carded only, finishes PA28, PA3, PA619, PA716, B3, B505, B619, B716



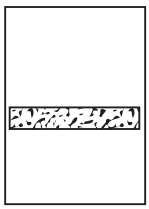
Mop Plates

- Protect the bottom of the pull side of door subject to cleaning and mopping procedures.
- Size Ranges:4" to 6" high, 22" to 48" wide



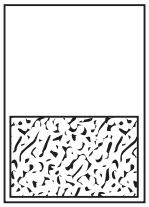
Kick Plates

- Protect the bottom of the push side of doors subject to scuffing from foot traffic.
- Recommended for all doors subject to normal use (especially doors using a closer).
- Size Ranges: 8" to 24" high, 22" to 48" wide



Stretcher Plates

- Protect doors at specific areas where consistent contact is made by stretchers, service carts or other equipment.
- Usually applied to push side of doors.
- Specify "B4E" Option for beveled edges.
- Size Ranges: 6" to 8" high, 22" to 48" wide



Armor Plates

- Protect lower half of doors from abuse by hard carts, trucks and rough usage.
- Usually applied to push side of single doors and both sides of double acting doors.
- Size Ranges: 26" to 48" high, 22" to 48" wide



WS406CVX & WS407CVX
Meets ANSI/BHMA 156.16 L22201 for brass, and L52101 for stainless steel.

WS406CCV & WS407CCV
Meets ANSI/BHMA 156.16 L22251 for brass and and L52251 for stainless steel.

WS406CVX Wall Bumpers
WS406CCV
WS407CVX
WS407CCV

- Constructed in sturdy yet economical wrought base of brass or stainless steel construction.
- Feature concealed tamper-proof mounting.
- Shipped factory preassembled backplate to reduce installation cost.
- Easy installation by inserting screwdriver through small hole in rubber.

WS406CVX (406) – convex rubber bumper, packed with wood screw and plastic anchor.
WS406CCV (406-1/2) – concave rubber bumper, which avoids damage to locks with projecting buttons, packed with wood screw and plastic anchor.
WS407CVX (407) – convex rubber bumper packed with screw and drywall anchor.
WS407CCV (407-1/2) – concave rubber bumper which avoids damage to locks with projecting buttons and is packed with screw and drywall anchor.

Dimensions

Base Diameter: 2-1/2"
Base Thickness: 3/8"
Overall Projection: 1"

Finishes *brass*

Ives Number	US3	US4	US5*	US10	US10B	US15	US15A**	US26	US26D	B716**
BHMA	605	606	609*	612	613	619	620	625	626	

Finishes *stainless steel*

Ives Number	US32D
BHMA	630

** only available on WS407CVX Slim-Pak of 15*

*** available on WS407CCV or WS407CVX Slim-Pak of 15*



FS439 Universal Dome Floor Stop

- High or Low-Rise Mount
- Zinc or Stainless Steel
- Spring-loaded Rubber Contact
- Replaceable Rubber Bumper

Dimensions

Overall Height: 1-1/2"
Pad Height: 1-1/8"
Base Height: 1/4"
Base Diameter: 1-7/8"

Finishes

Ives Number	US3	US4	US10B	US26D	US32D
BHMA	677	678	704	682	630



FS410 Decorative Floor Stop

- Non-directional
- Cast Brass Construction
- Replaceable Rubber Bumper

Dimensions

Overall Height: 1-1/2"
Bumper Thickness: 1/4"
Diameter: 1-1/4"

Finishes

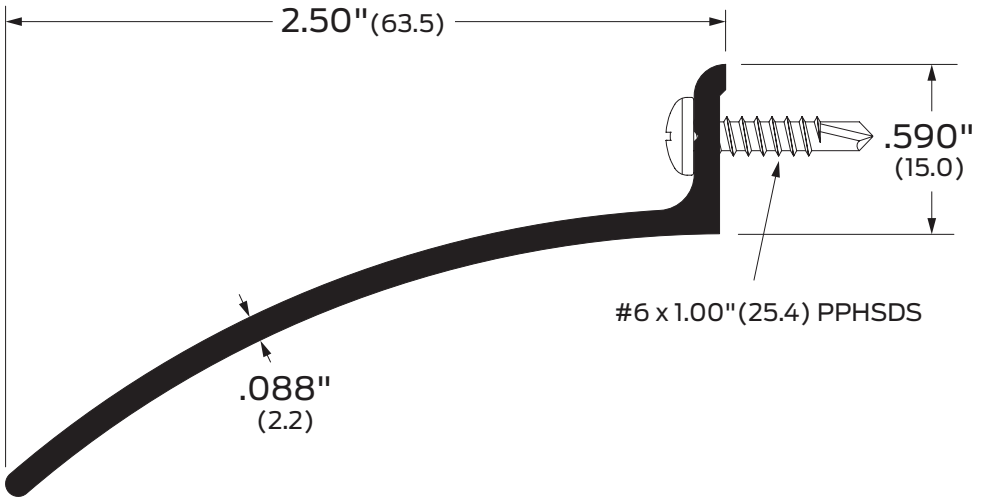
Ives Number	US3	US26D
BHMA	605	626

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Part No:	Part description:
142 Rain drip	Accessories & options

Notes:	Provided by:	
Customer name:	Job no:	Date:

Image may not be shown to scale



Certifications:

Fire rated-UL10c

ANSI/BHMA:

142AA, 142BK, 142D, 142G R3Y976

BHMA CERTIFIED

Finishes:

AA	Aluminum clear anodized
BK	Aluminum black anodized
D	Aluminum dark bronze anodized
G	Aluminum gold anodized

Options:

SEC	Security screws

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Part No: 188S

Part description: Self-adhesive weatherstripping

Notes:

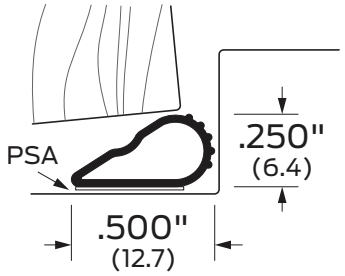
Provided by:

Customer name:

Job no:

Date:

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Notes:
PSA standard. 20-minute fire rating.

Certifications:

- Fire rated-UL10c
- Smoke and draft control
- Air Infiltration
- Sound

ANSI/BHMA:

188S R0E151

BHMA CERTIFIED

Finishes:

BK	Black
BR	Brown
CL	Clear
GY	Gray
WH	White

Options:

ZAG	Ligature resistant gasketing

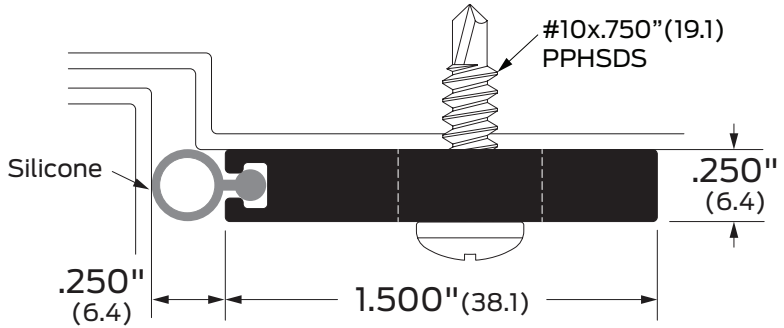
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Part No:	Part description:
429	Head & jamb gasketing

Notes:	Provided by:	
Customer name:	Job no:	Date:

Image may not be shown to scale



Notes:
Gasketing protection for closer bracket or door coordinator.

Certifications:

- Fire rated-UL10c
- Smoke and draft control

ANSI/BHMA:

429AA, 429BK, 429D, 429G R3E164

BHMA CERTIFIED

Finishes:

AA	Aluminum clear anodized
BK	Aluminum black anodized
D	Aluminum dark bronze anodized
G	Aluminum gold anodized

Options:

S	Order as a set
SEC	Security screws

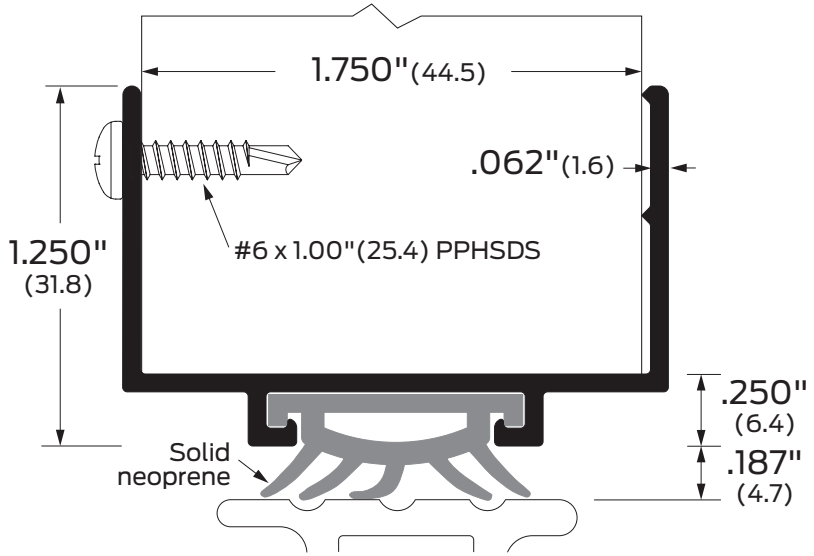
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Part No:	Part description:
111	Door shoe

Notes:	Provided by:	
Customer name:	Job no:	Date:

Image may not be shown to scale



Certifications:

Fire rated-UL10c

ANSI/BHMA:

111AA, 111BK, 111D, 111G R3B414

BHMA CERTIFIED

Finishes:

AA	Aluminum clear anodized
BK	Aluminum black anodized
D	Aluminum dark bronze anodized
G	Aluminum gold anodized

Options:

SEC	Security screws

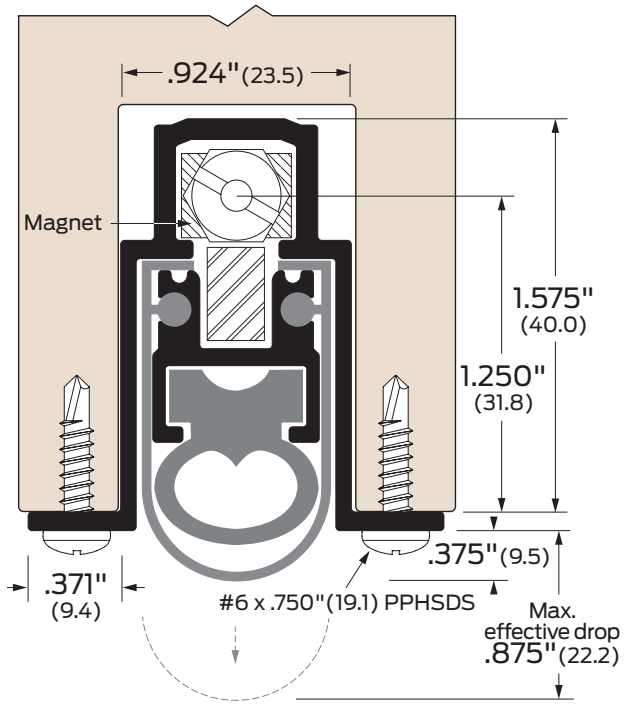
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Part No:	Part description:
369	Automatic door bottom Heavy duty

Notes:	Provided by:	
Customer name:	Job no:	Date:

Image may not be shown to scale



Notes:
Mortised. Supplied with double solid neoprene seal.
Magnet feature only on ADBs 24" and over.
Consult your local AHJ for maximum allowable door undercut.

Certifications:

- Fire rated-UL10c
- Sound

ANSI/BHMA:

369AA R3B3241

BHMA CERTIFIED

Finishes:

AA	Aluminum clear anodized

Options:

Z49	Removable end cap
PL	Pull out
NH	No holes

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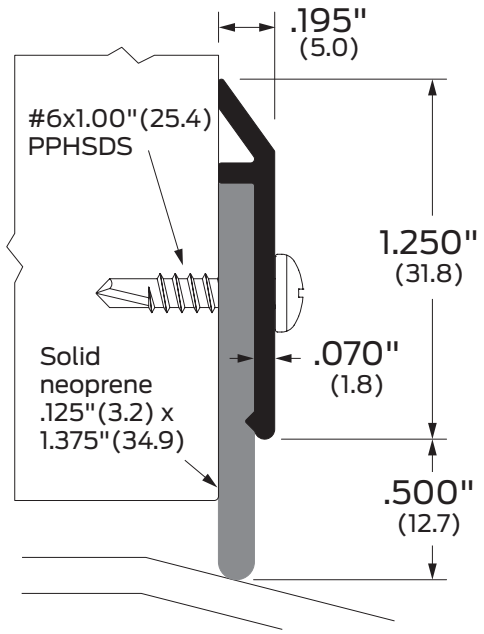
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Part No:	Part description:
39	Door sweep

Notes:	Provided by:	
Customer name:	**Job no:**	**Date:**

Image may not be shown to scale



Certifications:

Fire rated-UL10c

ANSI/BHMA:

39A, 39BK, 39D, 39G R3B434

BHMA CERTIFIED

Finishes:

A	Aluminum mill finish
BK	Aluminum black anodized
D	Aluminum dark bronze anodized
G	Aluminum gold anodized

Options:

S	Order as a set
SEC	Security screws

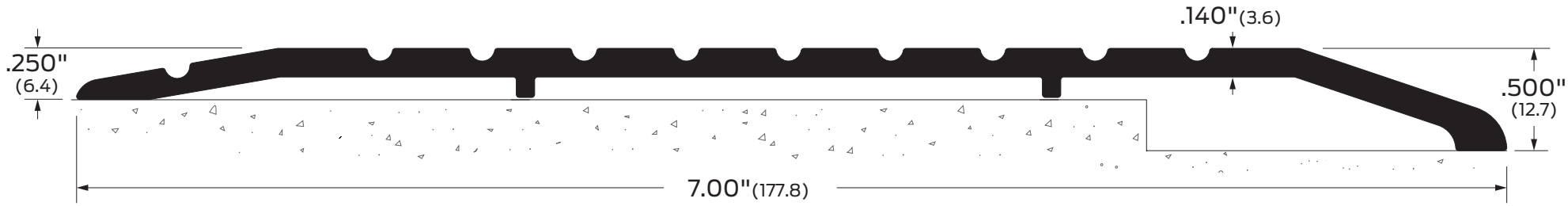
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Part No:	Part description:
103	Offset threshold

Notes:	Provided by:	
Customer name:	Job no:	Date:

Image may not be shown to scale



Notes:
Handicap offset. Supplied without mounting holes.

Certifications:

- Fire rated-UL10c
- ADA Accessible

ANSI/BHMA:

103A, 103D, 103G, 103BK	J32180
103A-E, 103D-E, 103G-E, 103BK-E	J32280

BHMA CERTIFIED

Finishes:

A	Aluminum mill finish
BK	Aluminum black anodized
D	Aluminum dark bronze anodized
G	Aluminum gold anodized

Options:

E	Epoxy abrasive tread
EL	Photoluminescent and abrasive epoxy tread

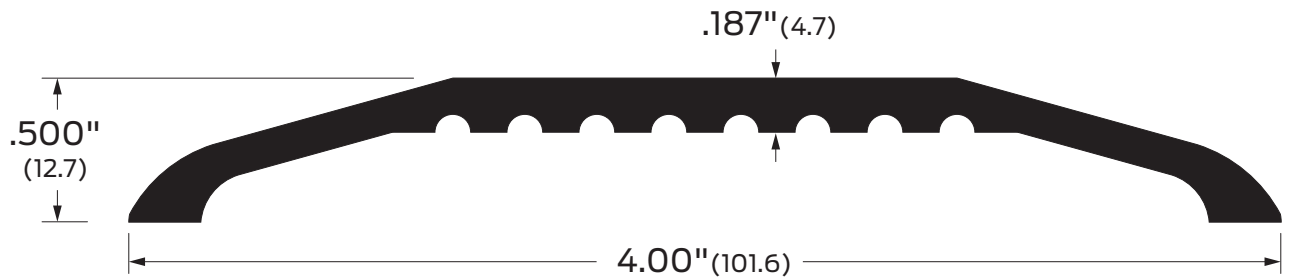
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Part No:	Part description:
164	Saddle threshold

Notes:	Provided by:	
Customer name:	Job no:	Date:

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Notes:
Model #654 is a recommended alternative if epoxy and/or body strength fills are desired.

Certifications:

- Fire rated-UL10c
- ADA Accessible
- Air Infiltration
- Sound

ANSI/BHMA:

164A, 164BK, 164D, 164G	J32300, J32330
164A-E, 164BK-E, 164D-E, 164G-E	J32400, J32430

BHMA CERTIFIED

Finishes:

A	Aluminum mill finish
BK	Aluminum black anodized
D	Aluminum dark bronze anodized
G	Aluminum gold anodized

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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.
2. Section 08 1416 - Flush Wood Doors.
3. Section 08 4112 - Aluminum Entrances and Storefronts.
4. Section 08 5123 - Steel Windows.
5. Section 08 5113 - Aluminum Windows.
6. Section 08 7100 - Door Hardware.

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 the CBC.

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-Strengthened and Fully Tempered Flat Glass.

4. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass.

5. CPSC 16 CFR 1201 - Safety Standards for Architectural Glazing Materials issued by the Consumer Products Safety Commission.

6. ANSI Z97.1 – Safety Glazing Materials Used in Buildings.

7. 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. Putty and glazing compound shall be delivered to the Project site in manufacturer's original unbroken containers labeled to identify contents.

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 five year material warranty.

B. Manufacturer shall provide a five 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.

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.

6. Equal.

2.02 GLASS MATERIALS

A. General: Conform to ASTM C1036, ASTM C1048, ASTM C1172 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. Tinted Float Glass: Type I (transparent glass), Class 2 (tinted heat absorbing and light reducing), quality q3 (glazing select), manufactured by PPG or LOF, color as selected by Architect, minimum 1/4 inch thickness unless otherwise indicated or required.

D. 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.

E. Clear Laminated Glass: Two layers of 1/8 inch clear float glass with 0.030 inch thick high strength polyvinyl butyral laminating sheet.

F. Tinted Laminated Glass: One layer of 1/8 inch clear float glass and one layer of tinted glass to match other windows, with 0.030 inch thick high strength polyvinyl butyral laminating sheet. Edges of laminated glass shall be treated with Argotec, Argo Edge Seal Plus, or equal, edge protection to prevent contact of laminating sheet with sealants.

G. Low Emissivity Glass (Low E Glass): Provide units with thin metallic high-transmittance coating applied to the number 3 surface of the unit, unless otherwise indicated. The U-value for the IGU shall be no greater than 0.34, unless otherwise indicated.

H. Wire Glass: Type II (patterned and wired glass, flat), Class 1 (clear glass), Quality q8 (glazing), Category II, Form 1 (wired, polished both sides), mesh m2 (square). Wire glass for fire rated openings shall bear an identifying UL label or the label of a recognized testing agency and shall be installed in a steel fire rated window frame assembly in compliance with CBC section 715.5. Wire glass shall be provided with fire-rated safety film meeting CPSC 16 CFR Part 1201, Category II for impact safety;

Superlite I-W, or equal. Safety film shall be installed on interior side of glass. Wire Glass Category I is not acceptable.

I. Obscure Glass: Type II (patterned), Class 1 (clear), Form 3 (patterned), Quality q7 (decorative), patterned one side, pattern as indicated or selected.

J. Unframed Mirrors: Category II safety backed mirror-quality float glass, ¼ inch thick, , edges finished and polished, double silvered with electro-deposited copper coating plus an organic protective coating, equal to Palmer Products Mirro-Bac Paint. Include polished stainless steel edge channels at top and bottom edges, plus mirror adhesive bonding to wall.

K. Framed Mirrors: Fabricated of one-piece Type 304 stainless steel angle frame, ¾ inch by ¾ inch, with continuous integral stiffener on sides and beveled front to hold frame tightly against mirror. Corners shall be heliarc welded, ground and polished smooth. Exposed surfaces shall have stain finish with vertical grain. Mirror shall be fabricated of 1/4 inch Category II safety backed mirror quality float glass, free from tong marks. Edges shall be protected by plastic filler strips. Full-size, shock-absorbing, water-resisting, non-abrasive 1/8 inch thick polyethylene padding shall protect backs of mirrors. Mirrors shall be provided with 24 gage galvanized steel back with integral hanging brackets for mounting on concealed, rectangular wall hangers, and shall be secured with concealed Phillips head locking screws on bottom of frame.

L. Thermoplastic Glazing: Polycarbonate sheet shall be ultra-violet stabilized material, clear or glare reducing as indicated, 1/4 inch thick as manufactured by General Electric Company “Lexan”, DuPont, or equal. Glare reducing glazing shall be gray in color, providing a light transmission of 14 percent.

2.03 GLASS SETTING MATERIALS

A. Glazing materials and accessories shall be fully compatible with the materials and finishes with which they are in contact.

B. 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.

C. 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.

D. Vinyl Glazing Channels: Profile compatible with framing system and designed to accommodate glass of specified thickness, light gray in color. Provide for dry glazing aluminum frames where indicated or permitted.

E. 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.

F. Spring Steel Spacers: Galvanized steel wire or strip designed to position glazing in channel or rabbet sash with stops.

G. Glazing Clips: Galvanized steel spring wire designed to hold glass in position in rabbet sash without stops.

H. Glazing Points (Sprigs): Pure zinc stock, thin, flat, triangular or diamond-shaped pieces, 1/4 inch minimum size.

I. 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.

J. Glazing Compound for Wood Sash: Provide acrylic latex glazing compound for bedding and sealing glass in wood frames

K. Glazing Compounds and Sealants for Thermoplastic: Provide silicone, butyl, or polysulfide glazing compound.

L. Mirror Setting Materials: Manufactured by Palmer Products Corporation, or equal, for installation of mirrors, and as follows:

1. Mirror backing paint: Mirro-Bac Paint, or equal, formulated to protect mirror silvering.

2. Mirror bond coat: Mirro-Mastic Bond, or equal, formulated to isolate deleterious backing materials from mastic and mirror.

3. Mirror mastic: Palmers Super Set Mirro-Mastic PM290.

2.04 SPEAK HOLES

A. Speak holes shall be stock No. 444, 4 to 6-inch diameter for 1/4-inch tempered float glass, stainless steel as manufactured by Nissen and Co., N666 by C.R. Laurence Co., or equal.

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:	9	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. Room or entrance doors shall be glazed with clear wire glass with impact film.

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. Display Cases and Sliding Glass Doors in Casework: Glass in display cases shall be ¼ inch clear laminated glass as indicated. Edges of glass shall be rounded and polished.

F. Serving windows in cafeterias with speak holes shall be laminated safety glass.

G. Glazing Aluminum Sash: Glazing material in aluminum sash shall be installed in compound and secured in place with aluminum glazing beads. In addition, horizontal beads shall be installed with 6-inch by 1 inch, type A, self-tapping, stainless steel, Phillips-head screws, installed into pre-drilled, counter-sunk holes and spaced 2 inches from each end and 9 inches on centers.

H. 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 oversight line. Do not undercut.

H. Glass in Wood Frames: Install glass with glazing points and setting blocks as required. Seal glass with glazing compound and secure with wood stops. Install stops with fine finishing nails and set for putty stopping.

I. Patterned Glass: Install glass with one patterned smooth surface on the weather side.

J. Wire Glass: Install glass for fire doors in accordance with installation requirements of NFPA 80.

K. Laminated Glass: Sashes, which are to receive laminated glass, shall be weeped to the outside to permit water in the channel to drain from the frame.

L. Unframed Mirrors: Walls shall be clean, dry, plumb, rigid and smooth. Install mirror backing paint to back of mirror and to edges. Install mirror bond coat over painted backing, wood backing, concrete and masonry to receive mirrors. Bond coat is not required over vitreous surfaces. Install sufficient mirror mastic coverage when mirror is installed. Mirror mastic will be applied 4 inches from edge and at a maximum of every 12 inches at the size of a golf ball. Install mirror into place, providing 3/16 inch clearance between mirror and substrate. Support mirrors with temporary edge channels to allow mastic set-up and provide permanent top and bottom edge channels.

M. Framed Mirrors: Walls shall be clean, dry, plumb, rigid and smooth. Install mirrors with concealed mounting devices, and secure with concealed screws on bottom of mirror. Conform to manufacturers written recommendations.

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 09 0561

MOISTURE TESTING FOR FLOORING INSTALLATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Moisture, alkali and bond testing of existing and new concrete slabs on grade and elevated slabs scheduled to receive adhered flooring.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 03 3000: Cast-in-Place Concrete; concrete slab curing.

3. Division 09 Finishes: Flooring Sections.

1.02 REFERENCES

A. ASTM International (ASTM):

1. ASTM D7234 – Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.

2. ASTM F710 – Practice for Preparing Concrete Floors to Receive Resilient Flooring.

3. ASTM F1869 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

4. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

1.03 TESTING REQUIREMENTS

A. Perform the following tests:

1. At new and existing concrete slabs on grade and below grade:

a. Moisture Vapor Emission Rate testing per ASTM F1869.

b. Relative Humidity testing per ASTM F2170.

c. pH testing per ASTM F710.

d. Bond testing per D7234 or manufacturer recommendations.

2. At new and existing lightweight concrete elevated slabs:

a. Relative Humidity testing per ASTM F2170.

b. pH testing per ASTM F710.

c. Bond testing per D7234 or manufacturer recommendations.

3. At new normal weight concrete elevated slabs:

a. Moisture Vapor Emission testing per ASTM F1869.

b. Relative Humidity testing per ASTM F2170.

c. pH testing per ASTM F710.

d. Bond testing per D7234 or manufacturer recommendations.

1.04 SUBMITTALS

A. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; indicating:

1. Moisture, humidity and pH limits.

2. Manufacturer's bond/compatibility test procedure.

B. Test Report: Submit on chart form with small scale floor plans showing the location of each test performed.

1. Submit report for relative humidity test in accordance to ASTM F2170. Include pH, moisture vapor emission, and adhesion test results.

2. Indicate areas where the test results exceed the floor covering manufacturer's limits and indicate proposed remediation procedures.

1.05 QUALITY ASSURANCE

A. Tests indicated in this Section shall be performed by CONTRACTOR or a qualified independent testing agency retained and paid by CONTRACTOR. OWNER may perform testing at its own expense to compare to CONTRACTOR’s test results.

B. Testing kits:

1. Moisture-Vapor Emission: Prepackaged anhydrous calcium chloride test kits conforming to requirements of ASTM F-1869.

2. Alkalinity: Calibrated digital pH meter in accordance with ASTM F-710.

3. Relative Humidity: Relative humidity concrete moisture testing equipment conforming to ASTM F-2170.

C. Chemically based products such as sealers, primers, fillers and adhesives, shall be approved by the OWNER's Office of Environmental Health and Safety (OEHS).

1.06 ENVIRONMENTAL CONDITIONS

A. Project areas to be tested shall be at the same temperature and humidity expected during normal use. These temperature and humidity levels shall be maintained for 48 hours prior to, and during the testing. If this is not possible, temperature and relative humidity ranges shall be within ranges indicated in the applicable ASTM test method.

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.01 PREPARATION

A. Testing shall take place after allowing concrete to dry for a minimum of 90 days.

B. Prior to test placement, CONTRACTOR shall clean concrete slabs and have them free of foreign substances, such as residual adhesives, curing or hardening compounds, adhesive removers, sealers, paints and other foreign materials that might prevent adhesive bond. These materials shall be removed not less than 24 hours prior to the placement of the test kits. Testing when floor coverings have never been installed may waive the 24 hour wait period.

C. The test site temperature and humidity shall be in conformance to Article "Environmental Conditions".

D. Minimum number of tests: For Moisture Vapor Emission Rate, Relative Humidity and pH testing, provide three for the first 1,000 square feet of floor area, and at least one for each additional 1,000 square feet or fraction thereof.

3.02 MOISTURE VAPOR EMISSION TESTING (MVEP)

A. MVEP testing shall be performed in accordance to ASTM F1869.

B. Unless more stringent requirements are recommended by flooring manufacturer, the maximum allowable moisture release at time of flooring installation shall be three pounds per 24 hours per 1,000 square feet.

C. Weigh test dish on site prior to start of test. Scale must report weight to 0.1 grams. Record weight and start time. Expose Calcium Chloride and set dish on concrete surface. Install test containment dome and allow test to proceed for 60 – 72 hours.

D. Retrieve the test dish by carefully cutting through containment dome. Close and reseal test dish. Weigh test dish on site recording weight and stop time. Calculate and report results as "pounds of emission per 1,000 sq. ft. per 24 hours".

E. In the event the MVEP value exceeds the value specified in this Article and the flooring manufacturer recommended limits, CONTRACTOR shall propose remediation to OWNER. In new concrete slab construction, remediation shall be at no cost to OWNER.

3.03 RELATIVE HUMIDITY TESTING

A. Relative humidity testing shall be performed in conformance to ASTM F2170.

B. Choose test areas where high moisture levels are suspected. Holes in new concrete slabs may be cast or drilled. Depth of holes shall be 40% of slab thickness for slabs drying only from the top, and 20% when drying from top and bottom, as indicated on ASTM F2170. Determine the concrete thickness of each type of slab to be tested and calculate depth of holes.

1. Hole shall be drilled dry; do not use water for cooling or lubrication. Drill holes in the concrete and insert test liners. Hole shall not be more than 0.04 inches, or one millimeter, larger than the test liner.

2. Before placing concrete, secure liner tube to formwork or steel reinforcing to avoid displacement during concrete placement, consolidation and finishing. Secure a solid rod into the liner and protruding slightly above the top of the liner to exclude fresh concrete from entering the liner.

C. Clean the area around the hole with a vacuum cleaner and vacuum the dust out of the hole. Immediately, set the sleeve by tapping the sleeve into the hole with a hammer or mallet.

D. Remove the sleeve plug and place probe into the sleeve assuring that it reaches the bottom of the test hole. Connect the probe lead wire to the meter, and turn meter on. Allow time for the probe to sit in the test sleeve to achieve moisture equilibrium before taking relative humidity readings. Probe shall be at the same temperature as the concrete before the reading. Check for drift and follow meter manufacturer recommendations.

E. Record the relative humidity to the nearest percent and temperature to the nearest degree. Record location of hole within the structure and depth of probe. Use the relative humidity probe to measure the ambient air temperature and relative humidity above the

slab in the vicinity of the test location. Remove the liner and fill the hole with a cementitious patching compound.

F. In the event the relative humidity exceeds 75% and the flooring manufacturer recommended limits, CONTRACTOR shall propose remediation to OWNER. In new concrete slab construction, remediation shall be at no cost to OWNER.

3.04 PH LEVEL TESTING

A. Perform testing in accordance to ASTM F710, and at the same time as the vapor emission and relative humidity tests.

B. Place several drops of water onto the concrete surface to form a puddle approximately 1" in diameter. Allow the water to set for 60 +/- 5 seconds. Dip the pH paper into the water and remove immediately, compare color to chart provided by paper supplier to determine pH reading. Record and report results.

C. When using pH Pencil and pH Meters, follow the instrument manufacturer's instructions.

D. The surface of the concrete should have a pH of 9 or less. In the event the pH exceeds this value and the flooring manufacturer recommended pH limits, CONTRACTOR shall propose remediation to OWNER. In new concrete slab construction, remediation shall be at no cost to OWNER.

3.05 BOND TEST

A. Perform bond testing in accordance to ASTM D4541 or per manufacturer's recommendations.

B. Select appropriate locations for the bond tests such as near walls or in light traffic areas. Spaced test samples approximately 50 feet apart throughout the designated installation area. Number of tests will be as determined by the recommended spacing of 50 feet.

C. Use the flooring material and recommended adhesives. Install 3' x 3' panels using the exact techniques that will be used for the flooring installation. It is recommended that tests be spaced approximately 50 feet apart throughout the designated installation area. Tape edges of panels to prevent edge drying of adhesive. Protect test panel from traffic.

D. After 72 hours of placing the flooring, remove tape and observe whether it is bonded tightly to the floor, by trying to lift the edges with a scraper or other means, or pull flooring from the subfloor by hand. Determine if bonding is suitable for flooring installation.

E. At locations where membrane, primer, leveler or patch are applied, perform applicable bond testing recommended by flooring manufacturer to assure adequate bondage of flooring to substrate.

F. Success or failure shall be determined by visual interpretation and the amount of physical effort required to remove the floor covering. If the flooring material can be removed it will indicate failure of the bond test. If the flooring requires a great deal of effort to pull it

up, the bond test can be considered successful, providing no sign of moisture is found. In the event that bond failure occurs in new concrete slab construction, remediation shall be at no cost to OWNER.

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 installation of finish flooring.

END OF SECTION

SECTION 09 2216

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Non-structural metal framing.

2. Slotted system for positive attachment of metal studs to fluted steel decks for head of wall expansion joint movement (cyclic).

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 05 4100 - Structural Metal Stud Framing.

3. Section 07 8116 Cementitious Fireproofing.

4. Section 07 8413 Penetration Firestopping.

5. Section 07 9200 – Joint Sealants.

6. Section 09 2423 - Cement Plaster and Metal Lath.

7. Section 09 2900 - Gypsum Board.

1.02 PROJECT REQUIREMENTS

A. Regulatory Requirements: Comply with DSA and CBC requirements.

B. Design Requirements:

1. Metal Studs: Studs for interior partitions shall be roll-formed channel or C-shapes.

2. Track: Stud track for floor and ceiling anchorage shall be channel configuration, sized to fit studs. Galvanized steel as manufactured for installation with specified metal studs.

3. Design: Design is based on minimum 5 pounds per square foot load applied perpendicular to walls. Deflection shall not exceed 1/240 under design load.

C. Performance Requirements: The top track fire-rated assembly, when incorporated into stud systems and tested in conjunction with products specified in Sections 07 8116 and/or 07 8413, shall exhibit the following performance characteristics:

1. Cyclic System: When tested for cyclical movement, in accordance with UL 2079.

2. When subsequently tested for one- and two-hour fire-resistive rated construction, in accordance with ASTM E119 and ASTM E814, assembly shall conform to requirements for hose stream resistance.

1.03 SUBMITTALS

A. Shop Drawings: Submit drawings showing framing, connection details, accessories and anchorage. Indicate location of assemblies and size and spacing of framing components.

B. Product Data: Submit manufacturer's catalog data for each item proposed for installation.

C. Certificates: Furnish manufacturer's certification that materials meet or exceed Specification requirements.

1.04 DEFINITIONS

A. Cyclic Anchoring Method: A system which provides for positive attachment (as described in ASTM C754) of studs to upper track, and of track to overhead fluted deck, while permitting up to 1-inch of vertical movement.

B. System: The application of the above products in their entirety as tested. There can be no intermixing of components unless specifically outlined in the appropriate test reports.

1.05 QUALITY ASSURANCE

A. Coordinate with related Work to provide blocking for items mounted on finished surfaces and to provide allowances for pipes and other items inside partitions and walls.

B. Comply with following as a minimum requirement:

1. American Welding Society (AWS): Structural Welding Code Steel (D1.1); and Structural Welding Code Sheet Steel (D1.3).

2. ASTM Standards:

a. ASTM A641 – Standard Specification for Zinc Coated (Galvanized) Carbon Steel Wire.

b. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.

c. ASTM A1003 –Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.

d. ASTM C645 – Standard Specification for Non-Structural Steel Framing Members.

e. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

f. 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 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.

g. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.

h. ASTM E814 - Standard Test Methods for Fire Tests of Penetration Firestop Systems.

3. Underwriter Laboratories (UL):

a. UL 94 – Classification and Flame-Retardant Thermoplastics.

b. UL 2079 - Standard for Safety Tests for Fire Resistance of Building Joint Systems.

4. American Iron and Steel Institute:

a. North American Standard for Cold Formed Steel Framing – Nonstructural Members.

5. Military Specifications (MIL-P):

a. Paint High Zinc Dust Content, Galvanizing Repair.

C. Tolerances: Install walls and partitions on straight lines, plumb, free of twists or other defects, and contacting a 10-foot straightedge for its entire length at any location within a 1/8 inch tolerance. Install horizontal framing level within a tolerance of 1/8 inch in 12 feet in any direction.

D. Manufacturers shall be members of the Steel Framing Industry Association (SFIA) or the Steel Stud Manufacturers Association (SSMA).

1.06 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered in their original unopened packages and stored protected from damage. Do not store material directly on grade. Provide adequate support to prevent bowing of material prior to installation.

B. Store welding electrodes in accordance with AWS D12.1.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Non-structural metal framing:

1. ClarkDietrich.
2. Marino/Ware.
3. Cemco.
4. Equal.

B. Top Track Systems:

1. BlazeFrame DSL or MaxTrak by ClarkDietrich, or equal. Down-standing legs shall be nominally 2 1/2-inch and shall be provided with 1 1/2-inch slots at 1 inch on center.
2. VertiTrack or VertiClip System by The Steel Network, Inc. or equal. Pre-assembled track with clips installed to match stud spacing. Clips with attached bushing and screws to allow stud movement.
3. System must provide for minimum tested overall movement of 3/4” up and 3/4" down.
4. Track shall be provided in standard widths of 4 and 6 inches and in 16, 18, and 20 gage (54, 43, and 33 mil) sheet steel thickness, as required by Project conditions and detailed.

2.02 MATERIALS

A. Light Gage Metal Framing:

1. Metal framing shall be formed from corrosion resistant-steel conforming to requirements of ASTM A653, 33 ksi minimum.
2. Metal framing shall be manufactured in conformance to AISI S220 and zinc coated to G60 per ASTM C645/AISI S220.
3. Install metal framing according to ASTM C754.

B. Studs: SFIA , Intertek CCRR - 0204SSMA, ICC-ES ER-3064, minimum yield 33 ksi, hot-dipped galvanized sheet steel, G-60, C Stud type, punched web (except tracks and joists), C-shaped, sizes required to conform to details and scheduled wall thicknesses. Studs shall be rolled from new steel sheet and shall not be produced from re-rolled steel. Stud flanges shall not be less than 1 1/4-inch wide; track legs, not less than 1 ¼-inch wide.

1. Wall Framing and Furring for Plaster and Mortar Beds: Studs and tracks shall be 18 gage (43 mil) minimum, unless otherwise indicated.

2. Wall Framing and Furring for Gypsum Wallboard: Studs and tracks shall be 20 gage (30 mils) 33 ksi unless otherwise indicated.

3. Load-Bearing Studs: Studs and members 18 gage (43 mil) and thicker shall conform to requirements of Section 05 4100 - Structural Metal Stud Framing.

4. Stud gages indicated on Drawings or specified are the minimum. Where required stud height and/or loads exceed code requirements or manufacturer's recommendations, provide heavier gage studs and/or decrease stud spacing as necessary to conform to code requirements.

C. Suspended and Furred Ceiling Systems and Wall Furring: Suspended ceiling framing system shall support finished ceiling, light fixtures, air diffusers, and accessories, as required. Suspension system shall provide a maximum deflection of L/240. Carrying channels shall be fabricated from minimum 0.0538 inch thick cold-rolled steel, 1 ½-inch wide by 1/2 inch deep. Carrying channels for supports under ducts shall be 2 inches in size as specified. Carrying channels shall be fabricated from hot-dip galvanized coated sheet.

1. Plaster Ceilings: Cross furring members shall conform to AISI S220, and shall be fabricated from cold-rolled steel, 7/8 inch wide by 1/2 inch wide flange. Furring members shall be fabricated from hot-dip galvanized coated sheet.

2. Gypsum Wallboard Ceilings: Furring members shall be fabricated from cold-rolled steel, 7/8 inch by 2-23/32-inch. Furring members shall be fabricated from hot-dip galvanized coated sheet.

D. Ceilings:

1. Framed Ceilings: Framed ceiling framing system shall support finished ceiling, light fixtures, air diffusers, and accessories, as required. Suspension system shall provide a maximum deflection of L/240.

2. Plaster and Gypsum Wallboard Ceilings: Ceiling joists shall conform to AISI S220, hot-dip galvanized coated steel, C-shaped, unpunched, 20 gage (30 mil) minimum, unless noted otherwise.

E. Shaft Wall Framing Members: CH or CT studs and J runners, 20 gage (30 mil) minimum for 2-1/2, 4 or 6 inch studs, conforming to AISI S220, fabricated of steel conforming to ASTM A653, hot-dip galvanized.

F. Framing Accessories: Provide standard related accessories including floor and ceiling tracks, clips, web stiffeners, anchors, and similar items, of same manufacture as each type of stud specified, and as required for a complete installation.

G. Splay Wires and Compression Struts: Approved manufacturers acceptable to manufacturer of ceiling grids, gages and types as required by building codes for ceiling types and weights specified.

H. Wires: Soft-annealed galvanized steel wire per ASTM A641, 8 gage for hanger wires and 16 gage for framing unless otherwise specified.

I. Fasteners: Wafer-head screws, self-drilling type for 20 gage (30 mil) metal and heavier. ASTM C954 self-drilling, self-tapping screws, Type S-12 pan head, 1/2 inch long.

J. Fire Rated Acoustical Foam Tape: Compressible, closed cell polyvinyl chloride foam with pressure sensitive adhesive, in rolls with protective release liner on non-adhesive face, 6 pounds per cubic foot density, 1 inch wide x not less than 1/4 inch thick, self-extinguishing, UL 94 recognized, Norseal V740FR, manufactured by Norton Performance Plastics Corporation, or equal.

K. Acoustical Sealant: Permanently resilient type, non-hardening, as specified in Section 07 9200.

L. Zinc-Rich Paint: Conform to MIL-P-21035. "Cold Galvanizing Compound", manufactured by ZRC Products Company, or equal. Provide for touch-up of galvanized surfaces.

M. Steel Backing Plates: Provide a minimum 4 inch wide by l6 gage (54 mil) steel, or sections of studs and stud track welded or fastened to web of studs, except as otherwise indicated. Apply galvanizing coat.

N. Anchorage Devices Powder Actuated: Minimum 0.177 inch diameter by 1-7/16 inch long fasteners in regular concrete and 0.145 inch diameter by 1 1/8-inch long fasteners in lightweight concrete. Allowable shear and tension values as permitted in ICC ES reports shall be reduced to 80 percent.

O. Anchorage Devices, Drilled Expansion Anchors: Minimum 3/8 inch diameter with 2-1/4 inch embedment. Allowable shear and tension values as permitted in ICC ES reports shall be reduced to 80 percent.

P. Top Track System Materials:

1. Forming steel shall be mill certified prime steel:

a. For 0.0538 inch sections, conform to ASTM A1003, Grade 50 with a minimum yield point of 50,000 psi.

b. For 0.0428 and 0.0329 inch sections, conform to ASTM A1003, Grade 33, with a minimum yield point of 33,000 psi.

c. Formed steel shall be provided with galvanizing in accordance with ASTM A653 for a G60 zinc coating.

2. Fasteners:

a. For attachment of steel studs to slotted track or deflection clip, minimum No.8 corrosion resistant by ½ inch waferhead screws.

b. For attachment of track system to overhead structural element or metal decking, as provided for by the structural details affecting the Work.

3. Sprayed-on Fireproofing:

a. Sprayed-on fireproofing shall be as specified in Section 07 8116 - Cementitious Fire Proofing.

4. Dry Method:

a. Dry mineral wool and sealant system shall use only such products as are represented to have been fully tested and approved under UL 2079 and as specified in Section 07 8413 - Penetration Firestopping.

b. Mineral wool shall be compressed to the degree as used on approval fire and hose stream test.

c. The system supplier shall provide a measuring device capable of determining compression to determine compliance with required density.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that overhead or concealed Work is completed, tested, inspected, and finished as required before starting Work of this section.

3.02 INSTALLATION

A. Walls and Partitions:

1. Fasten floor runners for exterior walls and interior partitions to concrete slab with required power driven fasteners. Spacing of fasteners not to exceed 24 inches on center. Fasten ceiling runners to structure as by top track system manufacturer.

2. Sound insulated walls and partitions: Embed floor runner tracks in two beads of acoustical sealant or two runs of compressible tape seal. Install top track nested into slotted track system, in same manner for full height of walls. Where wall ends abutting concrete, masonry, or steel set end studs in two beads of acoustical sealant or two tape seals and secure at 4-foot centers vertically.

3. Space studs not over 16 inch on center unless indicated otherwise. Studs shall be located approximately 2 inches from door frame jambs, abutting partitions and partition corners, except those providing support for door and window openings.

4. Furnish and install manufacturer's standard floor track. Fasten track to floor by means of 1/4 inch by 1 1/4-inch Star "Dryvin" hammer drive anchors or 3/16 inch by 1 inch round head, "Rawl-Drives" one-piece expansion bolts spaced not to exceed 3 feet, and installed in drilled holes in slab, or to wood joist with nails as indicated. Track may be fastened to concrete floor slabs with, power-driven fasteners.

5. Studs shall be seated squarely in track with stud web and flanges abutting track web, plumbed and securely fastened with sheet metal screws, to flanges or web of both floor and top tracks. Provide 4 screws per stud.

6. Where there is no suspended ceiling, tops of stud walls shall be provided with track and shoes and be fastened as specified for floors. Welding of studs to ceiling track will not be permitted except where bearing studs are installed.

7. Over metal doorframes, install a cut-to-length section of runner track, with flanges slit and web-bent to allow flanges to overlap adjacent vertical studs, and securely fasten to studs. At doorjambs, extend studs continuous to structure above.

8. Bridging, or horizontal bracing of 1 1/2-inch, cold-rolled channels shall be fastened in a manner to prevent stud rotation. Bridging shall be furnished as follows: walls up to 10 feet high, one row at mid-height; walls exceeding 10 feet high, bridging or bracing rows spaced not to exceed 5 feet on center.

9. Wind bracing shall be fastened where indicated on Drawings. Minimum size of strap shall be as indicated on Drawings. Track where strap terminates shall be anchored as indicated on Drawings.

B. Plaster Ceiling Suspension System:

1. Provide horizontal furring in accordance with CBC Section 2507.

2. Hanger Wires:

a. Hanger wires for ceilings suspended from wood frame construction shall be installed in accordance per DSA IR 25-1 and 25-4 and shall be fastened with stem lag screws in bottom edge of joists or rafters. Wire shall be looped through hole in stem lag screw and then wrapped twice around it. Stem lag screws shall be "Stanlag Screws" by Stanline, Inc., or equal, of type and penetration as follows:

Type Size	Hanger Wire	Screw Penetration, Minimum
Stanlag #SLS-3	#12 & #10 (0.104 and 0.128 inch diameter)	1 1/4-inch
Stanlag #SLS-375	#9 & #8 (0.144 and 0.160 inch diameter)	1 1/2-inch

b. Hanger wire shall be wrapped twice around runner channel, drawn up taut, and wrapped twice around itself.

3. Runner channels shall be installed 6 inches maximum from walls, parallel to runners. Splices in runner channels shall be provided at hangers only, by lapping channels not less than 12 inches and tying channels together at 2 points with a double wrap of tie wire twisted up taut.

4. Ends of runner channels abutting concrete or masonry surfaces shall be 1 ¼-inch clear and shall be tied to wall or partition with 3/4 inch channel brackets providing a 4-inch right angle bend secured with two 1/4 inch by 1 inch power-driven fasteners. Brackets shall extend from face of surface not less than 8 inches and shall be tied to runner channels at two points with double wrap of tie wire twisted up taut.

5. Securely saddle-tie furring channels to runner channels at each crossing with 16 gage (0.0538 inch diameter) tie wire twisted up taut, and with wings left uncut and bent back.

C. Gypsum Wallboard Ceiling Suspension and Framing: Suspended ceiling system framing shall be installed in accordance with ASTM C754, and as follows.

1. Hangers shall be spaced not more than 48 inches along runner channels and 36 inches in other direction or 42 inches in both directions unless otherwise indicated. Locations of hanger wires shall be coordinated with other Work. Hangers at ends of runner channels shall be located not more than 6 inches from walls. Hanger wire shall be fastened to structural elements with required fasteners. Sags or twists, which develop in suspended system, shall be adjusted. Damaged or faulty parts shall be replaced.

2. Main Runners: Hanger wires shall be double strand saddle-tied to runner channels and ends of hanger wire shall be twisted three times around itself. Main runners shall be located to within 6 inches of parallel wall to support ends of cross furring. Main runners shall not come in contact with abutting masonry or concrete walls. Where main runners are spliced, ends shall be overlapped 12 inches with flanges of channels interlocked, and shall be securely tied at each end of splice with wire looped twice around channels.

3. Furring channels shall be fastened to runner channels and to structural supports at each crossing with tie wire, hairpin clips, or required fastenings. Furring channels shall be located within 2 inches of parallel walls and beams, and shall be cut 1/2 inch short of abutting walls.

4. Ceiling Openings: Support members shall be provided as required at ceiling openings for access panels, recessed light fixtures, and air supply or exhaust. Support members shall be not less than 1 1/2-inch main runner channels and vertically installed suspension wires or straps shall be located to provide at least minimum support specified for furring and wallboard attachment. Intermediate structural members not a part of structural system, shall be provided for attachment or suspension of support members.

5. Light fixtures and air diffusers shall be supported directly from suspended ceiling runners. Wires shall be provided at required locations to support weight of recessed or surface mounted light fixtures and air diffusers.

6. Control Joints: Ceiling control joints for expansion and contraction shall be located where indicated on drawings. A control joint or intermediate blocking shall be installed where ceiling framing members change direction.

   a. Interior Ceilings with Perimeter Relief: Control joints shall be installed so linear dimensions between control joints shall not exceed 50 feet in either direction or more than 2,500 square feet in area.

   b. Interior Ceilings without Perimeter Relief: Control joints shall be installed so linear dimensions between control joints shall not exceed 30 feet in either direction nor more than 900 square feet in area.

D. Splay Wires and Compression Struts: Install as detailed and as required to prevent upward and sideward motion under seismic conditions, as required by code.

E. Suspension Under Ducts: For hangers spaced at 4 to 5 ½-foot centers, provide 6 gage (0.192 inch diameter) hanger wires with minimum 2 inch runner channels spaced at maximum 48 inch centers. For greater spans, design system for live load of l0 pounds per square foot of area plus dead load and provide a detail in Shop Drawings.

F. Furring: Provide framing for horizontal furring as shown or required. Conform to above requirements as applicable.

3.03 CONNECTIONS TO METAL DECKING

A. Provide pre-molded neoprene filler strips matching flute profile for non-fire-rated walls and partitions covered on one or both sides up to metal decking.

B. The top runner track of fire-rated partitions shall be a minimum of 20 gage (33 mils) and fastened to metal deck with required fasteners at spacing required for fire rating, but in no case over 16 inches on center. Neither wallboard nor metal studs shall be fastened to top runner to allow for slab deflection. Areas above runner shall be friction fit with a minimum depth of 2 1/2-inch of 4 pounds per cubic foot mineral wool insulation. A minimum of 1/2 inch of firestopping compound shall be installed to each side of mineral wool insulation for 1-hour system, and 1 inch of firestopping for a 2-hour system. Install required special tracks, angles, fasteners and strips of gypsum wallboard as required to achieve required fire resistance rating.

C. Proprietary fire-rated top tracks are installed in accordance with manufacturer's recommendations and fire rating approval requirements.

3.04 CLEANING

A. Remove debris, rubbish, and waste material and legally dispose of off Project site.

3.03 PROTECTION

A. Protect 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. Lath and scratch coat of Portland cement plaster as a substrate for ceramic wall tile.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 03 3000 – Cast-in-Place Concrete.

3. Section 04 2200 – Concrete Unit Masonry.

4. Section 05 4100 - Structural Metal Stud Framing.

5. Section 06 1000 - Rough Carpentry.

6. Section 06 1643 – Gypsum Sheathing.

7. Section 07 2100 – Thermal Insulation.

8. Section 07 2719 – Plastic Sheet Air Barriers.

9. Section 09 2216 - Non-Structural Metal Framing.

10. Section 09 2427 – Smooth Cement Plaster for Murals.

11. Section 09 3013 - Ceramic Tiling.

1.02 SYSTEM DESCRIPTION

A. Continuous Insulation Under Cement Plaster:

B. Three coat 7/8” cement plaster on metal lath with a fiberglass reinforcing mesh embedded into a polymer-modified base coat over the cured brown coat, over rigid foam insulation, over two layers of a water-resistive barrier over sheathing over metal studs. Continuous Insulation on Z Channels Under Cement Plaster: Three coat 7/8” cement plaster on metal lath with a fiberglass reinforcing mesh embedded into a polymer-modified base coat over the cured brown coat over rigid foam insulation friction-fitted

between steel Z channels with thermal break tape over two layers of water resistive barrier over sheathing over metal studs.

C. Three coat 7/8” cement plaster with a fiberglass reinforcing mesh embedded into a polymer-modified base coat over the cured brown coat on metal lath over water resistive barrier over plastic sheet air barrier over sheathing over metal studs.

D. Two coat 1/2” to 5/8” cement plaster on metal lath over CMU or concrete with a fiberglass reinforcing mesh embedded into a polymer-modified base coat over the cured brown coat.

E. Two coat 1/2” to 5/8” cement plaster over CMU or concrete with a fiberglass reinforcing mesh embedded into a polymer-modified base coat over the cured brown coat.

F. Soffits and ceilings: Three coat 7/8” cement plaster on metal lath with a fiberglass reinforcing mesh embedded into a polymer-modified base coat over the cured brown coat over suspended metal framing.

G. One coat cement plaster base for ceramic tile installation.

1.03 REFERENCES

A. ASTM International (ASTM):

1. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

2. ASTM A510 - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel.

3. ASTM A641 – Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

4. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

5. ASTM C150 – Standard Specification for Portland Cement.

6. ASTM C206 – Standard Specification for Finishing Hydrated Lime.

7. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring.

8. ASTM C847 - Standard Specification for Metal Lath.

9. ASTM C897 – Standard Specification for Aggregate for Job Mixed Portland Cement-Based Plasters.

10. ASTM C926 – Standard Specification for Application of Portland Cement-Based Plaster.

11. ASTM C932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering.

12. 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 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.

13. 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.

14. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.

15. ASTM C1116 – Standard Specification for Fiber-Reinforced Concrete.

16. ASTM E1190 – Standard Test Methods for Power-Actuated Fasteners Installed in Structural members.

B. Federal Specifications (FS):

1. FS FF-N-105: Nails, Brads, Staples and Spikes: Wire, Cut and Wrought.

2. UU-B-790A: Building Paper, Vegetable Fiber: (Kraft, Waterproofed, Water Repellent, and Fire Resistant).

C. International Code Council (ICC):

1. ICC-ES AC11: Acceptance Criteria for Cementitious Exterior Wall Coatings.

2. ICC-ES AC 191: Acceptance Criteria for Metal Plaster Bases (Lath).

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product data for each material and component proposed for installation.

B. Plaster 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. Accessories Samples: Submit 12 inch long samples of metal lath accessories: control joints, expansion joints, corner reinforcements, reveals and screeds.

D. Certificates: Submit test reports or ICC Evaluation Reports indicating that materials are in compliance with CBC requirements. Cementitious materials shall meet the acceptance requirements of ICC AC11, and metal lath the acceptance requirements of ICC AC191.

1.05 QUALITY ASSURANCE

A. Mock-ups:

1. Constructed separately from the building but on Project site.

2. Constructed as part of the building.

3. Provide a mock-up at least 10-foot wide by 10-foot high. Include at least one control joint and, corner condition and one window opening flashing. Locate where indicated by the ARCHITECT.

4. Mock-up shall be constructed by the same personnel who will be erecting the different components of the wall assembly on the project, overseen by the same personnel who will be acting as acting as supervisors during actual construction, and built with the same construction techniques and materials that will be used on the project.

B. Pre-Installation Conference: CONTRACTOR shall coordinate and conduct pre-installation conference in accordance to Section 01 3119, Project Meetings, to review the progress of construction activities and preparations for the installation of metal lath and cement plaster and other related work of this Section.

1.06 DELIVERY, STORAGE AND HANDLING

A. Store weather sensitive materials under cover, off the ground, and kept in a dry condition until ready for use.

B. Deliver materials to the Project site in manufacturer's sealed and labeled packages.

PART 2 - PRODUCTS

2.01 METAL LATH AND WEATHER RESISTIVE BACKING

A. Metal Lath:

1. Walls and Ceilings: Diamond mesh expanded metal lath, in conformance to ASTM C847, without paper backing. 3.4 pounds per square yard, hot-dip galvanized coating G60 in accordance with ASTM A653. Alabama Metal Industries Corporation (AMICO), California Expanded Metal Products Company (CEMCO), ClarkDietrich, Marino-Ware, or equal.

a. 3.4 Expanded Metal Lath V-grooved self-furring type for installation over sheathing. Lath shall be furred out a minimum of 1/4 inch when installed over a solid surface in accordance to DSAIR 25-4.

b. Flat type for installation over open stud framing.

2. Walls: Self-furring Welded Wire Lath: Weight 1.95 pounds per square yard, with Class 1 galvanized coating in conformance to ASTM A641. Structa Mega Lath per ICC ESR-2017, as manufactured by Structa Wire Corp, or equal.

3. Walls & Ceilings: Self-furring Welded Wire Lath: Weight 2.2 pounds per square yard, with Class 1 galvanized coating in conformance to ASTM A641 with heavy perforated Kraft paper. V-Truss per ICC ESR-2017, as manufactured by Structa Wire Corp, or equal.

B. Water Resistive Barrier Backing for Metal Lath:

1. One layer of air barrier membrane per Section 07 2719, Plastic Sheet Air Barriers.

2. One layer of asphalt saturated, water resistant Kraft paper backing conforming to Fed Spec UU-B-790A and ASTM E2556 Type II, manufactured by Fortifiber, Davis Wire, GMC Paper Products, or equal. Furnish for exterior plastering (except on soffits and ceilings), and for mortar-set ceramic wall tile.

C. Self-Adhered Flashing:

1. Compatible with the Plastic Sheet Air Barrier, minimum 25 mils thick, self-sealing and waterproof.

2. Adhesives, primers and sealers for self-adhered flashings and water repellant backing shall be as recommended by manufacturer for installation with specified products and substrates and shall be approved by the OWNER's Office of Environmental Health and Safety (OEHS).

2.02 METAL LATH ACCESSORIES

A. Materials: 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.

B. Manufacturers: Alabama Metal Industries Corporation (AMICO), California Expanded Metal Products Company (CEMCO), ClarkDietrich, Stockton Products, Marino-Ware, equal.

C. Products:

1. Exterior Stress Relief Joints: Sizes and profiles, indicated or required. Control joints shall have expanded wings when attachment flange is installed above the primary water-resistant barrier.

2. Expansion Joints: Two piece sections designed to accommodate expansion, contraction and shear forces. Industry generic name: M-Slide Expansion Joint 2 piece joint.

3. Control Joints: One-piece sections, with flange designed to engage plaster. Grounds shall provide full 7/8 inch thickness of cement plaster. Industry generic name: XJ-15.

4. Soffit Drip Screed: Similar to Stockton Products No. 5, with key holes.

5. Casing Beads: Expanded or standard flange type with 7/8 inch grounds to establish plaster thickness. Industry generic names: J-Mold or # 66.

6. Welded Wire Corner Reinforcement: 2-5/8 inch wire wings square or bullnose. Industry generic name: CornerAid.

7. Inner Corner Reinforcement: Shaped reinforcing expanded metal with 3 inch legs, for angle reinforcement. Industry generic name: Cornerite.

8. Lath Reinforcement: Flat expanded metal lath reinforcing units. Industry generic name: Striplath.

9. Outside Corner Reinforcing: 2 1/2" legs Class 1 Galvanized Coating complying with ASTM A641. VTruss Straight Corner per ICC ESR-2017, as manufactured by Structa Wire Corp, or equal.

10. Ventilating Screeds: Soffit, attic, fascia, edge, channel and expansion channel vent screeds, perforated web type, with integral plaster grounds, of sizes indicated on drawings.

11. Foundation Weep Screeds: Integral plaster ground and weep screed; 3-1/2" minimum attachment flange. Industry generic name: #7 Weep Screed.

12. Foundation Casing at Walls with Continuous Insulation: Custom shaped galvanized steel "J" mold with weep holes. Width shall be sized to accommodate insulation thickness plus 7/8 inch plaster.

2.03 LATH FASTENERS

A. Fasteners through Continuous Insulation: Fastener spacing as indicated on drawings.

1. Wood Studs: Fasteners shall be corrosion resistant screws in conformance to CBC Chapter 26.

2. Metal Studs: Corrosion resistant coated wafer head steel **[#8] [#10]** screws with length that penetrates framing steel thickness plus three threads minimum.

B. Fasteners at Locations with no Continuous Insulation:

1. Wood Studs: Fasteners shall be corrosion resistant.

a. Nails: In accordance to FS FF-N-105, 0.113 with a 3/8 inch diameter head with length that penetrates wood framing (exclusive of sheathing) 3/4 inch minimum.

b. Screws: Type A, in accordance to ASTM C1002, length that penetrates wood framing (exclusive of sheathing) 3/4 inch minimum.

c. Staples: In accordance to FS FF-N-105. Minimum 3/4 inch crown, 0.053 inch steel. Staples shall have sufficient length to penetrate studs at least 3/4 inch.

2. Metal Studs: Wafer head type S or S-12, corrosion resistant, with length to penetrate framing steel thickness plus three threads minimum.

   a. Screws for fastening to steel members from 0.033 inch to 0.112 inch in thickness shall be in accordance to ASTM C954.

   b. Screws for fastening to steel members 0.033 inch in thickness and less shall be in accordance to ASTM C1002.

C. Fasteners for Concrete and CMU Substrates: Power Actuated Fasteners: For attachment of lath to concrete and concrete masonry, recommended by manufacturer for the specific use intended. Minimum 3/4 inch long hardened drive style pin with a 1/2 inch diameter style washer. Fasteners shall be Fasteners shall be corrosion resistant and provide minimum withdrawal resistance of 50 pounds minimum.

D. Wire: Wire for fastening lath to supports, tying ends and edges of lath sheets, and securing accessories to lath, 0.0475 inch diameter (# 18 wire). Galvanized soft-annealed steel wire in conformance to ASTM A641.

2.04 MATERIALS FOR SUSPENDED CEILLINGS

A. Main Runners and Cross Furring Channels: Cold-formed channels made from steel with minimum 33,000 psi yield strength 0.0538 inch minimum bare steel thickness. Channel shall have a protective G60 galvanized coating conforming to ASTM A653.

1. Main Runners: [**in depth indicated**] [**1-1/2 inches deep**] [**2 inches deep**] [**2-1/2 inches deep**].

2. Cross Furring: 3/4 inch deep.

B. Wire: Galvanized soft-annealed mild steel wire in conformance to ASTM A641, Class 1 coating. Ultimate stress value of 60,000 psi and design value not to exceed 24,000 psi per DSA IR 25-1.

1. Hanger wire for suspended ceilings, minimum 0.1620 (8 gauge), 0.135 inch diameter (10 gauge), and 0.106 (12 gauge).

2. Wire for saddle-tying cross furring to main runners, 0.0625 inch diameter (16 gauge) for single strand tying and 0.0475 (18 gauge) for double strand tying.

C. Hangers:

1. Rod Hangers: ASTM A510, mild carbon steel, hot-dip galvanized per ASTM A153.

2. Flat Hangers: Commercial-steel sheet, 1 by 3/16 inch with G60, hot-dip galvanized zinc coating per ASTM A653.

3. Ceiling Clips: Commercial steel sheet, 3/4 inch wide minimum by 12 gauge minimum, with G60, hot-dip galvanized zinc coating per ASTM A653.

D. Hanger Attachments to Concrete: Power-actuated fasteners that use explosive powder, gas combustion, or compressed air or other gas to embed fasteners in concrete and that are suitable for application indicated. Fabricated from corrosion-resistant materials, with clips or other devices for attaching hangers. Capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E1190 by a qualified independent testing agency.

2.05 PLASTER MATERIALS

A. Factory Blended Portland Cement Plaster Basecoats and Finish: Products as fabricated by California Stucco, La Habra, Parex, Shamrock Stucco, Merlex, Omega Stucco, Inc., , Spec Mix, Quikrete, CTS, Sika, or other manufacturer member of the Stucco Manufacturer's Association (SMA).

1. Material Standards: Shall conform to ASTM C926.

2. Three Coat Systems:

   a. Scratch and Brown Coats: Factory blended fiber reinforced plaster and sand mix conforming to ASTM C926, and requiring only the addition of water. Total thickness of coats: 3/4 inch.

   b. Finish Coat: Factory blended cementitious stucco color coat, integrally colored with fade-resistant pigments. Coat thickness 1/8 inch.

      1) Finish: **[Light Sand]**

      2) Color: As selected by ARCHITECT.

3. Two Coat Systems:

   a. Brown Coat: Factory blended fiber reinforced plaster and pre-mixed with sand conforming to ASTM C926, and requiring only the addition of water. Coat thickness 3/8 to ½ inch.

   b. Finish Coat: Factory blended cementitious stucco color coat, integrally colored with fade-resistant pigments. Coat thickness 1/8 inch.

      1) Finish: **[Light Sand]**

      2) Color: As selected by ARCHITECT.

4. Crack Isolation System:

   a. Fiberglass Reinforcing Mesh (Lamina): 4.5 oz. Mesh, alkali resistant, compatible with plaster finish.

   b. Base Coat: Polymer-modified cement base/skim coat, compatible and approved by plaster finish coat manufacturer.

B. Water: Clean, potable and from domestic source.

C. Plaster Bonding Agent: In conformance to ASTM C932 and formulated for exterior use. "Weld-Crete", manufactured by Larsen Products Co., or equal.

D. Bonding Agent: 100% acrylic emulsion additive, Parex USA Adacryl Admix & Bonder or equal.

E. Flashing: 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.

F. Continuous Insulation: Refer to Section 07 2100, Thermal Insulation.

G. Miscellaneous Materials: Provide additional components and materials required for a complete installation.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that installation of plastic sheet air barrier and flashings, per Section 07 2719, and continuous insulation per Section 07 2100 are complete before starting Work of this Section.

3.02 INSTALLATION-OF WATER RESISTIVE BARRIER

A. Install one layer of water resistant barrier over air barrier. Install Kraft paper horizontally with each course weather lapped 2 inches over layer below and 6 inches on ends.

B. Repair and seal tears and holes in water resistive barrier prior to installing lath.

C. Install single ply self-adhesive flashing per manufacturer‘s recommendations in areas indicated on the Drawings and at locations where the plaster will be in less than a 60 degree plane or where water can pond, with a six inches extension onto the vertical wall surface. Apply self-adhesive flashing in a “shingle fashion”.

3.03 INSTALLATION OF SUSPENDED CEILING METAL FURRING

A. Install ceiling metal furring in conformance to drawings and ASTM C1063.

B. Space **[hanger wires]** as indicated on drawings along carrying channels and within 6 inches of ends of carrying channel run. Connect to underside of structure as indicated on drawings.

C. Install 1-1/2 inch carrying channels at spacing indicated on drawings and within 6 inches of walls, positioned for proper ceiling height. Level and secure with hanger wire saddle-tied along channel. Provide one inch clearance between runners and abutting

walls. At channel splices interlock flanges, overlap ends 12 inches and secure each end with 16 gauge tie wire or double-strand 18 gauge tie wire.

D. When flat hangers are used, bend tightly hanger around main runners and carried up and above the runners and fasten through with 3/8 inch round-head stove bolts. Nuts of bolts shall be drawn up tight. Smooth or threaded rod hangers shall be fastened to the runners with special attachments appropriate to the design.

E. Erect 3/4 inch cold-rolled furring channels at right angles to 1-1/2 inch carrying channels, and secure to furring channels by wire-tying with double-strand 18 gauge wire. At splices nest furring channels eight inches and securely wire-tie each end with single strand 16 gauge wire or double-strand 18 gauge wire.

F. Fasten wires with four (4) tight turns. Make all tight turns within a distance of one and one-half (1-1/2) inches.

3.04 INSTALLATION OF LATH AND LATH ACCESSORIES

A. Exterior Lathing, General: Install in conformance to ASTM C1063 and CBC Chapter 25.

B. Install longest length of metal lath as possible. Do not use pieces shorter than six feet in length. Attach lath to framing supports not more than seven (7) inches apart along framing supports only.

C. Apply metal lath with long dimension at right angles to framing or furring supports and lap lath a minimum 1/2 inch at sides and minimum 1 inch on ends. Lap wire lath minimum one mesh on sides and ends. Stagger vertical laps at least 16 inches. Lath shall lap flanges of solid flanged trim accessories by a minimum of 50%.

D. 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.

E. Install trim accessories plumb, level and straight, attachments should not exceed 24 inches on center.

F. Lath shall not be continuous through control joints. Two-piece Expansion Joints shall have the lath cut, be attached to framing and lath lap the flanges. Place control joints as indicated on elevations. Water resistant barrier shall be continuous behind all control joints and vertical reveals.

G. Install a weep screed at or below foundation plate line on exterior stud walls in conformance to CBC section 2512. Screed 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.

H. Powder Actuated Fasteners shall be used on concrete/masonry substrates when lath is applied. Fasteners shall be driven home and avoid spalling of concrete. Pattern shall simulate that of framed walls.

I. Interior Lathing, General: Install in conformance to ASTM C841 and CBC Chapter 25.

J. Metal lath shall be fastened to metal supports with specified fastener spaced not more than 6 inches apart or with other recognized fasteners.

3.05 PLASTER APPLICATION - GENERAL

A. Verify that installation of lath is complete prior to start plastering. Notify the Technical Service Information Bureau upon completion of lath and prior to start of plaster to schedule a lathing installation compliance meeting. TSIB will submit a written field observation report delineating any deficiencies. Site meeting shall be coordinated with OAR.

B. Proportion, mix, apply, and cure plaster in conformance with ASTM C926 and CBC Chapter 25.

C. 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.

D. 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, or OEHS approved equal are permitted.

E. 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.

3.06 EXTERIOR PLASTERING

A. Concrete surfaces, except where noted as "Exposed Concrete" or "Painted Concrete," shall be finished with stucco **[light sand]** finish coats, as specified.

B. Preparation of Concrete and Masonry 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 or as required to control suction.

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. 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 re-temper. Add only enough water to allow proper application of cement plaster.

D. Application:

1. **[Sand]** Bond Coat: on concrete or masonry surfaces, leave undisturbed, and maintain damp for at least 24 hours following installation. Dash bond coat may be omitted 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 1/4 inch tolerance in 5 feet of surface and consolidate surface with a wood or neoprene float. Surface shall be left open and course, suitable to receive finish coat.

4. 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 finish coat shall be installed adequately to cover surface and fill minor imperfection in the brown coat.

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.

E. Curing Exterior Plaster: Adhere to current edition of CBC for curing requirements.

F. Option for Machine Application, Scratch and Brown Coats: 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 or factory installed blow-off valve 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.

3.07 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. 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.

C. 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.

D. 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.

E. Mix factory blended plaster using only sufficient water to obtain proper consistency 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.

F. 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 of 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.

G. Curing Interior Plaster: Adhere to requirements of CBC.

3.08 QUALITY CONTROL

A. Finish interior and exterior plaster to a uniform texture, free of imperfections and flat within 1/4 inch in 5 feet. Form a suitable foundation for paint and other finishing materials. Avoid joining marks in finish coats.

3.09 REPAIR OF 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 wall and ceiling systems.

2. Gypsum Liner.

3. Cement Tile Backer Board.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 05 4100 - Structural Metal Stud Framing.

3. Section 06 1000 - Rough Carpentry.

4. Section 07 9200 - Joint Sealants.

5. Section 09 2216 - Non-Structural Metal Framing.

6. 09 9000 Painting Coating.

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 C475 – Standard Specification for Joint Compound and Joint Tape for finishing Gypsum Board.

2. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.

3. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.

4. 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.

5. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

6. ASTM C1325 - Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units.

7. ASTM C1396 - Standard Specification for Gypsum Board.

8. ASTM C1629 - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.

9. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

10. Underwriters Laboratories (ULI) requirements and listings for fire-rated materials and products classification.

11. GA-214 - Gypsum board finish shall conform to requirements of GA 214, Application and Finishing of Gypsum Panel Products, published by the Gypsum Association, and as specified herein.

12. GA-216 – Application and Finishing of Gypsum Panel Products.

13. GA 600 - Gypsum board shall conform to requirements of GA 600 Fire Resistance Design Manual, published by the Gypsum Association.

14. American National Standards for the Installation of Ceramic Tile.

15. ANSI A118.11 – Test Methods and Specification for Cementitious Backer Units.

16. The Interior Guide, published by the Wall and Ceiling Conference (WWC).

B. Qualifications: Installer shall have a minimum 5 years experience in installing and finishing gypsum board.

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 board 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 board showing any evidence of water damage shall not be installed. Gypsum board showing evidence of water damage after installation shall be removed and replaced.

1.06 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTMC840, GA 216 requirements or gypsum board manufacturer's written instructions, whichever is more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet moisture damaged and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Georgia-Pacific.

B. National Gypsum Co.

C. U.S. Gypsum Co.

D. Or equal.

2.02 MATERIALS

A. Gypsum Board Type X (fire-resistant) or Type C or Type ULIX as required by fire rated design and acoustic requirements: 5/8 inch thick, 4-foot wide and up to 16-foot long conforming to ASTM C1396 with long edges tapered.

B. Impact Resistant Gypsum Board, Type X (fire-resistant): 5/8 inch thick or Type C as required by fire rated design and acoustic requirements, 4-foot wide and up to 16-foot long complying with the following:

1. Fire resistant rated gypsum core with additives to enhance impact resistance, faced with moisture and mold resistant paper and reinforcing fiber mesh. Comply with ASTM C1629 level 3 hard body impact resistance.

C. Mold and Moisture 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.

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.

E. Glass Matt Gypsum Tile Backer: Fully embedded glass mat gypsum tile backer meeting the requirements of ASTM C 1178.

1. Type and Thickness: Type X, 5/8 inch and as otherwise required to meet fire rating for specific element.

2. Flame spread: ASTM E 84: Class A.

3. Smoke developed: ASTM E 84: Class A.

4. Standard Size: 4 feet by 8 feet.

5. Glass-Fiber Mesh Tape: Alkali-resistant self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch.

2.03 ACCESSORIES

A. Metal Trim: Paper-faced metal drywall beads and trim meeting ASTM C1047, as manufactured by USG/Beadex, 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. Provide 30 year warranty against edge cracking.

B. Joint Compound for gypsum board products: meeting the following requirements:

1. Shall conform to ASTM C475.

2. In areas subject to moisture after installation such as bathrooms and locker areas use setting type joint compound.

3. Interior areas not subject to moisture after installation use drying Type Joint compound.

C. Joint Tapes for gypsum boards: Shall conform to ASTM C475.

D. Joint mortar and Tape for Cement board: Meet ANSI 118.4.

E. Finishing Materials: Texture coat finish material shall be manufactured by U.S. Gypsum, Hamilton, Murlux, Parex, Rapid Set-Cement, Eisenwall, Mortar Mix, Stucco Mix, Stucco Patch, One Pass, Westpac or equal.

F. Acoustical Sealant: Non-hardening, non-shrinking, for use in conjunction with gypsum board, as recommended by Board Manufacturer and conforming to ASTM C919. Sealant shall maintain fire and sound rating assembly.

G. Fasteners:

1. Self-drilling, bugle-head drywall screws; in conformance to ASTM C1002. No. 6 Type S or S12, 1 5/8-inch long for metal framing,

2. Wood framing: Screws: Type W 1 5/8-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, fire rated design, and sound rating.

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 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.

6. Install gypsum board to ceiling framing with long dimension at right angles to furring channels, or wood framing members, and fasten with specified 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.

C. Cement Board Backer System:

1. In shower areas, install water barrier in shingle-like manner to prevent water infiltration into stud cavity. Pre-cut all board to required sizes and make necessary cut-outs.

2. Install in accordance with UL Design and SA-932. Install tile backer board plumb and flat. Shim behind board as required.

3. Fasten to steel studs spaced max. 16" o.c. and bottom runners with fasteners spaced 8" o.c. maximum with perimeter fasteners at least 3/8" and less than 5/8" from ends and edges. Studs shall be not less than 20 gage.

3.02 TOLERANCES

A. System shall appear smooth and monolithic with no exposed joints.

3.03 JOINT TREATMENT AND FINISHING

*At completion of specified taping and finishing, install one coat of drywall primer as specified hereafter

B. Levels: Install joint compound, tape, and finishing compound on joints in wall gypsum board as required for specified levels of finish.

C. Levels 2 through 5:

1. Install joint compound and finishing compound over screw heads. Treat all inside corners with joint compound, tape, and finishing compound. Treat outside corners with corner beads and finishing compound.

2. Provide metal casing beads at all edges of gypsum board, 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. All cut edges and openings around pipes and fixtures shall be sealed with a water-resistant flexible sealant.

4. When entire installation is completed, correct and repair broken, dented, scratched or damaged gypsum board before installation of finish materials by other trades.

D. Levels 3 and 4: Install one coat of high solids tinted topcoat primer over entire surface, Westpac Prep Coat, Tuff Hide Primer, and Hamilton Smooth Coat.

E. Level 5: Apply a skim coat over entire surface Westpac topping, USG topping, and Hamilton topping.

3.04 REQUIRED LEVELS OF FINISH

A. Finishes shall conform to GA 214

B. 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 gypsum board 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 gypsum board in classrooms, utility rooms, and similar spaces not requiring Level 5 finish. To be painted per Section 09 9000, Painting and Coating, with a paint sheen shall not be greater than a “flat” finish.

5. Level 5: Exposed, painted gypsum board in offices and corridors. To be painted per Section 09 9000, Painting and Coating, with a “non-flat paint” - a paint material specifically manufactured to produce greater than 10 gloss units (GU) at an 60^{o} and greater than 35 gloss units (GU) at an 85^{o} angle when measured using a gloss meter.

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 (100) percent minimum coverage of the entire surface area.

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, waterproof membrane for tile, stone thresholds, thin set mortar, and mortar setting beds for floor and wall tile.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 3000 - Cast-In-Place Concrete.
3. Section 06 1000 - Rough Carpentry.
4. Section 06 8316 - Fiberglass Reinforced Panels.
5. Section 07 9200 - Joint Sealants.
6. Section 08 1113 – Hollow Metal Doors Frames.
7. Section 08 3116 – Access Panels and Frames.
8. Section 09 2423 - Cement Plaster and Metal Lath.
9. Section 09 2900 - Gypsum Board.

1.02 SUBMITTALS

A. Product Data: Manufacturer's product data, standard specifications, 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. Manufacturer’s Instructions:

1. Manufacturer's preparation and installation instructions.

2. Maintenance instructions.

E. Product Certificates: Signed by manufacturer certifying that products furnished comply with requirements of this Specification.

1.03 REFERENCES

A. American National Standards Institute (ANSI)

1. A108, Specifications for the Installation of Ceramic Tile.

2. ANSI A118, Ceramic Tile Installation Materials.

3. ANSI A137.1, Standard Specifications for Ceramic Tile.

B. ASTM International:

1. ASTM A1064 - Standard Specification for Carbon Steel and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

2. ANSI A326.3 - Test Method for Dynamic Coefficient of Friction of Hard Surface Flooring Materials.

1. ASTM C185 - Standard Test Method for Air Content of Hydraulic Cement Mortar.

2. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.

3. ASTM C150 - Standard Specification for Portland Cement.

4. ASTM C206 - Standard Specification for Finishing Hydrated Lime.

5. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.

6. ASTM C241 - Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic.

7. ASTM C503 - Standard Specification for Marble Dimension Stone.

8. ASTM C920 - Standard Specification for Elastomeric Joint Sealants

9. ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

C. Tile Council of North America (TCNA) – Current edition of “Handbook for Ceramic, Glass and Stone Tile installation”.

D. CHPS Low-Emitting Materials Table: Materials submitted for tile assemblies shall be listed as low emitting on the CHPS website www.CHPS.net.

1.04 QUALITY ASSURANCE

A. Qualifications:

1. Tile Manufacturer: Company specializing in ceramic tile, mosaics, pavers, trim units, and thresholds with five years minimum experience.

2. Installation System Manufacturer: Company specializing in installation systems/ mortars, grouts/ adhesives with ten years minimum experience.

3. 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.

E. Environmental Requirements: Adhesives, primers, caulk, sealants and liquid applied products shall be approved by the LAUSD Office of Environmental and Health Safety (OEHS), and meet the technical requirements specified in this Section.

F. Grade Certificate and Labeling: With each delivery of tile, furnish manufacturer's "Master Grade Certificate" to the OAR.

B. Source of Materials: Provide materials obtained from one source for each type and color of tile, grout, and setting materials.

C. Consistent Quality: Products shall be consistent in appearance and physical properties.

D. Comply with requirements of California Building Code and ADAAG.

1.05 PRE-CONSTRUCTION MEETINGS:

A. 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 Section for each substrate.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver tile and other materials in sealed containers, with manufacturer's labels intact.

B. Store materials in clean, dry and secure areas.

1.07 MAINTENANCE

A. Extra Materials: Provide the following in labeled manufacturers' cartons:

1. Five percent of each type and color of tile installed.

2. Ten linear feet of coved base and bullnose tile for each color installed.

3. Six units of each type and color of corner pieces.

1.08 WARRANTY

A. Manufacturer shall provide a five year material warranty. Installer shall provide a five year installation warranty.

B. 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: Standard Grade Products from the following manufacturers conforming to ANSI A137.1:

1. Dal-Tile Corporation.

2. American Olean Company.

3. Florida Tile, Inc.

4. Equal.

B. Installation Materials: Products and methods of the following manufacturers conforming to ANSI A137.1:

1. Laticrete International, Inc.

2. Custom Building Products.

3. MAPEI.

4. Siena Tile and Stone Installation Products.

5. Equal.

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. Portland cement mortar bed for floor, walls and shower areas:

1. Laticrete International, Inc., 3701 Fortified Mortar.

2. Custom Building Products, Quickrete Floor Mud.

3. MAPEI, Modified Mortar Bed.

4. OEHS approved equal mix per ANSI A108.1A.

D. Latex Portland cement bond mortar thin-set for tiles under 15" in one dimension on floor installations:

1. Laticrete International, Inc., 254 Platinum.

2. Custom Building Products, Porcelain Tile Professional Thin Set Mortar.

3. OEHS approved equal mix per ANSI 118.4.

E. Latex Portland cement bond mortar thin-set for tiles over 15" in one dimension on floors. For all tile on wall installations:

1. Laticrete International, Inc., Tri-Lite.

2. Custom Building Products, ProLite Premium LFT Mortar.

3. MAPEI, UltraLite Mortar.

4. OEHS approved equal mix per ANSI 118.15.

F. Waterproof Membrane: Cold-applied, single component liquid with embedded reinforcing fabric where recommended by manufacturer: Laticrete International, Inc. Hydro Ban Waterproof Membrane, Custom Building Products Red Guard Waterproof Membrane, or MAPEI Mapelastic Aqua Defense.

G. Reinforcing Wire Fabric: 2-inch by 2-inch, 16 by 16 gage, galvanized electrically welded wire reinforcing, per ASTM A1064.

H. Latex Portland Cement Grout: Laticrete International, Inc. Sanded Grout (1500 Series), Custom Polyblend Sanded Grout, Laticrete International, Inc. Unsanded Grout 1600 Series (for joints smaller than 1/8"), Custom Polyblend Unsanded Grout, or MAPEI Ultracolor Plus FA.

I. 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.

J. Separation Material (for all sealed joints including perimeters): Quality Foam, QF 200 white, 3/8 inch wide by 5-inch high.

K. Backer Rod for sealants (for ceramic mosaic fields): Polyethylene foam, closed-cell, flexible and compressible, 3/16 inch diameter.

L. 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, MAPEI, or equal may be provided.

2. Cleaner: Aqua Mix Concentrated Tile Cleaner, neutral phosphate-free cleaner, Custom Building Products Tile Lab Concentrated Tile and Stone Cleaner, or Mapei Ultracare 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, Mapei Ultracare, or equal.

M. 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 C920; 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. Unglazed Ceramic Mosaic Floor Tile:

1. Size: 1 inch by 1 inch or as indicated.

2. Colors and patterns as selected by Architect from price groups specified.

3. Slip Resistance: Resistant to slipping appropriate to the installed conditions of use, as required by the California Building Code, ADAAG, ANSI 137.1 and TCNA.

a. For tile in shower and locker areas, incorporate grit into tile to increase slip resistance.

B. 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. Unglazed Paver Tile:

1. Porcelain, flat tile.

2. Size: 12 inch by 12 inch, or as shown.

3. Colors and patterns as selected by Architect from price groups specified.

4. Slip Resistance: Resistant to slipping appropriate to the installed conditions of use, as required by the California Building Code, ADAAG, ANSI 137.1 and TCNA.

D. Trim:

1. Integral bullnose at external corners.

2. Provide bullnose where tile projects from jamb.

3. Tile base with wall tile above

4. Bullnose at wainscot.

E. Stone Thresholds:

1. Exterior installation: Marble thresholds with minimum abrasive hardness value of 10 tested in accordance with ASTM C241.

2. White honed marble complying with Marble Institute of America Group "A," unless other color indicated and ASTM C503.

3. Size and profile shaped to provide transition between tile surfaces and adjoining finished floor surfaces, or as indicated. Width not less than 4 inches. Edges beveled on a slope of no greater than 1:2. Cut to fit door frame profile.

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).

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. 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 ASTM C920 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 and ASTM C185.

C. Once begun, mortar installation shall 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 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. Ensure 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. Install tile on floors with the following joint widths:

1. Ceramic Mosaic Tile: 1/16 to 1/8 inch.

2. Paver Tile: 3/16 to 3/8 inch.

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 3/4 inch. Once started, wall mortar installation shall continue until wall is completely floated. Discard any batch not floated and finished within a half an 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 waterproof membrane where indicated per article 3.03E WATERPROOF MEMBRANE requirements.

E. 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. Ensure that bond coats do not intrude into joints to be caulked.

F. 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.

G. 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.

H. 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. Special Large Tile: 3/16 to 3/8 inch.

I. Horizontal joints shall be level, vertical joints plumb with surfaces true and plumb, edges of tiles flushed.

J. 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.

K. 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 THIN SET METHOD

A. Confirm substrate is completely clean and free of dust. Cut foam at floor perimeters flush with top of mortar bed. Ensure 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.

B. Minimum coverage of bond mortar shall be 80 percent except 95 percent in shower areas and exterior installations. Place tile into fresh mortar press tile to ensure 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.

3.06 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.

3.07 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.

3.08 SEALANTS

A. Ensure 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.

3.09 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.

3.10 CLEAN UP

A. Remove rubbish, debris, and waste material and legally dispose of off the Project site.

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 systems.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 09 2216 - Non-Structural Metal Framing.
3. Section 09 2900 - Gypsum Board.
4. Section 09 5115 - Vinyl-Faced Acoustical Ceilings.
5. Section 11 5215 – Video/Multimedia Projector Mounting Plate.
6. Division 23 - HVAC.
7. 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 25-2.13.

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 listed 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. USG Corporation.

B. Armstrong World Industries.

C. CertainTeed Saint-Gobain.

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 with ASTM E1264.

B. Acoustical panels shall meet the following surface-burning characteristics when tested in accordance with 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 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.

B. ACT 2 - Administration:

1. Acoustical Ceiling Panels:

a. Panel Name: Armstrong Ultima 1912, USG Mars ClimaPlus 86985, CertainTeed Symphony M #1222BF-OVT-1, or equal.

b. Panel Size: 2-foot by 2-foot.

c. Panel Thickness: 3/4 inch.

d. Edge Detail: Beveled tegular.

e. Light Reflectance: 0.89 minimum, in accordance with ASTM E1477.

f. CAC: Minimum 35, UL Classified, complying with ASTM E1414.

g. NRC: Minimum 0.70, UL Classified, complying with ASTM C423.

h. Color: White.

i. Recycled Content: 74 percent minimum.

2. Suspension System:

a. Suspension System Name: Silhouette XL by Armstrong, Fineline by USG, 4500 Ultraline Series by Chicago Metallic Corporation, or equal.

b. Color: White.

C. ACT 3 - Cafeteria:

1. Acoustical Ceiling Panel:

a. Panel Name: Armstrong Optima Open Plan 3250, USG Halcyon #98223,CertainTeed Symphony F 1342B-OVT-1, or equal.

b. Panel Size: 2-foot by 2-foot.

c. Panel Thickness: 1 inch.

d. Edge Detail: Tegular.

e. Light Reflectance: 0.88 minimum, complying with ASTM E1477.

f. NRC: Minimum 0.95, UL Classified, complying with ASTM C423.

g. Color: White.

h. Recycled Content: Minimum 28 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.

D. ACT 4 – Other areas:

1. Acoustical Ceiling Panel:

a. Panel Name: Armstrong Fine Fissured 1729, USG Radar Climaplus 2410, CertainTeed Hytone Fine Fissured HHF 197, or equal.

b. Panel Size: 2-foot by 4-foot.

c. Panel Thickness: 5/8 inch.

d. Edge Detail: Lay-in.

e. Light Reflectance: 0.82 minimum, complying with ASTM E1477.

f. CAC: Minimum 35, 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.

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.

E. ACT 5 – Specialty Acoustic Spaces:

1. Acoustical Ceiling Panel:

a. Spaces with specialty acoustical requirements such as Music Classrooms, Multi-Purpose Room, shall be provided with the NRC and CAC performance requirements indicated on drawings. b. Ceiling tiles in control rooms in Multi-Purpose Rooms and Auditoriums shall be black in color.

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 lateral direction shall have a 2 inch oversized 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 6813 – Tile Carpet.

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 topset 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

2.01 ACCEPTABLE MANUFACTURERS

A. Mannington/Burke Wall Base.

B. Roppe, Pinnacle Rubber Base.

C. Flexco Company, Wallflower Premium Rubber Wall Base.

D. Equal.

2.02 MATERIALS

A. Rubber base: Conform to ASTM F1861; Group 1, solid (homogeneous); Type 1, TS, (thermoset) vulcanized rubber, Style B (coved), 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 topset base at:

1. Hard floors, including resilient flooring, concrete and wood, carpet tile and other soft floors.

2. Along cabinetry base and where flooring extends into open cabinets.

B. Install all wall base with pre-molded outside corners. Clean and prep existing wall and apply adhesive to the wall or back of base. Ensure that not less than 18-inch-long filler or end pieces are not installed. Roll base to ensure that the top of the bass installed is tight against the wall and toe is tight against the floor, all end joints to be tight with no gaps. Install matching factory pre-molded outside corners at all offsets. Should pre-molded outside corners become unavailable and confirmed, corners are to be wrapped tight by slightly gouging the back of the Base and apply adhesive at gauge. Wrap base around the corner, Push base down at the corner to form a consistent toe, ensuring that it is snug to the floor on both sides of the corner, All Inside corners shall be scribed fit

tight with no gaps at the top or bottom of the base. Wrapped inside 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 6526

HEAVY DUTY QUARTZ VINYL TILE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Heavy duty quartz vinyl tile as indicated.

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 6518 - Rubber Flooring and Stair Covering.
6. Section 09 6513 - Rubber Base.
7. Section 14 2423 - Hydraulic Passenger Elevators.

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.

B. Maintenance Instructions: Submit manufacturer’s recommendations for maintenance, care, and cleaning of heavy duty quartz vinyl tile.

C. Samples: Submit Samples of tile and 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 heavy duty quartz vinyl 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. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

B. Instructions: Current published manufacturer’s installation and maintenance instructions.

C. Qualifications of Installer: Minimum five years experience in successfully installing the same or similar flooring materials.

D. 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.

E. 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.

F. Comply with the following as a minimum requirement:

1. Materials shall be compliant with requirements of CBC Chapter 11B and ADAAG.

2. ASTM E648: Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source >0.45 watts/sq.cm.

3. ASTM E662: Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials < 450 flaming and non-flaming.

4. Moisture Testing: Per section 09 0561.

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 twenty year material warranty.

B. Installer shall provide a two year installation warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. UPOfloor Quartz Tile: Mosaic Collection.

B. Or equal.

2.02 MATERIALS

A. Heavy Duty Quartz Vinyl Tile: Conform to ASTM F1066, Class 2 (through pattern), Type A, asbestos free, 12” x 12” or 24” by 24” x .080” thick, colors and patterns as indicated on Drawings.

1. Prefinished with poly-urethane reinforced (PUR) factory applied finish. No sealer or wax required.

2. Static Load Limit of 3500 psi in accordance with ASTM F970.

3. Tile shall be from same batch and run number for each color.

B. 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. Ardex SD-F.

2. Schonox SL.

3. Armstrong S183 or S184.

4. Equal, as recommended by flooring manufacturer and approved by OEHS.

5. Leveling Compound shall meet or exceed 200 pounds when tested in accordance with ASTM C1583.

C. Concrete Primer: Non-staining type recommended by manufacturer of heavy duty quartz vinyl tile. Concrete primer shall be OEHS approved.

D. Adhesive: Water based, low odor type formulated specially for installation with heavy duty quartz vinyl tile and recommended by manufacturer and shall be OEHS approved.

E. Reducer Strips: Tapered rubber not less than one inch wide, and thickness to match tile. Install with double sided tape.

1. Burke Flooring.

2. 3M Company.

3. Guerilla Glue Company.

4. Equal.

PART 3 – EXECUTION

3.01 TESTING

A. Refer to Section 09 0561 – Moisture Testing for Floor Installation.

3.02 COORDINATION

A. Coordinate with related Work to assure level, dry, smooth, and clean finish surfaces to receive heavy duty quartz vinyl tile.

3.03 EXAMINATION

A. Field verify and correct deficiencies of conditions affecting Work before commencing
3.04 PREPARATION OF CONCRETE SLABS

A. Do not start preparation until underlying concrete floor slabs are at least 90 days old. Leveling compounds shall be warranted to be installed in a wet or moist environment without moisture limitations.

B. Leveling: Check sub-floors for true to level and plane within the tolerance listed in Manufacturer's installation instructions. 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 an approved cementitious leveling compound. Remove high areas by power sanding, stone rubbing or grinding or chipping off. Fill low areas with an approved leveling compound. Repair and level surfaces having abrupt changes in plane, such as trowel marks or ridges, whether or not within allowable tolerance. Clean areas where repairs are performed.

3.06 INSTALLATION OF TILE

A. Install tiles in the pattern and colors 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 heavy duty quartz vinyl tile using either computer aided water-jet technology to a tolerance of 0.005 inch.

C. Install heavy duty quartz vinyl tile when ambient temperature is 70 degrees F or higher or manufacturer's range.

D. Mix adhesive in accordance with manufacturer's instructions.

E. Apply the tile adhesive in a thin film evenly with a notched trowel. Trowel notches shall be as recommended by adhesive manufacturer.

1. Install adhesive only in area that can be covered by flooring material within the adhesive manufacture's recommended working time. Adhesive application rate shall be as required to avoid telegraphing trowel lines to the surface. Adjust tile runoff during installation if necessary.

2. Immediately remove any excess adhesive from the tile surface using the adhesive manufacturer's recommended cleaner and a damp, not wet, cloth.

F. Provide reducer where floor covering edges are exposed, such as at center of the door or where floor coverings terminate.

G. Install tiles symmetrically about centerlines of areas progressing toward walls. Adjust border tiles to be even on all walls or nothing smaller than a 3" piece. Tiles shall be straight and joints closed. Tile shall be cut to fit snugly at doorframes, and walls. No slivers at edges allowed.

H. Mechanically cut flooring material to produce square true edges.

I. 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.

J. Remove dust, debris, and soil with any combination of sweeping, micro-fiber dust-mopping with a properly treated, non-oily mop and vacuuming.

3.07 CLEANING

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 floor machine; or preferably, 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. Do not flood or excessively dampen floor at any time.

F. Allow the Work to dry thoroughly.

G. Clean adjacent baseboard and other surfaces of adhesive and other materials. Replace damaged or defective Work to the specified condition.

H. Do not wax floors.

3.08 CLEAN UP

A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

3.09 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 6813

TILE CARPETING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Tile carpeting.

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.

1.02 SUBMITTALS

A. Shop Drawings: Submit dimensioned layout of carpet tile and details for binder bars.

B. Samples:

1. Submit minimum three labeled carpet tile actual size with proper backing. Carpet style and color as selected by the Owner.
2. Trim and accessories: Submit 12-inch long Samples of each type trim proposed for the Work.

C. Product Data: Submit the following:

1. Carpet tile manufacturer's published technical data fully describing carpet materials, construction, and recommended installation directions.
2. Technical data and installation instructions for each adhesive and sealer material.
3. Carpet tile manufacturer's published instructions for maintenance, care, cleaning and repair of carpet.
4. MSDS on Manufacturers recommended adhesives and primers.

D. Certificate:

1. Submit a certificate from carpet tile manufacturer that materials supplied comply with fire hazard resistance standards specified.

2. Submit a manufacturer certification that the installer is approved by the manufacture to install the specified product.

E. Installer's Experience Qualifications: Submit list of not less than five projects with similar scope of work, extending over period of not less than five years, indicating installer's experience record.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. Manufacturer's installation instructions

2. Materials shall comply with CBC Chapter 11B and ADAAG requirements.

3. Comply with current CHPS requirements for low emitting materials, www.chps.net.

4. Chemically based products such as sealers, primers, fillers, adhesives, etc. must be approved by owner's office of the Environmental Health and Safety (OEHS).

5. Carpet tile must be free of Anti-Microbial Protection.

6. Comply with ASTM F1869 for moisture testing.

B. Requirements of Regulatory Agencies: Carpet tile shall meet requirements of federal, state and local regulatory agencies for flammability, static control, or other properties as specified with testing documentation from the manufacturer by a third party laboratory.

C. Carpet Tile Installation: Comply with CRI 104 - Standard for Installation of Textile Floor Covering Materials.

D. Each color of carpet tile shall be of the same dye lot.

E. Qualifications of Installer: Minimum five years experience in successfully installing the same or similar flooring materials.

F. Pre-Installation and Progress meetings: Prior to start of work of this section and after approval of submittals, schedule an on site Pre-Installation and progress meetings between Contractor, Supervising Installer, OAR and Project Inspector to review construction, drawings and installation procedures in accordance with the requirements of this specification.

1.04 DELIVERY, STORAGE AND HANDLING

A. Full cartons of carpet tile shall be packaged and identified by the flooring manufacturer. Distributor, dealer, or vendor cutting, re-packaging, and re-labeling is not permitted.

B. Store material at least 48 hours at room temperature prior to installation and in accordance to manufacturer's instructions.

C. Deliver fire-rated materials with testing agency labels and required fire classification numbers attached and legible.

1.05 JOB CONDITIONS

A. Ventilation and Temperature: Verify areas to be carpeted are ventilated to remove any off gassing from installation materials, and areas are within temperature range recommended by the various material manufacturers for Project site installation conditions. The temperature of a concrete slab must be stabilized above 65 degrees both 12 hours prior to and after the installation. The following environmental conditions inside the building are critical for proper installation. Temperature must be between 65 degrees F and 95 degrees F and the humidity between 10 percent and 65 percent for at least 72 hours before and 72 hours after installation. In addition, any adhesives and primers should be stored under these conditions for a minimum of 24 hours prior to installation.

B. Protection: Prohibit traffic on carpet for at least 12 hours after installation. Cover carpet with heavy non-staining Kraft paper in areas where the Work of other trades is to be performed and traffic and passage areas. Protect carpet from damage or soiling. Maintain protection in place until Substantial Completion.

1.06 WARRANTY

A. Contractor shall provide a two year installation warranty.

B. Manufacturer shall provide a 30 year material warranty as described below:

1. Delamination Warranty: Carpet tile will not delaminate for a minimum of 30 years from the date of installation.

2. Zippering Warranty: Carpet tile will not zipper or develop continuous pile yarn runners in the body of the carpet for a minimum of 30 years from the date of Substantial Completion.

3. Edge Ravel: Carpet tile will not have continuous pile yarn coming out at seams for a minimum of 30 years from the date of Substantial Completion.

4. Cup, Dish or Dome Warranty: The manufacturer warrants that the carpet tile will not cup, dish or dome for 30 years from the date of Substantial Completion.

5. Dimensional Stability Warranty: The manufacturer warrants that the carpet tile will not lose its dimensional stability (namely: growth or shrinkage with glue-down installations) for 30 years due to normal variations in atmosphere, temperature, or humidity

6. Wear Warranty: The manufacturer warrants that the carpet tile will lose no more than 10 percent by weight of the pile fiber during the life of the carpet from the date of Substantial Completion.

C. Manufacturer shall provide a 10 year material warranty for colorfastness and texture retention.

1. Stain and Soil Protection: 10 year stain removal written guaranty.

2. Texture Retention Warranty: The manufacturer warrants that the carpet tile will substantially maintain its physical surface texture against crushing, matting and walking out for 10 years from the date of Substantial Completion.

3. Colorfastness to light: Carpet tile will not fade for 10 years due to exposure to sunlight.

4. Colorfastness to atmospheric contaminants: Carpet tile will not fade for 10 years due to atmospheric contaminants.

1.07 MAINTENANCE

A. Extra Materials: Provide minimum three cartons of extra materials for each color, pattern, and dye lot of carpet.

PART 2 - PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. Modular Carpet Tile, Heavy Commercial Traffic:

1. Mohawk Industries, Style: Class Act.

2. Shaw Contract Group, Style: No Rules Collection.

3. Mannington Commercial, Style: Centerfield III, Everywear III and The Committee Collection.

4. Equal products meeting CHPS requirements as a system and that meet or exceed the products and systems listed below.

B. Adhesives and Primers: As recommended by tile carpeting manufacturer and approved by OEHS.

2.02 MATERIALS

A. Carpet tile shall meet the following minimum standards:

1. Pile: 0.195 inch maximum height level loop. No cut pile or cut and loops will be accepted.

2. Dye Method: 85 percent Solution Dyed Method. 15 percent Yarn Dyed.

3. Construction: Maximum 24-inch by 24-inch Modular Carpet Tile. Tufted level loop (no cut or cut loop accepted).

4. Pile / Yarn weight: Minimum 17 ounces per square yard.

5. Minimum Density: Not less than 6,800.

6. Moisture Impervious: Carpet tile shall be unaffected by water and moisture.

7. Static Protection: The manufacturer warrants that the carpet tile will not static discharge in excess of 3.5 KV or under when tested under the AATCC Test Method 134 for the life of the carpet.

8. Carpet tile shall be able to be installed with 5 pounds hydrostatic pressure or better per 1,000 square feet per 24 hours with written documentation from manufacturer, per CRI-104.

9. Fluorochemical Treatment: Minimum of 500 parts per million: per CRI-102; after two hot extractions (AATCC171), minimum 400 Parts per Million per CRI TM-102.

10. Traffic Classification: Class III – Extra Heavy Commercial Traffic (more than 1000-foot traffic per day).

11. GSA Certification: Carpet tiles shall meet or exceed the General Services Administration requirements.

12. Flammability:

a. Flooring Radiant Panel: Class I- per ASTM E648

b. NBS Smoke Density: Less than 450 per test ASTM E662; NFPA-258

c. Flame Resistant: Shall pass Methenamine pill test ASTM E662.

d. Materials shall meet requirements of California Proposition 65. In case of fire, no material shall be used that emit gas and is prohibited by California Proposition 65.

13. Run Resistant Strength: Not less than 25 pounds, in accordance with the Loop Pile Run Resistance test (TP 155-86), wet or dry for a minimum of 30 years.

14. Indoor Air Quality: Carpet tile and adhesion systems shall meet or exceed CRI and EPA guidelines (green label plus certified and labeled) and may not contain any VOC's such as: 4PCH (4 phenulcyclohexeneor, SBR latex (Styrene Butadiene Rubber).

15. Recycling Program: Carpet tile shall be eligible for a recycling program (the carpet tile will be recycled and no part of the reclaimed carpet enters a landfill) either through the carpet tile manufacturer or fiber manufacturer. If project scope included removal and disposal of existing carpet or carpet tile, contractor is responsible for delivery to a certified recycling center. A recycling certificate must be submitted to OAR, with its name and address of location of recycling center, date and weight of carpet recycled. Contractor is responsible for costs associated with recycling.

B. Carpet tile shall be from one dye lot.

C. Full cartons of carpet tile shall be cut, packaged, and identified by the factory. Distributors, dealers and vendor cutting, re-packaging, and re-labeling are not permitted.

D. Stair Nosing: Universal Moldings # A-544-BA 1 commercial (butt to nosing) type or equal, installed with recommended sized screws.

E. Adhesive: Water-resistant latex-based adhesive recommended by carpet tile manufacturer for re-leasable adhesive carpet tile installation. Where primers or sealers are furnished, verify their compatibility with adhesive.

F. 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 as approved by OEHS:

1. Webcrete #95 as manufactured by Durabond

2. Ardex SD-F as manufactured by Ardex

3. Or as recommended by flooring manufacturer and approved by LAUSD's Office of Environmental Health and Safety.

4. Leveling Compound shall meet or exceed 200 pounds when tested in accordance with ASTM 1583.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Before installation is started, examine surfaces to receive carpet tile. Deficiencies shall be corrected before starting Work of this section.

B. Field verify dimensions and other conditions affecting this Work before commencing carpet tile installation.

3.02 PREPARATION

A. Provide concrete moisture vapor emission and pH testing to concrete per Section 09 0561 - Moisture Testing for Flooring Installation for areas specified to be covered with carpet tile. Includes concrete placed below, on and above grade. For replacement projects, concrete slabs not in direct contact with ground may be excluded from this requirement. Comply with requirements of ASTM F1869.

E. Preparation of Subfloors: Any leveling compound used over a vapor or moisture barrier will be warranted to be installed in a wet or moist environment without moisture limitations.

1. Delay application of flooring until sub-floors are sufficiently dry according to flooring manufacturer’s recommendations, or perform remedial measures as recommended by flooring materials manufacturer.

F. Cleaning and Drying: Clean concrete floor slabs of oil, grease, waxes, curing compounds, dust, dirt, debris, paint, and other deleterious substances. Failure to remove or seal old adhesives or other floor coatings may result in installation failure. Provide a commercial vacuum cleaner to remove dust and dirt. Do not furnish oiled or chemical treated sawdust or any similar product for dust removal.

G. Leveling: Verify floor slabs true to level and plane within a tolerance of 3/16 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 an approved cementitious leveling compound. Remove high areas by power sanding, stone rubbing or grinding, chipping off and filling with an approved cementitious leveling compound, or equivalent method. Fill low areas with an approved cementitious 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. Again clean areas where repairs are performed and prime floor using recommended primer by manufacture. Do not sand, stone rub grind or power chip floor adhesives that contain asbestos.

H. Wood subfloors: Clean wood subfloors of oil, grease, waxes, dust, dirt, debris, paint, and other deleterious substances. Do not furnish oiled or chemical treated sawdust or any similar product for dust removal. Sand off projecting ridges. If recommended by carpet tile manufacturer, prime floors with a recommended primer, compatible with adhesives to be installed.

I. Conditioning of Materials: Carpet tile and adhesives shall be conditioned at the Project site at not less than 65 degrees F and relative humidity between 10 percent and 65 percent for 48 hours prior to installation and in accordance to manufacturer's instructions.

J. Floors should be level and sound. Any trowel marks from old adhesives must be sanded smooth, creating a level surface prior to the application of adhesives and primers.

3.03 CARPET TILE INSTALLATION

A. General: Install carpet tile in accordance with requirements of CRI 104, except where more stringent requirements are specified herein or recommended by carpet materials manufacturers.

B. Install carpet tiles in each dye lot in the number sequence as furnished by manufacturer. Measure the area to find the best starting point that will utilize a maximum size perimeter tile. After selecting the starting point, snap a chalk line that bisects this point by at right angles. To achieve a perfect angle form a triangle by measuring 6-inch up from the center point. Then measure 8-inch out from the center point. Then, find a 10-inch angle between these two points. (See manufacturers written instructions for complete details).

C. Color Control: Install dye lot in the number sequence at locations indicated to prevent shading variations. Install only one dye lot for each area of building unless otherwise reviewed. If more than one dye lot is required, obtain prior review of color match between dye lots by Owner and its representative's written approval.

D. Carpet Tile Fit: Refer to the layout Shop Drawings. The corners of the carpet tiles should be flat to assure a proper fit. Install the carpet tiles snuggly. Be careful to not to over tighten the installation.

E. Laying and Seaming: Cut carpet tiles for seams between rows and prevent damage to loops, prevent edge ravels, and preserve uniform row alignment and spacing on both sides and across seams. Install carpet tiles with loop rows in straight lines both ways, free of offsets, waviness, distortion, or misalignment. Cut seam edges straight and square with backing. Trim carpet tiles at walls, columns, and penetrations for a compressed fit.

F. Doorways: Extend carpet tiles into doorways without piecing in and seam to the carpet on other side of door under door centerline except where metal thresholds occur; no small filler pieces of carpet tiles will be permitted at doorways.

G. Adhesive Installation: Provide proper equipment as required by manufacturer. Evenly spread adhesive free of excess or thin areas. Place and lay carpet tile within open time of adhesive.

H. Binder Bars: Provide bars at edges of carpet tiles not abutting walls or other construction, securely fastened in place by using aluminum drive nails. Precisely align splices and tightly miter angles.

3.04 PROTECTION

A. Protect the Work of this section until Substantial Completion. Limit rolling traffic on carpet tiles for at least 12 hours after installation. Cover carpet tiles with heavy non-staining Kraft paper in areas where the Work of other trades is to be performed and/or traffic and passage areas. Protect carpet from damage or soiling. Maintain protection in place until Substantial Completion.

3.05 CLEANING

A. As each carpeted area is completed, clean up dirt and debris, remove spots and soiling with proper cleaner, trim off loose threads with sharp scissors, and vacuum entire area clean.

3.06 CLEAN-UP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.07 INSTRUCTION

A. Before Substantial Completion of the Work, should the district request and at the districts discretion, provide a four hour Owner instruction period for proper maintenance of carpeting. Instructions shall be provided by technical representative of manufacturer.

END OF SECTION

SECTION 09 8100

ACOUSTICAL INSULATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Acoustical insulation and sealants.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 07 2100 - Thermal Insulation.
3. Section 09 2216 - Non-Structural Metal Framing.

1.02 SUBMITTALS

A. Product Data:

1. Provide manufacturer’s printed Product Data for each product.
2. Provide manufacturer’s printed installation instructions.

1.03 QUALITY ASSURANCE

A. Fire Ratings: Comply with fire-resistance and flammability ratings specified.

B. Acoustic Performance: Acoustic Insulation shall be tested in accordance with ASTM C423, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method, with Type A (#4) mounting.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Protect insulation from physical damage and from becoming wet or soiled.

B. Comply with manufacturer’s recommendations for handling, storage and protection during installation.

PART 2 PRODUCTS

2.01 ACOUSTICAL INSULATION

A. Unfaced Mineral/Glass Fiber Blanket/Batt Acoustical Insulation: Acoustical insulation produced by combining mineral/glass fibers with thermosetting resins to comply with ASTM C665, Type I.

1. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50 when tested in accordance with ASTM E84.

2. Manufacturers: Johns Manville "Sound Control Batts", Owens Corning "Sound Attenuation Batts", or equal.

3. Thickness: 3-inch unless otherwise indicated.

2.02 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant for Concealed Joints: Non-drying, non-hardening, non-skinning, non-staining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound:

1. Pecora Corp. "BA-98".

2. Tremco Inc. "Tremco Acoustical Sealant".

3. Hilti, Inc. “CP 506”.

4. Equal.

B. Acoustical Sealant for Exposed Joints: Non-oxidizing, non-hardening, skinnable, paintable, gunnable sealant recommended for sealing interior exposed joints to reduce transmission of airborne sound.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with manufacturer's instructions for installation conditions.

B. Do not install insulation until building is sufficiently enclosed or protected against absorption of moisture by the insulation, and do not install insulation unless supporting framing and construction is in a thoroughly dry condition.

C. Install snugly between framing members with ends snugly fitted between units and against adjacent construction.

D. Carefully cut and fit insulation around pipes, conduit, and other obstructions and penetrations.

E. Where door and window frames occur in framing; cut additional strips of insulation and hand-pack as required to fill voids in and around such frames.

F. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C919 for use of joint sealants in acoustical applications as applicable to materials, applications and conditions indicated. Install sealants in accordance with manufacturer's instructions.

3.02 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose off of Project site.

3.03 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 8434

ACOUSTICAL WALL PANELS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Acoustical wall panels.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 09 2900 - Gypsum Board.

1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings for panel units. Indicate anchors, accessories, and installation details.

B. Product Data: Submit manufacturer's specifications and installation instructions for each material and component part. Include methods of installation for each type of substrate to receive units.

C. Material Samples: Submit 12-inch by 12-inch Samples, of each color fabric required. Review of Samples will be for color, pattern, and texture only. Submit 12-inch by 12-inch Samples of substrate material including edge condition with fabric.

D. Test Reports: Submit certified copies of test reports from an independent acoustical testing laboratory indicating compliance with the standards and requirements listed in this section.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. In addition to the requirements of these Specifications, comply with manufacturer's instructions and recommendations including preparation of substrate, installation of anchors and application of materials.

2. The manufacturer shall have been regularly engaged in the manufacturer of fabric wrapped acoustical panels for a period of no less than two years and provide a list of at least five completed projects of equivalent size and scope.

B. Acoustical measurements shall be performed in accordance with ASTM C423 and shall be performed in Type A mounting in accordance with ASTM E795. An independent acoustical testing laboratory accredited under the National Voluntary Laboratory Accredited Program (NVLAP) shall perform the test.

C. Each component of the panel shall have a Class A rating supported by test from Underwriter's Laboratory in accordance with ASTM E84.

D. Sound Absorption Coefficient Requirements for Panels:

1. The sound absorption coefficients of the material shall not be less than the following tabulated values:

	One-Third Octave Band Center Frequency in Hertz					
Thickness:	125	250	500	1000	2000	4000
	0.05	0.20	0.65	0.90	0.90	0.90

1.04 PRODUCT HANDLING

A. Crate and pack units as required preventing damage during transit, storage, or handling at the Project site.

B. Store material to provide easy access for inspection and identification.

1.05 JOB CONDITIONS

A. Space Enclosure: Do not install until ambient conditions of temperature and humidity are continuously maintained at values indicated at time of Substantial Completion.

PART 2 - PRODUCTS

2.01 PANELS

A. Fabric Requirements: The fabric shall be equivalent to the following:

1. Guilford FR-701 Screen Fabric:

a. Pattern 2100.

b. Weave: Plain, 17 plus or minus 1 by 16 plus or minus 1.

c. Yarn: 2 ply.

d. Contents: 100 percent polyester.

e. Weight: 16.0 plus or minus 0.5 ounces per linear yard.

f. Flammability (ASTM E84):

1) Flame Spread: 0 to 25.

2) Fuel Contributed: 0.

3) Smoke Developed: 0 to 450.

g. Tensile (ASTM D2262):

h. Tear (ASTM D2262): 30 pounds minimum.

i. Moisture Regain (ASTM D2654): 0.5 percent maximum.

j. Color Fastness to Light (ASTM D3597 Mod Voluntary Product TS-198) – Full Commercial Serviceability.

B. Acoustical Core Materials: Semi-rigid inorganic glass fiber material equal to Owens Corning Industrial Insulation, Johns Manville, Knauf, or equal.

2.02 PANEL CONSTRUCTION

A. Panel construction shall consist of a one-piece layer of rigid insulation board with a rigid framing system that provides a dimensionally stable panel. The construction shall be guaranteed against twisting and warping. Edges shall be straight and parallel to plus or minus 1/32 inch for butt joint application or reveal wall mounting. Finished thickness shall be as indicated on the finish schedule or indicated on the Drawings. Panel framing shall consist of one of the following:

1. Chemically treat edges of the acoustical material to full panel thickness and to a depth of 1/8 inch to resist damage and to form an integral framing system. Edges shall have a minimum Barcol hardness of 35.

2. An extruded aluminum frame with minimum 1/16 inch wall thickness. Corners shall be mitered and welded of secured with corner clips.

3. A wood frame with corners mitered and secured with screws. Furnish gusset plates as required. Fire retardant wood shall be installed as required to pass ASTM E84.

B. Provide cutouts in panels for flush plates, receptacles, outlets, switches, thermostats, clocks, lights, and similar items.

2.03 MOUNTING HARDWARE

A. Installation hardware shall be concealed types and provided by the panel manufacturer. Panels shall be provided with appropriate hardware to securely fasten edges and corners to the wall and to prevent the center portions of the panel from deflecting more than 1/2 inch in any 10-foot plane. Panels shall be individually removable unless otherwise specified.

B. Install panels as indicated with specified air space, filler panels, and fiberglass fill backing as indicated. Provide furring strips, blocking, leveling angles, etcetera as required to provide a complete and finished system.

C. Where panel ends are exposed, panel shall be constructed to conceal mounting hardware.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install panels in locations as shown on the Drawings and in accordance with the manufacturer’s written instructions.

B. Install units plumb and level in accordance with the manufacturer’s printed instructions and reviewed Shop Drawings. No exposed fastening devices are permitted.

C. Required cutouts or changes in panel dimensions may be factory performed or field cut in accordance with manufacturer’s written directions.

D. Finish corners even and true to line on face and sides with no wrinkles. Corners shall be finished to prevent unraveling, tearing or other visible defects.

E. Provide minimum amount of adhesive to fasten fabric to the acoustic core. The adhesive shall not reduce the acoustical panel sound absorption.

3.02 TOLERANCES

A. The fabric will be selected by the Architect from the panel manufacturer's standard finishes. The finish shall be of the same type as that furnished for the sound absorption test.

B. Finished appearance shall be flat with finish tight and free from sags and wrinkles. Finish may be returned onto the backside of the panel. Panel edge construction shall not be visible though finish.

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 09 9000

PAINTING AND COATING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Interior and exterior painting.

B. Following items shall not be painted:

1. Brass valves, chromium or nickel-plated piping and fittings.

2. Boiler control panels and control systems.

3. Fabric connections to fans.

4. Flexible conduit connections to equipment, miscellaneous name plates, stamping, and instruction labels and manufacturer's data.

5. Mechanical and electrical utility lines, piping and heating and ventilation ductwork in tunnels, under-floor excavated areas or crawl spaces, attic spaces and enclosed utility spaces.

6. Flag, floodlight, parking light poles and loudspeaker poles, metal stairs, handrails and chain-link fence with a galvanized finish, unless otherwise noted.

7. Structural and miscellaneous steel, open web steel joists and metal floor decking, which will not be exposed in final construction, shall have no finish other than one coat of shop primer.

8. Hardboard covering on tops and backs of counters and benches.

9. Brass, bronze, aluminum, lead, stainless steel and chrome or nickel-plated surfaces.

10. Non-metallic walking surfaces unless specifically shown or specified to be painted.

1.02 REGULATORY REQUIREMENTS

A. Paint materials shall comply with the Food and Drug Administration’s (F.D.A.) Lead Law and the current rules and regulations of local, state and federal agencies governing the use of paint materials.

1.03 SUBMITTALS

A. List of Materials: Before submittal of samples, submit a complete list of proposed paint materials, identifying each material by distributor's name, manufacturer's name, product name and number, including primers, thinners, and coloring agents, together with manufacturers' catalog data fully describing each material as to contents, recommended installation, and preparation methods. Identify surfaces to receive various paint materials.

B. Material Samples: Submit manufacturer's standard colors samples for each type of paint specified. Once colors have been selected, submit Samples of each color selected for each type of paint accordingly:

1. Samples of Paint and Enamel must be submitted on standard 8 ½" x 11" Leneta Opacity-Display Charts. Each display chart shall have the color in full coverage. The sample shall be prepared from the material to be installed on the Work. Identify the school on which the paint is to be installed, the batch number, the color number, the type of material, and the name of the manufacturer.

2. Elastomeric shall be submitted in duplicate samples of the texture coating. Samples will be not less than 2 ½ by 3 ½ in size and installed upon backing. Finished Work will match the reviewed Sample in texture.

3. Materials and color samples shall be reviewed before starting any painting.

C. For transparent and stained finishes, prepare samples on same species and quality of wood to be installed in the Work, with written description of system used.

1.04 QUALITY ASSURANCE

A. Certification of Materials: With every delivery of paint materials, the manufacturer shall provide written certification the materials comply with the requirements of this section.

B. Coats: The number of coats specified is the minimum number. If full coverage is not obtained with the specified number of coats, install additional coats as required to provide the required finish.

C. Install coats and undercoats for finishes in strict accordance with the recommendations of the paint manufacturer as reviewed by the Architect.

D. Paint materials shall comply with the following as a minimum requirement:

1. Materials shall be delivered to Project site in original unbroken containers bearing manufacturer's name, brand number and batch number.

2. Open and mix ingredients on premises in presence of the Project Inspector.

1.05 DELIVERY, STORAGE AND HANDLING

A. Storage and Mixing of Materials: Store materials and mix only in spaces suitable for such purposes. Maintain spaces clean and provide necessary precautions to prevent fire. Store paint containers so the manufacturer's labels are clearly displayed.

1.06 SITE CONDITIONS

A. Temperature: Do not install exterior paint in damp, rainy weather or until surface has thoroughly dried from effects of such weather. Do not install paint, interior, or exterior, when temperature is below 50 degrees F, or above 90 degrees F, or dust conditions are unfavorable for installation.

1.07 WARRANTY

A. Manufacturer shall provide a three year material warranty.

B. Installer shall provide a three year application warranty.

1.08 MAINTENANCE

A. Provide at least one gallon of each type, color and sheen of paint coating installed. Label containers with color designation indicated on Drawings.

PART 2 - PRODUCTS

2.01 PAINT MATERIALS

A. Furnish the products of only one paint manufacturer unless otherwise specified or required. Primers, intermediate and finish coats of each painting system must all be the products of the same manufacturer, including thinners and coloring agents, except for materials furnished with shop prime coat by other trades.

B. Factory mix paint materials to correct color, gloss, and consistency for installation to the maximum extent feasible.

C. Paint materials to be minimum “Architectural Grade”.

D. 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 MANUFACTURERS

A. Acceptable manufacturers, unless otherwise noted:

1. Dunn-Edwards Corporation Paints

2. Frazee Paints and Wall coverings

3. Vista Paints

4. Sherwin Williams

5. ICI Paints

6. Equal.

2.03 MURALS

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 PREPARATION

A. Examine surfaces to receive paint finish. Surfaces which are not properly prepared and cleaned or which are not in condition to receive the finish specified shall be corrected before prime coat is installed.

B. New woodwork shall be thoroughly cleaned, hand sandpapered, and dusted off. Nail holes, cracks or defects in Work shall be filled. On stained woodwork, fill shall be colored to match stain. Filling shall be performed after the first coat of paint, shellac or varnish has been installed.

C. Plaster surfaces except veneer plaster shall be allowed to dry at least 3 weeks before painting. Veneer plaster shall be allowed to dry sufficiently to receive paint as determined by moisture meter tests.

D. Metal surfaces to be painted shall be thoroughly cleaned of rust, corrosion, oil, foreign materials, blisters, and loose paint.

E. Do not install painting materials to wet, damp, dusty, dirty, finger marked, rough, unfinished or defective surfaces.

F. Concrete surfaces shall be dry, cleaned of dirt and foreign materials and in proper condition to receive paint. Neutralize spots demonstrating effects of alkali.

G. Mask off areas where necessary.

3.02 APPLICATION

A. Backpainting: Immediately upon delivery to the Project site, finish lumber and millwork shall be backpainted on surfaces that will be concealed after installation. Items to be painted shall be backpainted with priming coat specified under "Priming".

B. Priming: New wood and metal surfaces specified to receive paint finish shall be primed. Surfaces of miscellaneous metal and steel not embedded in concrete, and surfaces of unprimed plain sheet metal Work shall be primed immediately upon delivery to the Project site. Galvanized metal Work and interior and exterior woodwork shall be primed immediately after installation. Priming of surfaces and priming coat shall be as follows:

1. Knots, Pitch and Sap Pockets: Shellac before priming.

2. Exterior Woodwork and Wood Doors: Prime with one coat of exterior waterborne emulsion wood primer.

3. Interior Woodwork: Where indicated to be painted, prime with one coat of waterborne wood primer.

4. Stain: Woodwork indicated to receive a stain and varnish finish shall be stained to an even color with water borne stain. On open-grained hardwood, mix stain with paste filler and completely fill pores in wood.

5. Galvanized Metal Work: Clean oil, grease and other foreign materials from surfaces. Install vinyl wash pretreatment coating. Follow manufacturer's instructions for drying time, and then prime with one coat of metal primer.

6. Unprimed Iron, Steel, and Other Uncoated Metals: Where specified to be painted, prime with one coat of metal primer.

7. Shop Primed Metal Items: Touch up bare and abraded areas with metal primer before installation of second and third coats.

8. Coats shall be installed evenly and with full coverage. Finished surfaces shall be free of sags, runs and other imperfections.

C. Allow at least 24 hours between coats of paint.

D. Rollers shall not be used on wood surfaces.

E. Each coat of painted woodwork and metal, except last coat, shall be sandpapered smooth when dry. Texture-coated gypsum board shall be sanded lightly to remove surface imperfections after first coat of paint has been installed.

F. Each coat of paint or enamel shall be a slightly different tint as required. Each coat of paint, enamel, stain, shellac, and varnish will be inspected by the IOR before next coat is applied. Notify the Project Inspector that such Work is ready for inspection.

1. Tinting Guideline: The first coat, primer/undercoat(s) to be untinted or tinted up to 50 percent lighter or darker (at the discretion of the installer) than the finish coat. The second coat (or third coat if a seal coat and undercoat have been specified) is to be factory tinted in the range of 10 percent to 15 percent lighter or darker (at the discretion of the installer) than the finish coat. The final coat is to be factory tinted to the required color selected. These tinting guidelines shall be provided on all surfaces receiving paint.

G. Do not "paint-out" UL labels, fusible links and identification stamps.

H. Paint Roller, brush and spray.

1. Only Paint rollers shall be used on interior plaster, drywall, masonry/plaster and plywood surfaces, nap shall not exceed one half inch in length.

2. First coat on wood overhang and ceilings shall have material applied by roller and then brushed out in a professional manner to leave surface free of imperfections. Finish coat may be sprayed.

3. Other surfaces shall have all coatings applied with brushes of proper size.

4. Spray work is permitted only on radiators, acoustic plaster, masonry and plaster.

I. Where ceilings are specified to be painted, beams, cornices, coves, ornamental features, plaster grilles, etc. shall be included.

J. Ceilings shall be white, including classrooms, storage rooms, offices, arcades, etc. Boiler room and fan room ceiling color shall match adjacent walls.

3.03 CLEANING

A. Remove rubbish, waste, and surplus material and clean woodwork, hardware, floors, and other adjacent Work.

B. Remove paint, varnish and brush marks from glazing material and, upon completion of painting Work, wash and polish glazing material both sides. Glazing material, which is damaged, shall be removed and replaced with new material.

C. Clean hardware and other unpainted metal surfaces with recommended cleaner. Do not furnish abrasives or edged tools.

3.04 SCHEDULE

A. Interior:

1. Woodwork, Painted: 3 coats.

a. First Coat: As specified in this section under Priming.

b. Second and Third Coats: Interior enamel, semi-gloss or gloss as indicated.

2. Woodwork, Stained and Varnished: 4 coats.

a. First Coat: As specified in this section under Priming.

b. Second, Third and Fourth Coats: Varnish, semi-gloss.

3. Wood Corridor doors: 4 coats.

a. First Coat: As specified in this section under Priming.

b. Second, Third, and Fourth Coats: Varnish, gloss.

4. Other Wood Doors: 4 coats.

a. Varnished or painted as indicated.

b. If varnished, same finish system as painted woodwork, with semi-gloss or gloss finish to match adjacent wall.

5. Miscellaneous Woodwork: 4 coats. Wood items including, but not limited to stair treads and risers, handrails, rolling ladders, wood base and shoe, chair rails, counter tops and locker room benches.

a. First Coat: As specified in this section under Priming.

b. Second, Third and Fourth: Exterior varnish, gloss.

6. Casework: Interior surfaces of casework (except plastic laminate-faced casework) including top, edges and underside of shelving, poles, surfaces of drawers (except fronts), interior surfaces of mailbox pigeonholes, and particle board.

a. First Coat: Waterborne stain.

b. Second and Third Coats: Satin varnish.

7. Plaster: 4 coats.

a. First Coats: Pigmented wall sealer.

b. Second coat: Enamel under coater.

c. Third and Fourth Coats – Interior enamel, semi-gloss or gloss as indicated.

8. Gypsum Board: 4 coats.

a. First Coat: Drywall sealer.

b. Second Coat: Enamel under coater.

c. Third and Fourth Coats: Interior enamel, semi-gloss or gloss as indicated.

9. Concrete: 3 coats.

a. First: Concrete sealer.

b. Second and Third: Interior enamel, semi-gloss or gloss as indicated.

10. Concrete Block: 3 coats.

a. First: Concrete block filler.

b. Second and Third: Interior enamel, semi-gloss or gloss as indicated.

11. Metal: Shall be cleaned, pre-treated and painted with 3 coats. Items to be painted include, but are not limited to: exposed structural and miscellaneous steel, metal doors and frames, ladders, table and bench legs.

    a. First Coat: Metal primer.

    b. Second and Third Coats: Interior gloss enamel, except metal doors and frames which shall be semi-gloss or gloss to match adjacent wall.

B. Exterior:

1. Woodwork: 3 coats.

    a. First Coat: As specified in this section under Priming.

    b. Second and Third Coats: Exterior house and trim enamel.

2. Wood Doors: 3 coats.

    a. First Coat: As specified in this section under Priming.

    b. Second and Third Coats: Exterior gloss enamel.

3. Plaster and Stucco: 3 coats. Flat 100 percent acrylic.

    a. Prime Coat: Alkali resistant primer/sealer.

    b. Exterior 100 percent acrylic.

4. Concrete: 3 coats. Flat 100 percent acrylic.

    a. First Coat: Concrete sealer.

    b. Second and Third Coats: Exterior 100 percent acrylic.

5. Concrete Block: 3 coats. Flat 100 percent acrylic.

    a. First Coat: Concrete block filler.

    b. Second and Third Coats: Exterior 100 percent acrylic.

6. Metal: 3 coats. Shall be cleaned and pre-treated. Items to be painted include, but are not limited to: steel columns and miscellaneous steel items, gravel stops, metal doors and frames, hoods and flashings.

    a. First Coat: As specified in this section under Priming.

    b. Second and Third Coats: Exterior gloss enamel.

C. Mechanical and Electrical Work:

1. Except where interior mechanical and electrical Work to be painted is specified to receive another paint finish, Work occurring in finished rooms and spaces shall be cleaned, pre-treated, and painted with 3 coats. Items to be painted include, but are not limited to: steel and copper piping, pipes, vents, fittings, ducts, plenums, miscellaneous supports and hangers, electrical conduit, fittings, pull boxes, outlet boxes, unfinished surfaces of plumbing fixtures, miscellaneous metal cabinets, panels, and access doors and panels.

    a. First Coat: As specified in this section under Priming.

    b. Second and Third Coats: Interior enamel, semi-gloss or gloss to match adjacent wall or ceiling finish.

2. Insulation and Taping on Pipes and Ducts: 3 coats.

    a. Finished Rooms:

        1) First Coat: Interior waterborne primer.

        2) Second and Third Coats: Interior semi-gloss or gloss enamel to match adjoining wall or ceiling finish.

    b. Building Exterior:

        1) First Coat: Exterior waterborne primer.

        2) Second and Third Coats: Exterior gloss enamel.

3. Inside surfaces of ducts, vents, dampers and louvers as far back as visible from room in which they open shall be painted with 2 coats of flat black paint.

D. Miscellaneous:

1. Outside Storage Units (wood or metal): 3 coats.

    a. First Coat: As specified in this section under Priming.

    b. Second and Third Coats: Exterior gloss enamel.

2. Exterior and interior surfaces of storage bins, and potting tables shall have 3 coats of acrylic stain.

3. Wood compost bins shall be finished with 3 coats of acrylic stain.

3.05 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.06 CLEANUP

A. Remove rubbish, debris, and waste materials 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 02 8333 – Lead Abatement and Lead-Related Construction Work.
3. Section 02 8213 – Asbestos Abatement and Asbestos Related Disturbance.
4. Section 06 1000 - Rough Carpentry.
5. Section 06 2000 - Finish Carpentry.
6. Section 07 9200 - Joint Sealants.
7. Section 09 2423 - Cement Plaster and Metal Lath.
8. Section 09 2900 - Gypsum Board.
9. Section 09 9623 – Graffiti - Resistant Coatings.

1.02 REGULATORY REQUIREMENTS

A. Workers shall be trained in EPA’s (Environmental Protection Agency); Renovation, Repair and Painting (RRP), the lead-related construction course that satisfies the requirements specified in 40 CFR, Part 745, Section 745.90.

B. 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.

C. Prior to commencement of Asbestos Related Construction Work, personnel required to construct and enter the Work Area or handle Asbestos Containing Materials shall have received adequate training, minimum of 16 hours of O&M training comprised of 2 hours of Awareness Training and 14 hours of Special O&M

Training, in accordance with the requirements by 40 CFR, Part 763, Subpart E (AHERA) and Title 8, Section 1529, of the California Code of Regulations.

D. 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.

E. 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 Project Inspector 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. Provide the current SCAQMD permit for each HEPA Vacuum and Portable Mechanical Ventilation System before they are brought onto the Project site.

E. 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 be approved by OWNER'S Office of Environmental Health and Safety (OEHS) Chemical Evaluation Program and comply with applicable requirements of Food and Drug Administration's (FDA) Lead Law and South Coast Air Quality Management District (SCAQMD).

C. Painters working on Lead related work shall be trained at a minimum, in EPA's Renovation, Repair and Painting (RRP) Rule.

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 Safety Data 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.

1.07 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 55 degrees F., humidity is above 80%, or above manufacturer's stated recommended temperature, or when dust conditions are unfavorable to proper workmanship.

1.08 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.

1.09 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.

1.10 REMOVAL AND REINSTALLATION OF SECURITY GRILLES

A. Replace and secure at end of each working day protective security grilles. Every bolt shall be replaced properly using a washer, cut smooth and filed down.

B. Remove window grilles and anchoring devices prior to painting area behind grille.

C. Repair or replace grills, anchoring devices, and hardware damaged during removal and replacement process with material of same composition.

D. Reinstall grilles; anchoring devices and hardware shall be replaced with new hardware of same material. Installation of previously used or damaged hardware and anchoring devices shall not be permitted.

E. Provide hardware, specialty tools, and labor needed to remove and reinstall window grilles.

F. Paint security grilles that have graffiti or have been vandalized.

G. Do not leave any building or classroom unsecured. Grilles shall be reinstalled and rooms properly secured at end of each day.

H. Patch holes that exist prior to removal of grilles or that are exposed or created during removal.

I. Removal and Replacement

1. Grille and window sill shall be numbered prior to removal. Grille must be reinstalled to original location. Remove numbers upon reinstallation.

2. Window grilles may have been anchored in different ways according to building composition and grille type. Following is a list of different types of anchors and methods of removal and installation. (Processes listed are not applicable to every situation. Use appropriate methods as needed, with prior consent of Project Inspector).

a. Nail in Anchor:

1) Removal: Use cold chisel to split aluminum head, pull out steel nail in center, and then pull out aluminum sleeve or grind off aluminum head to reveal nail, then remove nail. Touch up grille with approved spray cold galvanize where galvanize has been damaged from grinding.

2) Reinstallation: With grille flush to wall, insert anchor flush with mounting tab, and drive nail with hammer until secure. Bent nails will not be accepted.

b. Threaded Anchors:

1) Removal: Grind off tack weld only, threaded stud shall remain in wall. Remove nut, washer, and grille. Touch up galvanizing damaged during grinding.

2) Reinstallation: Install grille without damaging anchor threads. Install new washer and nut, tack weld nut to tab, clean weld, and paint. Do not weld threads.

c. Carriage Bolts: Note: Extra-long carriage bolts are a specialty item. Allow sufficient time to order.

1) Removal: Remove nut and washer and pull out bolt (do not reuse).

2) Reinstallation: Replace with new bolt of same size and minimum of 1 inch longer than bold removed. Install a new fender washer and nut. Tighten until grill is firmly against wall. Check to make sure window operates correctly. Cut off bolts flush with nut and de-burr bolt.

d. Lag Type Screws

1) Removal: Remove nut and washer and pull out bolt (do not reuse).

2) Reinstallation:

a) If existing hole is capable of receiving new screw: Replace with new lag, of same diameter, using 1 inch longer than those removed. Tack weld screws to grille.

b) If existing hole is damaged or otherwise compromised, a new placement of tab and screw is necessary. Remove existing tab, offset location of tab 2 inches, and drill correct size pilot hole into wood frame to avoid splitting wood. Replace with a new lag, of same length and diameter as removed. Tack weld screws to grill. Welds shall be cleaned and painted with cold galvanized paint.

e. Tamper Proof Screws

1) Removal: Remove nut and washer and pull out bolt (do not reuse).

2) Reinstallation:

a) If existing hole is capable of receiving new screw: Replace with new screw, of same diameter, using 1 inch longer than those removed.

b) If existing hole is damaged or otherwise compromised, a new placement of tab and screw is necessary. Remove existing tab, offset location of tab 2 inches, and drill correct size pilot hole into wood frame to avoid splitting wood. Replace with a new screw, of same length and diameter as removed. Welds shall be cleaned and painted with cold galvanized paint.

f. Pop Rivet-Steel, Aluminum, or Stainless Steel. Note: Extra-long pop rivets are a specialty item. Allow sufficient time to order.

1) Removal: Drill out with proper size drill bit, do not increase hole size.

2) Reinstallation: Replace with new pop rivet, of same diameter and composition as rivet removed.

3. Grilles reinstalled in exact prior position. Do not use plastic anchors or toggle bolts. Grilles have been installed with expanded metal situated in a consistent directional manner and shall be reinstalled in same manner. Extra or oversized holes shall be repaired. If for any reason anchor will not securely hold, use next bigger size anchor and offset tab 2 inches and re-anchor as per OAR direction.

4. Repair damage that previously exists prior to removal or is done to existing concrete, brick, wood, or any other surface during removal. If welding is necessary, welder shall protect surfaces from damage and maintain a fire watch during welding and at least ½ hour after completion.

5. Do not change original type of anchor without prior approval from OAR and Project Inspector.

6. Comply with applicable lead and asbestos abatement requirements prior to removal of grilles. Only employees properly trained and certified shall be permitted to disturb building materials containing lead or asbestos.

1.11 MOVING EQUIPMENT

A. Perform handling and moving of furniture, equipment, casework, books, and supplies, or items impeding project and re-installing in their original location, except as otherwise directed by OAR. Library books shall be moved and re-shelved in same sequence and in same location from which they were removed, unless otherwise directed by OAR.

1.12 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.

1.13 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".

E. Whenever "Paint or Enamel" is referred to in these specifications, it shall be taken to mean types of waterborne materials and water reducible materials.

F. Whenever "edges" are referred to in these specifications, it shall be taken to mean every edge (which include tops and bottoms).

G. 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 SCAFFOLDING

A. Scaffolding and aerial lifts shall be made available to OWNER, without cost, to make repairs. OWNER will coordinate its work with that of CONTRACTOR's to avoid delays to the work.

1.15 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 Plus or Ultra Premium Grade”.

D. Acceptable manufacturers, unless otherwise noted:

1. Dunn-Edwards Corporation Paints.

2. Vista Paints.

3. Frazee Paints and Wall coverings.

4. Sherwin Williams.

5. PPG Paints.

6. Equal.

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 MURAL PAINT MATERIALS

A. Manufacturer: Behr, Premium Plus Ultra Exterior Flat, Behr Premium Plus Exterior Semi-Gloss Enamel, 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 ensuring 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.

3.02 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.

3.03 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 on an exterior stucco/masonry finish. For stucco/masonry repair, apply an exterior patching material specified in Section 09 2423, bringing the surface flush with the existing finish while matching the existing building textured finish.

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. 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.

   a. Surfaces shall then be considered as new work.

   b. Woodwork shall be hand sanded smooth after each and every coat, except last coat. Coats shall be free from dust, dirt or other imperfections.

   c. 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.

   d. Remove lint and grease from screens, vents, hoods, et cetera that are to be painted.

3.04 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. Checked, cracked, blistered, scaled loose, and alligator paint on wood and metal surfaces on exterior or interior of facilities shall be wet scraped and wet sanded to a smooth solid surface, H.E.P.A. vacuumed, wet wiped as specified per EPA RRP and then painted as specified. Wet scraping and or wet sanding shall be performed 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. Sandblasting and/or pressure washing shall not be allowed without prior approval from the OWNER’s Facilities Environmental Technical Unit. Only low pressure hydro-washing, below 750 psi, shall be allowed on all exterior surfaces.

4. 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, et cetera. Immediately following hydro-washing, areas surrounding buildings must be rinsed down. Ensure no rinse water enters storm drains.

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 using the wet method. 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 shall be collected and stored in DOT approved container and examined for the presence of paint chips. The visible paint chips shall be separated from the waste water and be disposed of as assumed RCRA hazardous waste or be characterized to determine disposal requirements. The remaining wastewater must be characterized for proper disposal in accordance with Specification 02-8333, Lead Abatement and Lead Related Construction Work.

e. At no time shall water from hydro-washing process be directed to soil, such as planted area, sewer system, 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. Hazardous waste generated by this process requires that the Office of Environmental Health and Safety (OEHS) be notified. Hazardous waste shall be being transported under a Uniform Hazardous Waste Manifest approved by OEHS prior to disposal. CONTRACTOR shall ensure the manifest is completed as required by code and then submit it to OEHS for approval. The OAR will sign the manifest once it is accurately completed and approved by OEHS prior to transport.

5. 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.

6. Sandblasting and Pressure Washing of materials containing asbestos or lead are abatement activities and will only be performed by companies and individuals with prior Facilities Environmental Technical Unit (FETU) approval.

3.05 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.

3.06 FILLER ON SIDING AND WOODWORK

A. Checked and cracked portions of siding and woodwork (after surrounding areas have been prepared as specified above) shall be primed, smoothed with an exterior filling compound and then sanded smooth when dry. Filled areas must be spot primed. Filler shall not be used on handball walls or basketball backstops.

3.07 SEALING SASH, DOOR FRAMES

A. Sealant that will interfere with proper application of coatings 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 MASTIC REPAIR AND ELASTOMERIC REPAIR

A. Surface must be clean, firm and free of oil, wax and chalk. Mildew must be killed. Surface must be rinsed and allowed to dry.

B. Use primers as recommended by manufacturer for each substrate.

C. May be applied with airless spray equipment, using a 22 to 34 orifice tip and do not apply when surface or air temperature is below 50 degrees F.

D. Apply elastomeric with a ½ inch to 1 ½-inch roller cover or an air-atomized spray texture pump system. Do not over-roll.

E. Spreading rate:

Fine texture:	Approx. Mil thickness	Wet	18 Mils
	at 80 square feet per gallon	Dry	9 Mils
Medium texture:	Approx. Mil thickness	Wet	18 Mils
	at 60 square feet per gallon	Dry	9 Mils
Heavy texture:	Approx. Mil thickness	Wet	39 Mils
	At 40 square feet per gallon	Dry	26 Mils

NOTE: Coverage will vary depending upon texture desired and surface. Direction will be given by an OWNER representative.

F. Dry time: To touch: 1 to 1 ½ hours

To re-coat: 24 hours

G. Finish will be uniform in texture and free of imperfections.

H. Elastomeric coatings will receive at least two coats of paint.

I. Hairline cracks: Two coats of elastomeric coating to bridge hairline cracks.

J. Small to medium cracks and imperfections: elastomeric coating to fill and span cracks up to 1/32 inch. Cracks 1/32 inch width or greater shall be treated with an elastomeric sealant (recommended by paint manufacturer) prior to applying elastomeric coating.

K. Medium to large cracks and imperfections: Cracks from 1/32 inch to 1/8 inch shall be treated with a brush-grade elastomeric sealant applied in a 2-inch wide band; crowned at center and feathered at edges to conceal repair.

L. Large cracks: Cracks 1/8 inch to ½ inch shall receive a urethane sealant (recommended by paint manufacturer), “rake out” crack to conform to manufacturer’s specifications and applied as directed for medium to large cracks.

M. Cracks, holes and damaged spots larger than ½ inches: Damaged areas shall be given a cement plaster finish coat consisting of one-part plastic Portland cement to

three-parts plaster sand to match existing finish. When finished, it shall be flush with and match existing texture of adjoining surface.

N. Texture match: Crack repairs shall be finished to match texture of adjoining surfaces, per Project Inspector's approval. Hand held plaster hopper guns may be used. Exercise care to ensure that areas finished by hand held plaster machines match in color, texture and thickness to adjoining surfaces. A compatible bonding agent shall be used.

3.09 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 Article Mastic Repair and Elastomeric Repair.

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.

3.10 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 sand/media blasting, 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.

3.11 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.

3.12 CAFM BUILDINIG NUMBERS

A. After painting of masonry/plaster, paint and repaint (stencil) CAFM numbers with 100 percent acrylic gloss in one location on each building. Numbers shall be 6 inches in height using Gothic Bold Army font. Color is to be Black on light color surfaces and White on dark color surfaces. Coordinate with OAR color selection for surfaces and locations.

3.13 STAINED AND VARNISHED SURFACES

A. Where existing varnish has been removed and woodwork is to be enameled, woodwork shall be primed as specified under "Priming" and then given three coats. First coat of enamel undercoat, second and third coats of gloss or semi-gloss enamel.

B. Interior woodwork having a stain and varnish finish shall have areas where painter's finish has been removed, build-up to match adjoining finish with stain, filler for open wood grained wood and varnish. Exposed surfaces of woodwork shall be given two coats of interior gloss varnish, and one coat of interior varnish, semi-gloss finish or as specified herein. Between coats of varnish, surfaces shall be sanded with #220 sandpaper or steel-wool and dusted clean.

C. Where exterior gloss varnish for finish coat is specified, method of build-up shall be as specified above, however exterior gloss varnish shall be used in lieu of interior varnish. When following items are to receive varnish, three coats of exterior gloss varnish shall be used on: window stools, sash, screens, exterior doors/frames, wood handrails, balustrade caps, chalk rails, toilet stall doors, fixed benches, sash poles, stair treads, risers, bleachers, base and base shoe.

D. Remove stains from varnished surfaces before refinishing.

E. Colored varnish is prohibited.

3.14 SASH PUTTY

A. Loose sash putty must be removed and replaced. Rough, uneven or otherwise deteriorated sash putty shall be sanded smooth or re-puttied.

B. Sash putty and sealing compound shall be painted with same number of coats as specified for woodwork.

3.15 PUTTY

A. Holes, open joints of siding, woodwork and sash glazing shall, after surrounding areas have been prepared as specified above, be knife puttied. On stained woodwork, putty must be colored to match stain. Puttying shall be done after first coat of paint or varnish has been applied. Latex sealant may be used on open joints and woodwork. Putty and/or sealant shall be spot primed before finish coat is applied. Putty or latex sealant shall not be used on handball walls or basketball backstops.

3.16 FILLER ON SIDING AND WOODWORK

A. Checked and cracked portions of siding and woodwork (after surrounding areas have been prepared as specified above) shall be primed, smoothed with an exterior filling compound and then sanded smooth when dry. Filled areas must be spot primed. Filler shall not be used on handball walls or basketball backstops.

3.17 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 or may be tinted up to 50% lighter or darker than the finish coat at the discretion of the installer.

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.

3.18 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.

3.19 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 a metal clean and etch 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.

3.20 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".

3.21 DOORS

A. Painted or refinished interior and exterior wood or metal doors 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."

3.22 RAMPS, STAIRS AND HANDRAILS

A. Unpainted, painted and mastic coated classroom ramps, treads, risers and thresholds of building shall be prepared as specified herein and painted with two coats of Monochem DEX-COAT textured paint or equal.

B. Handrails shall be finished same as specified for exterior wood doors using exterior gloss enamel.

3.23 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.

3.24 INTERIOR AND EXTERIOR WOODWORK

A. Wood surfaces shall be prepared to receive new finish as specified under Articles Preparation of Surfaces and Priming. Wood surfaces (with the exception of wood classrooms and offices walls which shall be painted in a semi-gloss finish) shall be painted with three coats of paint consisting of first coat of primer, second coat and third coat of exterior high gloss enamel.

3.25 ENAMEL FINISH

A. Interior woodwork having an existing enameled finish must have areas where painter's finish has been removed and where spackling has been done in repairing defects in surface, built-up with undercoat. Wood surfaces shall then be given one coat of undercoat, a second coat and third coat of finish paint to match room finish. Paint shall be applied as specified under "Colors and Number of Coats."

B. Unpainted plaster surfaces to receive an enamel finish, must receive four coats of paint. First coat of pigmented sealer, second coat of enamel undercoat, third and fourth coats of gloss or semi-gloss enamel as specified herein.

C. Previously painted interior surfaces must have patching and places where painted finish has been removed, built up with one coat of a pigmented sealer. Then entire

surface including patching shall be given one coat of an enamel undercoat, a second and third coat of gloss or semi-gloss enamel as specified herein.

3.26 CABINETS

A. Cabinets without doors, cabinets with glass doors and pegboard doors shall have interiors finished to match surrounding or adjacent work, unless interior has a stained finish.

B. Cabinets having solid panel doors must have exposed parts of cabinet and surfaces of doors finished to match room finish. Shelf edges shall be finished same as room finish.

3.27 PLYWOOD WALLS

A. Interior plywood walls having an existing stain finish must have exposed plywood joints machine sanded to remove projecting edges and prepared as follows:

1. Voids between wall surfaces and wood or metal trim or battens, and nail holes must be filled with putty, sealant, or an exterior filler, sanded smooth when dry and dusted clean.

2. Interior walls must be sanded smooth, brushed off and finished with three coats of paint. First coat of enamel undercoat, second and third coats of semi-gloss enamel.

3. Exterior plywood shall be cleaned and finished with three coats. First coat shall be undercoat. Second and third coats shall be gloss enamel. Exterior plywood may be sprayed if it is then back-rolled.

3.28 INTERIOR PLASTER AND DRYWALL WORK – WALLS AND CEILINGS

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.

3.29 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 – Q7-16P.

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.

3.30 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.

3.31 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 containers, including both sides of door(s) and edges shall be prepared and painted with three coats of paint consisting of first coat of primer, second coat and third coat of exterior high gloss enamel. Exterior metal storage container(s) must be sprayed.

3.32 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.

3.33 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.

3.34 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.

D. Rolling or airless spraying is not permitted on flag and light poles.

3.35 METAL SHOWERS AND DRESSING ROOMS

A. The exterior and interior surfaces of metal shower stalls and dressing rooms in locker and shower rooms to be cleaned of rust, dirt, grease and loose materials. Where painters finish has been removed, area to be built-up with a coat of rust preventive primer and then surfaces shall be given first, second and third coats as specified under “Areas requiring enamel.”

3.36 PAPER TOWEL BOXES

A. Metal boxes for paper towels, toilet paper and metal sanitary boxes, must be enameled with two coats of gloss white enamel.

3.37 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.

3.38 METAL LOCKER FINISH

A. Following items in physical education and gymnasium buildings, (including related physical education buildings, such as locker rooms, field houses, etcetera and buildings having lockers or like equipment) must be washed with a silicone wax and grease remover, rinsed and have scratches, marks and defacements “feathered out.” Then surfaces must be given one coat of a primer and two finish coats of a gloss metal enamel finish. Surfaces must be free from sags, runs, over-spray, etcetera.

1. Interior and exterior surfaces of faculty and students’ metal lockers, metal shelving for drawers of wire baskets and drawer type lockers or as specified.

2. Plated hardware, locks, name plates and number tags shall be masked off and adjoining surfaces shall be protected while spraying. If locks are to be removed, they shall be removed and reinstalled by OWNER.

3.39 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.

3.40 ELECTRICAL CABINETS

A. Front side of doors and exposed lip around doors to electrical cabinets in finished areas must be finished same as walls.

3.41 ACOUSTICAL PLASTER, TILE, FIBERBOARD

A. Acoustical plaster shall be cleaned to remove dust before painting.

B. Acoustical plaster shall be sprayed with One full Coat of Pigmented Sealer and then with two coats of Vinyl Wall paint, using “cross-off” method of spraying horizontally with a 50 percent overlap on each stroke and then doubling back with a vertical application with a 50 percent overlap on each stroke.

C. Acoustic tile, wood fiber units, and fiberboard shall receive not less than two coats of a fire retardant paint with a flame spread rating of not more than seventy-five feet on acoustical tile as evaluated by a tunnel test and shall be currently recognized by State Fire Marshal's Office. Fire retardant shall be applied in strict conformity to manufacturer's directions. The above surfaces shall be sprayed using "cross-off" method. Before fire retardant coating is applied, ceiling shall receive one full coat of pigmented sealer. Kitchens shall receive two coats of gloss finish after receiving one full coat of a pigmented sealer.

3.42 CORK AND FIBERBOARD TACK BOARDS

A. Unpainted cork board panels used in connection with chalkboards or bulletin boards shall be finished with two coats of vinyl wall paint, factory tinted to match wall color and brushed on. Where cork strips are inset in head trim on chalkboards, cork shall be either varnished or enameled to match wood trim.

B. Painted cork board and unpainted or painted fiberboard panels shall be finished with two coats of vinyl wall paint.

C. Where cork or fiberboard has been painted with water-soluble paint, this water-soluble paint shall be washed off and allowed to dry. Surface shall then be painted as described above.

3.43 CHALKBOARDS

A. Chalkboards (including portable chalkboards) shall be washed with a strong solution of a cleaner as per manufacturer's recommendation, rinsed with clear clean water to remove chalk dust and allowed to dry. Fill joints and repair defects such as cracks and holes with paste wood filler colored with paint to match chalkboard. After filler has hardened sufficiently, repaired spots shall be sanded smooth to level of adjacent surfaces.

B. Apply two coats of chalkboard paint. Paint shall be liquid slate green as manufactured by Cal-Western, Rust-Oleum, Valspar, or equal. Sand between coats with #180 wet-or-dry sandpaper. Paint shall be rolled with a ¼ inch nap and brushed out.

C. After final coat, entire surface must be finished smooth with #400 wet or dry sandpaper.

D. Finished board must present a surface free of defects and brush marks and shall meet approval of Project Inspector.

E. Do not paint natural slate chalkboards.

3.44 LETTERING

A. Lettering and numerals on glass, fiberglass, plaster, and surfaces to be refinished shall be reproduced in original locations and will be of size, color and design as directed by Project Inspector and OAR. An experienced sign painter shall do lettering.

3.45 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.

3.46 GAS FIRED UNITS

A. Gas fired units, which need to be disconnected and reconnected, and/or any unit that must be shut down, re-ignited and tested will be done by OWNER personnel.

3.47 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.

3.48 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 9623

GRAFFITI-RESISTANT COATINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Work includes anti-graffiti coating.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 09 9000: Painting and Coating.

1.02 SUBMITTALS

A. Provide submittals in accordance with Division 01.

B. Samples: Submit Samples of coating system.

C. Product Data: Submit anti-graffiti coating manufacturer's technical data and installation instructions, recommended coverage rates for types of surfaces to be treated, and evidence that coatings conform to requirements specified. Submit evidence of code approvals.

D. Furnish Samples on the same materials to which coating will be applied on. Indicate satin or flat finish. Coat one-half of each Sample, with the other half non-coated.

E. Installer: Submit written evidence the installer for the Work of this section has completed at least five projects of similar complexity within the past five years.

F. Certificate and Summary Statement: Before Substantial Completion, submit a certificate stating that coatings applied conform to reviewed submittals and specified requirements. Provide a summary statement setting forth the following:

1. Number of square feet of each surface treated with coating, classified as to the kind of material treated, open pore or closed pore type, and whether vertical or horizontal.

2. The number of gallons of each type, class, or grade of coating required to treat involved surfaces, based on the number of square feet of each type and orientation of the material the coating was installed on.

3. Total gallons of each coating type, class, or grade installed.

G. Maintenance Instructions: Furnish manufacturer's recommended graffiti removal instructions, and recommendations for recoating. Furnish names and addresses of cleaning firms and of suppliers of maintenance materials.

H. Maintenance Material: Furnish five gallons of each product specified.

1.03 QUALITY ASSURANCE

A. Manufacturer's Observation: Start coating application under the observation of the coating manufacturer’s technical representative. Notify Project Inspector and coating manufacturer at least 72 hours before starting installation.

B. Preliminary Tests: Perform tests on each kind of surface to be treated to establish the actual application rates required to provide the surfaces resistant to defacing and meet warranty requirements. Tests shall demonstrate the coating does not yellow, darken, mottle, or discolor any treated surface and those surfaces to be treated are dry. Established application rates shall not be less than those recommended in the coating manufacturer's technical data for the kind and surface orientation of the material.

C. Compliance with Regulations: Materials shall comply with the current rules and regulations of the local air quality management district, with the rules regarding volatile organic compounds, and with FDA rules and regulations for dangerous materials in coatings.

D. Materials shall meet requirements of SCAQMD regarding emission of solvents and other pollutants.

E. Qualifications:

1. Manufacturer: Anti-graffiti coating shall be product of a manufacturer who has been regularly engaged in manufacturing anti-graffiti coatings for at least 5 years. Manufacturer shall supply references of at least five satisfactory installations in which anti-graffiti coating has been in service for at least five years.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver coating materials to the Project site in containers bearing name and batch number of manufacturer, with seals intact.

1.05 PROJECT CONDITIONS

A. Protection: Install temporary coverings and protection, and do not allow coating to contact plastic, planting soil, plants, asphaltic paving, roofing membranes, or other materials that are likely to be damaged by coating.

B. Weather Conditions: Do not install coating during windy, wet, or excessively hot or dry weather conditions.

1.06 WARRANTY

1. Manufacturer shall provide a five year material warranty.

2. Installer shall provide a one year application warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE PRODUCTS

A. Permashield, by Monopole Inc.:

1. Permashield Premium 5600 over Aquaseal ME12, Permanent Graffiti Control, Monopole Inc., ND Graffiti Shield System, Rainguard VandlGuard System, or equal. Matte finish.

B. Coval Anti-Graffiti coating by Coval Molecular Coatings.

2.02 PROPERTIES

A. Coatings shall not darken or discolor the treated surfaces and shall be non-toxic, compatible with standard polymer type sealing materials, conforming to AQMD 1113, and certified by manufacturer as suitable over paint finish.

B. Colors of opaque materials shall match adjoining colors, or shall be selected from manufacturer's custom colors.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Do not start installation of coating if conditions are present that prevent or interfere with the correct preparation of surfaces or installation of coating system.

3.02 PREPARATION

A. Remove dust, dirt, oil, grease, other deleterious substances and stain, and efflorescence and laitance from surfaces. Repair cracks and holes over 1/16 inch size. Spot prime cracks and holes 1/16 inch size and smaller and prime horizontal surfaces other than soffits with a heavy duty coating supplied by same coating manufacturer. Mask and protect adjoining surfaces and glass, unless coating is harmless and easily removed.

3.03 APPLICATION

A. Install the anti-graffiti coating to surfaces indicated on drawings.

B. Test graffiti resistant coating in an inconspicuous location to ensure adhesion and performance.

C. Apply the anti-graffiti coating to surfaces indicated on drawings per manufacturer’s recommended application methods and thicknesses.

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 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.

3. School Name and Address Sign.

B. Related Requirements:

1. Division 01: General Requirements.

2. Section 08 1113: Hollow Metal Doors, Windows and Frames.

3. Section 08 1416: Wood Doors.

4. Division 09: Finishes.

5. Section 32 1313 - Site Concrete Work.

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 D4802 - Standard Specification for Poly (Methyl Methacrylate) Acrylic Plastic Sheet.

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.

8. Ada Sign Products.

9. Equal.

2.02 MATERIALS AND FABRICATION

A. Interior Sign Materials:

1. Substrate Panel: 1/8 inch minimum thick, integrally colored or clear acrylic plastic, or laminated acrylic. Conforming to ASTM D4802; non-glare (matte), UV stable, suitable for interior and exterior use.

a. Corners shall be [square], [radius].

b. Edges shall be square and eased.

c. Colors as selected by ARCHITECT from manufacturer's custom color range.

2. Fasteners:

a. Stainless steel tamper-proof screws and plastic anchors.

b. Signs mounted on fire-rated doors shall be secured with adhesive.

c. Adhesives and sealants shall comply with the limits for VOC content and shall be approved by OWNER'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: Shall be fabricated by one of the processes described below:

1. 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. Raised characters and graphics including braille shall be integral to sign face and shall be formed into sign face by high pressure thermoforming using a negative mold. No applied, glued, welded tactile elements are acceptable. Raised characters and graphics shall have beveled, eased or rounded edges. No sharp, square edges are acceptable. 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 vinyl film. Pictograms and other symbols including the International Symbol of Accessibility, which are included on signs with raised characters and Braille, or other signs 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: Shall be placed in accordance with Paragraph 2.03, C below.

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 Contrast: 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 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 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 with 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 Contrast: 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 color shall be approximate to FS. 15090 in Federal Standard 595C.

F. Mounting Locations and Height: Signs with tactile characters shall be as indicated on the drawings and in conformance to CBC 11B-703.4.

1. Mounting Locations:

a. 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.

b. Signs that identify exits shall be located at the exit door when approached in the direction of egress travel.

c. 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 degrees open position.

d. Where a tactile sign is provided at a door, the sign shall be located alongside the door at the latch side.

e. Where a tactile sign is provided at double doors with one active leaf, the sign shall be located at the inactive leaf.

f. Where a tactile sign is provided at double doors with two active leafs, the sign shall be located to the right of the righthand door.

g. 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 the 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 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. Room name shall be raised characters 3/4 inches high minimum, and room number 1 inch minimum; and shall be accompanied with Braille indicators.

2. 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.

3. Room Number Sign: 7 inches wide by 4 inches high; room number, one inch high minimum, raised character, accompanied by Braille indicator immediately bellow.

B. 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 RESTROOM SIGNAGE

A. Multiple-Occupancy restrooms shall be provided with geometric symbols and wall mounted pictograms with text descriptors.

B. Geometric Symbols:

1. Doorways leading to toilet rooms shall be identified by a geometric symbol complying with CBC Section 11B-703.7.2.6.

2. 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 male silhouette shall appear within the equilateral triangle in contrasting color to it.

3. 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 female silhouette shall appear within the circle in contrasting color to it.

4. "All Gender" Restroom Door Sign (Single occupancy restrooms): 1/4 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 female and a male silhouette shall appear within the equilateral triangle in contrasting color to it, and the word "restroom" shall appear on the bottom part of the circle in contrasting color to it.

5. Edges and Vertices on Geometric Symbols: Shall be eased or rounded at 1/16 inch minimum or chamfered at 1/8 inch maximum. Vertices shall be radiused between 1/8 minimum and ¼ inch maximum.

6. 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.

    a. At locations with no restroom doors, locate sign adjacent to the opening. Tactile room name accompanied by Braille shall be located on symbol sign.

C. Room Identification for Multiple-Occupancy Restrooms: Provide a 16 inch long by 6 inch tall room identification sign, including a pictogram of the International Symbol of Accessibility on a side. Restroom names shall be "Girls" or "Boys", for students, and "Women" and "Men" for staff. Characters, Braille, pictograms and mounting locations and height shall be in conformance to Article 2.03.

D. Room Identification for Single-Occupancy Restrooms: Provide a 16 inch long by 6 inch tall room identification sign, including a pictogram of the International Symbol of Accessibility on a side. Text descriptor shall be "All Gender Restroom". Characters, Braille, pictograms and mounting locations and height shall be in conformance to Article 2.03.

E. Room Identification for Non-Accessible Single-Occupancy Restrooms: Provide an 8 inch long by 3 inch tall room identification sign. Text descriptor shall be "All Gender Restroom". Characters, Braille, and mounting locations and height shall be in conformance to Article 2.03.

2.06 RAISED CHARACTER AND BRAILLE EXIT SIGNS

A. Tactile Exit Sign Types:

1. "EXIT".

2. "EXIT ROUTE".

3. "TO EXIT".

4. "EXIT WITH ALARM", on exit doors with an alarm.

5. "EXIT ONLY" or "EXIT STAIR ONLY", on exit doors and stair exit doors which lock from outside and does not allow a return.

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.

2.08 SIGNS FOR AREAS OF REFUGE AND EXTERIOR AREA FOR ASSISTED RESCUE

A. Doors providing access to an area of refuge shall be identified by a sign stating: "AREA OF REFUGE". Sign shall have visual characters per paragraph 2.03.B, Braille per 2.03.C and the International Symbol of Accessibility per 2.03.E.

B. Doors providing access to an exterior area for assisted rescue shall be identified by a sign stating: "EXTERIOR AREA FOR ASSISTED RESCUE". Sign shall have visual characters per paragraph 2.03.B, Braille per 2.03.C and the International Symbol of Accessibility per 2.03.E.

C. Sign Instructions: In Areas of Refuge and Exterior Areas for Assisted Rescue provide instructions on the use of the area under emergency conditions. The sign shall include the following, and shall comply with 2.03.B:

1. Persons able to use the exit stairway do so as soon as possible, unless they are assisting others.

2. Information on planned availability of assistance in the use of stairs or supervised operation of elevators and how to summon such assistance.

3. Directions for use of the two-way communications system where provided.

2.09 DIRECTIONAL EXIT SIGNAGE

A. At exits serving a required accessible space but not providing an approved accessible means of egress, at elevator landings and within areas of refuge, 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.

2.10 ASSISTIVE LISTENING DEVICE SIGN

A. Include International Symbol of Access for Hearing Loss, CBC Figure 11B-703.7.2.4, with text “Assistive-Listening System Available”. 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.

2.13 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: Refer to 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.

A. .

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 indicated above. Fasten sign to backplate with 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

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 05 4100 - Structural Metal Stud Framing.

3 Section 06 1000 - Rough Carpentry.

4 Section 10 2813 - Toilet Accessories.

5 Section 10 2815 – Hand and Hair Dryers.

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. Underwriters Laboratories Inc. (UL):

a. UL Fire Resistance Directory; applicable UL Design Numbers for application of fireproofing and conditions as indicated.

4. Chemical Resistance: Panels to meet or exceed Scientific Equipment Furniture Association’s (S.E.F.A.) list of 49 standard chemicals.

5. 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 prior to fabrication, 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. Toilet Compartment Manufacturer shall provide a 25 year material warranty for solid phenolic panels and hardware.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer:

1. Qualifications of Toilet Compartment Manufacturer: Partition Manufacturer shall have been regularly engaged in the construction of Phenolic Toilet Compartments of the type specified for a minimum of five years.

B. Solid Phenolic Panels:

1. Formica Solid Phenolic panels with -692 Folkstone Celesta, 689 Stellar, Formica Corporation.

2. Wilsonart.

3. Nevamar Surface Systems.

4. Equal.

C. Hardware:

1. Galaxy Hardware, Series 8033.

2. Jacknob Corporation.

3. Equal.

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: 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 723 classification and labeling in accordance with ASTM E84 Class A 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 greater 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, Stainless steel.

2.03 FABRICATION

A. Doors shall be ¾ inch thick, panels ½ inch thick, pilasters 3/4 inch thick and screens ½ inch thick. Edges shall be machined to a radius of 3/16 inch; exposed surfaces shall be free of fabrication marks.

B. Pilasters: Flush, formed of ¾ inch thick solid phenolic panels. Edges shall be machined to a radius of 3/16 inch.

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.

C. Panels and Urinal Screens: Flush, formed of ½ inch thick solid phenolic panels with a one inch corner radius. Height and width as indicated in drawings.

2.04 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.

a. Galaxy Hardware: CS-560 (LeftHand IN/RightHand OUT) or CS-561 (RightHand IN/LeftHand OUT).

b. Jacknob Corporation: 7273 (RightHand IN/LeftHand OUT) or 7283 (LeftHand IN/RightHand OUT).

c. Equal.

2. Continuous Hinge: Continuous 14 gauge stainless steel hinge (48.5”) shall be made of Type 302/304 Stainless Steel and shall have a Satin Finish. Hinge shall be 3” wide and shall have four (4) Stainless Steel wire springs for self-closing action. Pivot pin shall be .250” in diameter, and shall be made of Type 304 Stainless Steel. Hinges shall provide emergency access by lifting the door. Hinges shall be pre-drilled for mounting to door and pilaster with Theft Proof Stainless Steel Torx Head with Pin Through-Bolts. Brass inserts are unacceptable. Each Hinge Set is to be packaged in a separate carton, and is to be labeled by stock number, manufacturer, and left or right hand. Furnish one per door.

a. Galaxy Hardware: SS-953 (LeftHand IN/RightHand OUT) or SS-954 (RightHand IN/LeftHand OUT).

b. Jacknob Corporation: 7339 (RightHand IN/LeftHand OUT) or 7349 (LeftHand IN/RightHand OUT).

c. Equal.

2. Strike and Keeper with Emergency Access: Refer to Detail #1 of this section. Strike and keeper shall be heavy duty ASTM A167, Type 304 cast stainless steel with a polished satin finish. All outside corners and edges shall be rounded to

ensure there are no sharp edges. The strike and keeper shall provide emergency egress by lifting of the door. The strike and keeper shall be 2.50" high, with the mounting holes at 1.50" O.C. The wall thickness shall be a minimum of .125". The keeper shall have a minimum 7/8 inch tab to prevent impaling injuries. The strike and keeper shall be mounted to the pilaster with theft proof stainless steel Torx Head with pin through-bolts. Strike and keeper shall have an integral rubber bumper door stop rated and able to withstand a sudden impact of 350 lbs. Stamped stainless steel strike and keepers are unacceptable. Extra door stops that encumber the door opening and create a hazard are unacceptable. The stock number shall be molded into the back of strike and keeper for ease in identification. Furnish one per door.

a. Galaxy Hardware: CS-458 (inswing strike & keeper), or CS-456 (outswing strike & keeper).

b. Jacknob Corporation 6283 (inswing strike & keeper), or 4913 (outswing strike & keeper).

c. Equal.

3. Slide Latch: Heavy duty cast stainless steel with satin finish. 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 shall be riveted to the slide bar and welded to insure that the knob will not come off. 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.

   a. Galaxy Hardware: CS-233.

   b. Jacknob Corporation: 5053

   c. Equal.

4. Coat Hook: Heavy duty cast stainless steel with 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.

   a. Galaxy Hardware: CS-274.

   b. Jacknob Corporation.

   c. Bobrick: B-212.

   d. Equal.

5. Door Stop: Heavy duty cast stainless steel with 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. Stamped stainless steel is not acceptable.

a. Galaxy Hardware: CS-276.

b. Jacknob Corporation: 4123.

c. Equal.

6. Pull Handle:

a. Heavy duty cast stainless steel with 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.

1) Galaxy Hardware: CS-277.

2) Jacknob Corporation: 6253.

3) Equal.

b. Accessible Door Pull: 5-1/8 inch by 3 inch high stainless steel pull:

1) Galaxy Hardware: PH-200.

2) Jacknob Corporation: 6253.

3) All Partitions A0625.

4) Equal.

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 or 304 stainless steel. 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.

1. Galaxy: AL-115 (16’ antigrip headrail), EC-120 (3/4” END CAP), HP-132 (Headrail to wall bracket pack), HP-970 (Corner headrail bracket pack).

2. Jacknob Corporation: 80188 – Extruded Aluminum Headrail, 2109 Headrail Wall Brackets, 6672 Headrail End Caps.

3. Equal.

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 AND PREPARATION

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 a continuous bracket.

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.

3.03 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. Door shall be plumb with pilasters when door is closed.

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

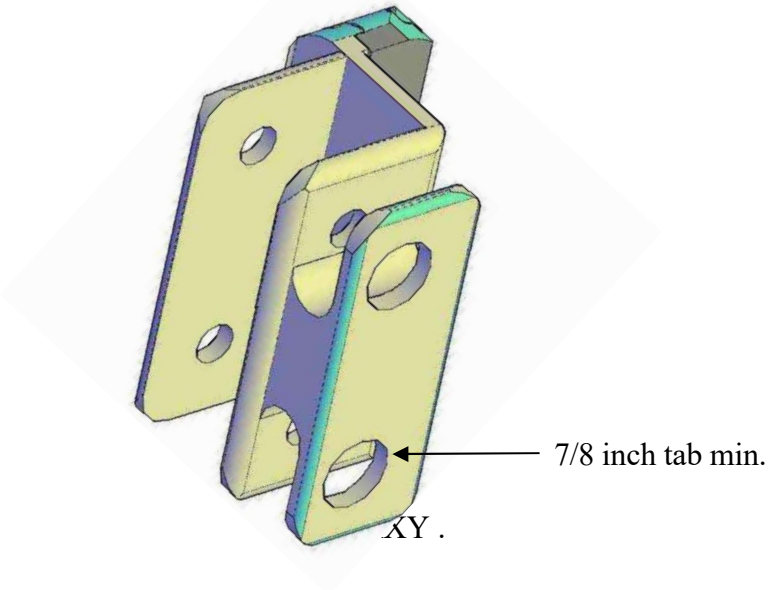
A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.05 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

DETAIL #1 – STRIKE AND KEEPER



SECTION 10 2813

TOILET ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Toilet accessories.
2. Changing tables.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 06 1000- Rough Carpentry.
3. Section 05 4100 - Structural Metal Stud Framing.
4. Section 10 2113 - Plastic Toilet Compartments.
5. Section 10 2815 – Hand and Hair Dryers.

1.02 REGULATORY REQUIREMENTS

A. Comply with CBC Chapter 11B requirements and ADAAG recommendations for accessibility.

1.03 SUBMITTALS

A. Shop Drawings: Submit a schedule of accessories and Shop Drawings indicating installation methods and fasteners.

B. Changing Tables: Submit conformance to specified standards.

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 10 2113 - Plastic 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 TOILET ACCESSORIES

A. Liquid Soap Dispenser: 20 gage stainless steel, 40-ounce. capacity, tamper-proof cap and concealed vandal-proof mounting. Continental V 444SS, ASI 0347, Bobrick B-2111, or equal.

B. Toilet Paper Boxes:

1. For Student and Public Restrooms:

a. Non-accessible toilet compartments: Surface mounted, JR Billington JRB-016, or equal.

b. Accessible adult toilet rooms or compartments: semi-recessed Bobrick B-3888, ASI-0031, Bradley 5412 (double roll tissue holder without paper roll spindle stops), or equal.

c. Accessible elementary or kindergarten toilet rooms or compartments: semi-recessed with theft resistant toilet tissue spindles Bobrick B-6977, include part number 283-604, Bradley 5124-52, or equal

2. For Faculty and Staff Restrooms:

a. Non-accessible toilet compartments: ASI 0264-1A2, Bobrick B-27460 (double roll tissue holder), Bradley, or equal.

b. Accessible toilet rooms or compartments:

1) Semi-recessed Bobrick B4388 or 3888, ASI 0031, Bradley 5412 (double roll tissue holder without paper roll spindle stops), or equal.

2) Surface mounted ASI 0264-1A2, Bobrick B-27460 (double roll tissue holder), Bradley, or equal.

C. Paper Towel Boxes: Type 304 stainless steel, satin finish. Door with tumbler lock and piano hinge.

1. Surface mounted: ASI 0245-SS, Bobrick B-263, Bradley 252, or equal.

2. Semi-recessed: ASI 0457-2, Bradley 247-10, or equal.

3. Recessed: ASI 0457, Bobrick B-35903, Bradley 247, 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, or equal.

E. Not Used

F. Mirrors: Framed mirror, with one piece roll-formed 3/4 inch by 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 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, Bradley, or equal. Size as indicated on Drawings.

G. Mirror with Shelf: Frame and mirror as described above, with Type 304 stainless steel shelf, 5 inches deep with 3/4 inch return edges on 4 sides, front and side return edges shall be hemmed. ASI 0605, Bobrick B-292, Bradley, or equal. Size as indicated on Drawings.

H. Not Used

I. Toilet Seat Cover Dispensers (Faculty and Staff Toilet Rooms only): Surface-mounted, Type 304 stainless steel, satin finish. ASI 0477SM, Bobrick B-221, Bradley, or equal.

J. Sanitary Napkin Vendors and Disposals:

1. Vendors (In Nurse's Office Restrooms only): Surface mounted, Type 304 stainless steel, satin finish, tumbler lock, single 25 cent coin operation. ASI

0864, Bobrick B-2706 surface mounted, Bobrick B-3706 recessed/semi-recessed, Bradley, napkin/tampon dispenser, or equal.

2. Disposals in non-accessible toilet compartments Surface-mounted, Type 304 stainless steel, satin finish, ASI 0473-A, Bobrick B-270, Bradley, 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), ASI 0473 (recessed), Bradley, or equal.

K. Not Used

L. Not Used

M. Not Used

N. Mop and Broom Holder Rack: Provide two 24-inch long minimum, stainless steel mop and broom holder racks at each janitor room. ASI 8215-3, Bobrick B223 by 24, Bradley, or equal.

O. Coat Hook Strip: Hook strip shall be type-304 stainless steel with satin finish. Hooks shall be 14 gauge and mounting strip shall be 20 gauge. ASI 1307, Bobrick B-232 x 24, Bradley 9943, or equal.

2.03 CHANGING TABLES

A. Horizontal, wall mounted, stainless steel finish, baby changing station. Koala Kare Products KB110-SSWM, or equal.

B. Unit shall conform to:

1. California Code of Regulations CBC 2022 Title 24 and ADA regulations

2. ICC A117.1, Standard for Accessible and Usable Buildings and Facilities.

3. ASTM F2285, Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use.

4. ANSI Z535.4 Product Safety Signs and Labels.

5. ASTM G21, Standard Practice for Determining Resistance of Polymeric Materials to Fungi.

C. 18 gage type 304 satin stainless steel exterior finish with FDA approved blow molded high-density grey polyethylene with antimicrobial interior. Reinforced full-length steel-

on-steel hinge mechanism with 11 gage steel mounting plates and mounting hardware. Pneumatic cylinder shall provide controlled, slow opening and closing of bed. Provide molded-in graphics and safety messages in six languages. Provide safety straps and bag hooks.

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 ¼-inch 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 two 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 04 2200 - Concrete Unit Masonry.
3. Section 06 1000 - Rough Carpentry.
4. 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).

7. Equal.

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. LAN Rooms, Bracket mounted:

a. Type Halotron 1, EPA approved "Clean Agent" with UL rating 5B:C, 5 pounds size, with red glossy polyester coated steel cylinder, discharge nozzle and bracket. Maximum Height: 15 ¼-inch. Maximum Cylinder Diameter: 6-inch. Provide 16 gage steel bracket by same manufacturer as extinguisher.

3. Electrical, Science Rooms, 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 LOS ANGELES 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 11 6811

COMPOSITE PLAY STRUCTURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes composite play structures with integral shade structures as indicated on the drawings.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 2000: Concrete Reinforcing.
3. Section 03 3000: Cast-in-Place Concrete.
4. Section 05 0513: Hot-Dip Galvanizing.
5. Section 31 2200 - Grading.
6. Section 31 2313 - Excavation and Fill for Structures.
7. Section 32 1319 – Site Concrete Work.
8. Section 32 1816 - Playground Protective Surfacing.

1.02 REFERENCES

A. ASTM International (ASTM):

1. ASTM A36 – Standard Specification for Carbon Structural Steel.
2. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM A135 – Standard Specification for Electric-Resistance-Welded Steel Pipe.
4. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
5. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

6. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

7. ASTM A513 – Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.

8. ASTM A572 - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.

9. ASTM A1023 – Standard Specification for Stranded Carbon Steel Wire Ropes for General Purposes.

10. ASTM B26 - Standard Specification for Aluminum-Alloy Sand Castings.

11. ASTM B108 - Standard Specification for Aluminum-Alloy Permanent Mold Castings.

12. ASTM B179 – Standard Specifications for Aluminum Alloys in Ingot and Molten Forms for Castings from All Castings Processes.

13. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

14. ASTM C109 – Standard Test Method for Hydraulic Cement Mortars (Using 2-in Cube Specimens).

15. ASTM C939 – Standard Test Method for Flow of Grout for Pre-Placed Aggregate Concrete (Flow Cone Method).

16. ASTM C1090 – Standard Test Method for Measuring Changes in Height of Cylindrical Specimens from Hydraulic-Cement Grout.

17. ASTM D2261 – Standard Test Method for Tearing Strength of Fabrics by the Tongue (Single Rip) Procedure (Constant-Rate-of-Extension Tensile Testing Machine).

18. ASTM D5034 - Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test).

19. ASTM D6112 - Standard Test Methods for Compressive and Flexural Creep and Creep-Rupture of Plastic Lumber and Shapes.

20. ASTM D6386 - Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.

21. ASTM D7803 – Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Powder Coating.

22. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

23. ASTM F594 - Standard Specification for Stainless Steel Nuts.

24. ASTM F879 – Standard Specification for Stainless Steel Socket Button and Flat Countersunk Head Cap Screws.

25. ASTM F1487 - Standard Consumer Safety Performance Specification for Playground Equipment for Public Use.

26. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

27. ASTM F3125 - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.

B. The Society for Protective Coatings (SSPC):

1. Surface Preparation Standards.

C. National Fire Protection Association (NFPA):

1. NFPA 701: Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

D. U.S. Consumer Products Safety Commission (CPSC):

1. Public Playground Safety Handbook.

E. 2010 ADA Standard for Accessible Design.

1.03 SECTION DEFINITIONS

A. Composite Play Structures: ASTM F1487 defines composite play structures as “two or more play structures attached of functionally linked, to create one integral unit that provides more than one play activity.

B. Critical Height: CPSC Public Playground Safety Handbook defines critical height as “the fall height below which a life-threatening head injury would not be expected to occur.” Is the Standard measure of shock attenuation.

C. Fall Height: ASTM F1487 defines fall height as “the vertical distance between a designated play surface and the protective surfacing beneath it.” The fall height of playground equipment should not exceed the critical height of the protective surfacing beneath it.

D. Play Structure: ASTM F1487 defines play structure as “a free-standing structure with one or more components and their supporting members.”

E. Transfer Point: ASTM F1487 defines transfer point as “platform along an accessible route of travel or an accessible platform provided to allow a child in a wheelchair to transfer from the chair onto the equipment.”

F. Use Zone: ASTM F1487 defines use zone as “the area beneath and immediately adjacent to a play structure or equipment that is designated for unrestricted circulation around the equipment and on whose surface, it is predicted that a user would land when falling from or exiting the equipment.”

1.04 SUBMITTALS

A. Shop Drawings: Layout plans and elevations indicating extent of playground equipment with playground surface systems. Indicate playground equipment locations, use zones, fall heights, extent of protective surfacing, and critical heights. Include two 3D renderings. Show footing layout, sizes, reinforcement, and concrete strength.

B. Engineering Calculations: Submit structural calculations for the Division of the State Architect (DSA) approval. Engineer shade structure using the loads and procedures in accordance with:

1. ASCE 7 – Minimum Design Loads for Buildings and other Structures.

2. California Code of Regulations Title 24.

3. AWS D1.1 - Structural Welding Code - Steel.

4. AISC 360 – Specification for Structural Steel Buildings.

5. ACI 318 – Building Code Requirements for Structural Concrete.

C. Product Data: For each type of product specified. Include construction details, material descriptions, dimensions of individual components, profiles, and finishes. Submit a list of each component of the play structure.

D. Maintenance Manuals: Containing the maintenance instructions and describing the recommended preventive maintenance, inspection frequency and techniques, periodic adjustments, lubricants, and cleaning requirements.

E. OWNER’s Office of Environmental Health and Safety (OEHS) Approval: Installation of composite play structures and horizontal bars shall not be started until detailed plans and product data are approved by the OEHS. OAR will submit drawings and product data to the OEHS for approval.

F. Certificate or Testing Report demonstrating shade fabric conforms with NFPA 701.

G. Samples: Submit complete sets of colors representing manufacturer's full range of available shade fabric colors for ARCHITECT’s selection.

1.05 QUALITY ASSURANCE

A. Provide playground equipment complying with or exceeding the requirements in CPSC, “Handbook for Public Playground Safety.” Label play structures with warning label and manufacturer’s identification in accordance with ASTM F1487.

B. CPSI (Certified Playground Safety Inspector) inspection of composite structures prior to installation of surfacing materials to ensure that applicable requirements are met.

C. Composite play structures shall be designed to provide challenging play activities by age group. Design playground equipment to be age appropriate for the age group designated to use it.

D. Equipment Identification: Identify playground equipment with attached and durable labels stating the age-group that the equipment is designed to accommodate. Provide permanent WARNING labels and manufacturer's identification labels, ASTM F1487. Submit a list to include part numbers of furnished play event and equipment materials and components.

E. Manufacturer Qualifications: Play structures similar to those furnished must have been installed in a minimum ten sites and been in successful service for a minimum five year calendar period. Submit name of the owner or user; service or preventive maintenance provider; date of the installation; point of contact and telephone number; and address for ten sites.

F. Installer Qualifications: Installer shall be certified by the manufacturer for training and experience installing the play structure. Submit the installer's company name and address, and training and experience certification.

G. Manufacturer's Representative: The manufacturer's certified playground safety inspector or the manufacturer's designated certified playground safety representative shall supervise the installation and adjustment of the play events and equipment to verify the installation meets the requirements of the manufacturer, this specification, and the referenced standards. Submit the individual's name, company name and address, and playground safety training certificate.

1.06 WARRANTY

A. Manufacturer shall provide OWNER a Certificate of Insurance AA rated for a minimum one million dollars covering both product and general liability.

B. Five years on the structural integrity of the play structure from date of substantial completion, failures include but are not limited to:

1. Deterioration of metals, finishes, and other materials beyond normal weathering.

2. Deterioration of shade fabric including seam failure.

1.07 COORDINATION

A. Coordinate construction of equipment use zones and fall heights during installation of playground equipment with installation of protective surfacing specified in Section 32 1816.

PART 2 – PRODUCTS

2.01 PLAY STRUCTURE

A. Manufacturer:

1. BCI Burke Company, LLC.

2. Playcraft Systems.

3. Landscape Structures Inc.

4. Miracle Recreation.

5. Playworld Systems Inc.

6. Equal.

EDIT NOTE: SELECT AGE GROUP APPLICABLE TO PROJECT; DELETE UNUSED OPTION.

B. Age Group:

1. 2 to 5 years.

2. 5 to 12 years.

2.02 MATERIALS

A. Metal components shall have factory-drilled holes and be corrosion resistant. Components shall be free of excess weld and spatter.

B. Steel:

1. Tubular components shall comply with ASTM A53 grade C, ASTM A135, ASTM A500 grades B or C, or ASTM A513.

2. Plates and other non-tubular components shall comply with ASTM A36, or ASTM A572.

3. Bolts, nuts and washers shall comply with ASTM F3125, ASTM F593 or ASTM F594. Anchor Bolts set in concrete shall comply with ASTM F1554.

4. Welding: Shall conform to AWS D1.1 Structural Welding Code - Steel.

C. Extruded aluminum components shall be type 6061-T6, 6062-T6, or 6063-T6, and shall conform to ASTM B221. Cast aluminum alloy shall conform to ASTM B179, ASTM B26, and ASTM B108.

D. Hardware:

1. Fasteners shall be corrosion resistant.

2. Fasteners, connectors, and covering devices shall not loosen or be removable without the use of tools.

3. Fasteners, connectors, and covering devices that are exposed to the user shall be smooth and shall not belikely to cause laceration, penetration, or present a clothing entanglement hazard.

4. Lock washers, self-locking nuts, or other locking means shall be provided for nuts and bolts to protect them from detachment.

5. Hardware in moving joints shall be secured against unintentional or unauthorized loosening.

E. Rails, Loops, and Hand bars shall consist of corrosion resistant aluminum, hot-dip galvanized steel or powder-coating over hot-dip galvanized steel.

F. Plastic:

1. Plastic panels shall be molded of ultraviolet (UV) and color stabilized polyethylene or nylon with a minimum 3/16 inch thickness, ASTM F1487. Edges shall be a minimum 3/16 inch radius.

2. Plastic windows shall be flat or molded into a bubble shape, consisting of clear polycarbonate plastic a minimum 3/16 inch thick before forming in accordance with ASTM D1248. Material shall be shatterproof and resistant to crazing, cracking, or fogging.

3. Fabricate plastic components with a maximum 1/4 inch deflection or creep in any member, ASTM D6112. Submit results of individual component and assembled unit structural integrity test; creep tolerance; deflection tolerance; and vertical load test results.

G. High Density Polyethylene:

1. Mold components of ultraviolet (UV) and color stabilized polyethylene consisting of a minimum 75 percent plastic profile of high-density polyethylene, low-density polyethylene, and polypropylene raw material. The material shall be non-toxic, have no discernible contaminates such as paper, foil, or wood, and contain a maximum 3 percent air voids. The material must be free of splinters, chips, peels, buckling, and cracks and be resistant to deformation from solar heat gain. Material shall have factory-drilled holes. Components with extra holes not filled by hardware or covered by other components will be rejected. The material shall not be painted.

2. Panels shall be a minimum 1/4 inch thick; exposed edges shall be smoothed, rounded, and free of burrs and points; and the material shall be shatterproof and resistant to fading, cracking, or fogging.

3. Structural Component Recycled plastic materials shall not be used as load bearing structural members: framing, beams, columns or posts.

H. Steel Finish:

1. Structural and miscellaneous steel components, except items embedded in concrete, shall be hot-dipped galvanized after fabrication per ASTM A123 and Section 05 0513 Hot-Dip Galvanizing. Hardware fabrications shall be galvanized in accordance with ASTM A153. Remove tailings and sharp protrusions formed as a result of the hot-dip process; edges shall be burnished.

2. Hot-dipped galvanized components to be painted shall not be water or chromate quenched. Surfaces of hot-dipped galvanized steel components shall be prepared in accordance with ASTM D7803 or ASTM D6386 and referenced SSPC surface preparation standards. Powder-coated surfaces shall receive electrostatic zinc primer prior to painting. Powder coating shall be electrostatically applied and shall be oven cured.

I. Shade: Post pyramid structure with shade membrane attached by cable along the perimeter.

1. Shade fabric:

a. Fabric shall be made of a UV stabilized high-density polyethylene. Mesh shall be knitted with monofilament and tape yarn filler to ensure that material will not unravel if cut.

b. Fabric shall be flame retardant in accordance with NFPA 701.

c. Fabric shall achieve an ultimate tensile capacity when tested in accordance with ASTM D5034:

1) Warp direction of 100 lbs. per inch at 66% maximum elongation.

2) Fill direction of 50 lbs. per inch at 33% maximum elongation.

3) Across seam of stitching of 80 lbs. per inch at 80% maximum elongation.

d. Fabric shall achieve an average tearing strength when tested in accordance with ASTM D2261.

1) Warp direction: 14 lbs.

2) Fill direction: 11.5 lbs.

2. Stitching & Threading:

a. Corners shall be reinforced and edges hemmed. Sewing threads shall be double stitched.

b. Thread shall be GORE Tenara Sewing Thread manufactured from 100% expanded PTFE (Teflon); mildew resistant exterior approved thread. Thread shall meet or exceed the following:

1) Flexible temperature range.

2) Very low shrinkage factor.

3) Extremely high strength, durable in outdoor climates.

4) Shall resist flex and abrasion of fabric.

5) Unaffected by cleaning agents; acid rain, mildew, salt water and rot resistant, unaffected by most industrial pollutants.

6) Treated for prolonged exposure to the sun.

3. Cable: For fabric attachment use galvanized cable per ASTM A1023. Cable shall be tensioned to 250 lbs. minimum. Cables shall be fed through the fabric sleeves and tensioned until the fabric panels reach a taught appearance. Provide hot-dip galvanized fittings for securing cable.

J. Concrete: Normal-weight concrete with a minimum 28-day compressive strength of 3,000 psi and 3 to 5 inch slump. Concrete shall be in conformance with ACI 318 and the following Sections:

1. 03 2000 Concrete Reinforcing.

2. 03 3000 Cast-in-Place Concrete.

3. 32 1313 Site Concrete Work.

K. Non-shrink Grout: Shall have a minimum compressive strength of 5,000 psi and shall comply with the requirements of ASTM C109, ASTM C939, ASTM C1090, as applicable.

L. Field applied primers, paints, adhesives, and sealants shall be OEHS approved.

2.03 PLAY STRUCTURE FABRICATION

A. Provide standard sizes and weights as indicated or required to comply with ASTM F1487. Factory drill components for field assembly. Provide complete play structure, including supporting members and connections, means of access and egress, designated play surfaces, barriers, guardrails, handrails, handholds, and other components.

B. Play event configuration, platform height, fall height, and maximum equipment height:

1. Age Group 2 through 5 years of age: maximum 48 inches above the finished elevation of the protective surfacing.

2. Age Group 5 through 12 years of age: maximum 72 inches above the finished elevation of the protective surfacing.

C. Steel and Iron Components: Galvanized and color coated. Bare metal steel or iron components are not permitted, unless stainless steel.

1. Color-Coated Pipe and Tubing for Main Frame: Powder coat baked enamel finish.

2. Color-Coated Pipe and Tubing for Component Frames: PVC-coat or baked-enamel powder-coat applied to steel.

D. Provide hardware as required for a complete installation of play structure. Fasteners shall be socketed and pinned tamperproof in design, stainless steel and conforming to ASTM F879.

E. Provide signage indicating age group.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions for compliance with requirements for Project site clearing, earthwork, surface and sub-grade drainage, and other conditions affecting installation.

B. Do not begin installation before final grading for placing protective surfacing is completed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Verify that playground layout and equipment locations comply with the requirements for each type and component specified.

3.03 INSTALLATION, GENERAL

A. Post and Footings:

1. Excavation: Hand-excavate holes for posts and footings to dimensions, profile, spacing, and in locations indicated on Drawings, in firm, undisturbed or compacted subgrade soil. Level bearing surfaces with drainage fill, to required elevation.

2. Install footing reinforcement per Section 03 2000.

3. Post Setting: Install posts in concrete footing. Protect portion of posts above footing from concrete splatter. Install concrete per Section 03 3000 around posts and vibrate or tamp for consolidation. Verify that posts are set plumb or at the correct angle and are aligned and at the correct height and spacing. Brace posts in position during placement and finishing operations until concrete is sufficiently hydrated. Smooth tops of concrete footings and slope top surface for positive shedding of water.

B. Anchor playground equipment securely, installed at locations and elevations indicated. Coordinate installed heights of equipment and components with installation of protective surfacing, Section 32 1816. Install equipment so fall heights and elevation requirements for age group use and accessibility are within required limits. Installation must be inspected and approved by certified playground safety inspector (CPSI) prior to installation of protective surfacing.

C. Follow manufacturer’s installation instructions when assembling and installing the equipment.

3.04 ADJUSTING AND PROTECTION

A. Adjust movable playground equipment components to operate smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range.

B. Protect the Work of this section until Substantial Completion.

3.05 CLEANING AND CLEANUP

C. After completing playground equipment installation, inspect components. Remove spots and dirt. Repair damaged finishes to match original finish or replace component.

D. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 11 6813

PLAY FIELD EQUIPMENT AND STRUCTURES

(PRIMARY CENTERS AND ELEMENTARY SCHOOLS)

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following types of play equipment and structures:

1. Basketball Backboards.
2. Volleyball Standards.
3. Tetherball Standards.
4. Baseball and Softball Backstops.
5. Other playground equipment as indicated on the Drawings.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 3000 - Cast-In-Place Concrete.
3. Section 31 2200 - Grading.
4. Section 31 2313 - Excavation and Fill.
5. Section 32 1216 - Asphalt Paving.
6. Section 32 1723 - Pavement Markings.
7. Section 32 1816 - Playground Protective Surfacing.
8. Section 32 3113 - Chain Link Fencing and Gates.
9. Section 33 4000 - Storm Drainage Systems.

1.02 SUBMITTALS

A. Coordination Drawings: Layout plans and elevations indicating extent of playground equipment with playground surface systems. Indicate playground equipment locations, use zones, fall heights, extent of protective surfacing, and critical heights.

B. Product Data: For each type of product specified. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

C. Certificates: Signed by manufacturers of playground equipment certifying that products furnished comply with DSA and Contract Documents.

1.03 QUALITY ASSURANCE

A. Comply with NAAMM'S "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating metal finishes.

B. Comply with the Architectural and Transportation Barriers Compliance Board Final Rule, ADAAG for Play Areas, effective November 2000.

C. Comply with California Code of Regulations Title 22.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: In the locations indicated on the Drawings, provide the products specified for each designation. If location is not shown, provide unit located per the OAR's directions.

2.02 PLAYGROUND EQUIPMENT, GENERAL

A. Athletic Equipment:

1. Basketball Backboards:

a. Manufacturer/Product:

1) Porter Athletic Equipment Co. / "Outdoor Backstop", as a standard of quality.

2) L.A. Steelcraft.

3) Gametime.

4) PW Athletic.

5) Equal.

b. Type:

1) Porter model #00164-234 Outdoor 4 feet Extended Vertical Post Backstop with #234 Fan Aluminum Bank, Regular Duty Goal #00235-000 or Heavy Duty #00202-H00 double rim.

1) Porter model #00184-234 Outdoor 4 feet Extended Vertical Post Back-to-Back Backstop with Backboards and Goals, with

#234 Fan Aluminum Bank, Regular Duty Goal #00235-000 or Heavy Duty #00202-H 00 double rim.

c. Backstop support shall be designed for mounting goal at any height between 6 and 10-foot.

d. Upright support shall be 4 ½-inch outside diameter heavy wall, galvanized steel pipe, capped at top end. Anchor pin for lower end of upright shall be provided to anchor pipe in concrete footing.

e. Backboard shall be supported 4 feet in front of upright support by dual horizontal support assemblies. Lower support assembly shall be fabricated from 3-½ inch outside diameter heavy wall, galvanized pipe furnished with a heavy, slotted mounting plate which is located directly behind the four goal mounting holes. Upper support assembly shall be fabricated from 1-7/8 inch outside diameter heavy wall, galvanized pipe fabricated with a plated, structural angle for attachment to the top corners of the backboard. Support assemblies shall be clamped to the upright support by means of heavy, galvanized, ductile iron castings with plated hardware.

f. Cast Aluminum backboard Porter model #01207-300 Official size 3 feet six inches by six feet Rectangular Perforated Steel. Heavy-wall rectangular frame shall include two vertical struts located on 2 feet 11-inch centers with mounting holes for attachments to supports structures. Goal mounting area shall be reinforced by horizontal and vertical support tubing to minimize undue load. Powder coated before final assembly. 11- Gage steel face with 1 ½-inch deep to formed perimeter flange. Perforations shall be ¼ inch diameter, spaced ½ inch diagonal centers for a 23 percent open area. Perforated areas will not be included/located on 3-inch wide perimeter outline or on 24-inch wide target area. Backboard shall be compatible with direct mount type support structures, drilled holes shall be 7/16” diameter.

g. Goals:

1. Goal - Heavy duty Porter model # 00202-H 00 double rim shall be fabricated from 5/8 inch diameter cold drawn alloy steel round formed to an 18 inch inside diameter ring. Inside of ring shall be positioned 6 inch from face of backboard by heavy, L-shaped, formed steel mounting plate with a 5 inch by 5 inch mounting hole centers. Goal shall be rigidly braced by means of a ½ inch diameter cold drawn alloy steel round formed and welded in position for maximum support. Rim shall be provided with twelve “no-tie” net attachment clips for net attachment. Goal shall be finished in a durable enamel finish. Color of goal to be official orange. Goal shall be furnished complete with a high quality white nylon net and plated mounting hardware.

2. Volleyball Standards:

a. Manufacturer / Product:

1) L.A. Steelcraft / Volleyball Posts, as a standard of quality.

2) Porter.

3) Gametime. / Great Western, Number – 273SS.

4) PW Athletics.

5) Equal.

b. Type: L.A. Steelcraft model #VBP-25-BG with #278E sleeve and net.

c. Size: 2 7/8-inch outside diameter. by height as required for 7 feet above finish surface.

d. Construction: Galvanized steel pipe with eyelets for attachment of rope for volleyball nets. One column of the two-column set shall be equipped with hand ratchet and stop for net adjustment. Top of pipe to be capped. Provide nets, complete.

3. Tetherball Standards:

a. Manufacturer / Product:

1) Porter Athletic Equipment Company.

2) Gametime.

3) L.A. Steelcraft.

4) PW Athletics.

5) Equal.

b. Type: Porter model #00763-200 Tetherball Post, rope and Ball.

c. Size: 2 3/8-inch outside diameter by height as required for 8-foot 6-inch height above finish surface.

d. Construction: Galvanized steel pipe with 3/8 inch solid stack eyebolts 7/8 inch inside diameter hook (galvanized), galvanized steel cap.

4. Baseball and Softball Backstops:

a. Manufacturer / Product:

1) L.A. Steelcraft, as a standard of quality.

2) Gametime.

3) Jaypro Sports, LLC.

4) PW Athletics.

5) Equal.

b. Size: 13-foot high by 20-foot 6-inch wide by 81-inch deep.

c. Pipe Supports: 2 3/8-inch outside diameter, vertical posts and front top, 1-5/8 inch outside diameter horizontal braces, and 1-7/8 inch outside diameter back top. Galvanized steel per ASTM 53, Grade B and ASTM A53M-02.

d. Fabric: 9 gage galvanized wire fabric, 2-inch mesh.

e. Type: L.A. Steelcraft model #810JH4C permanent heavy-duty baseball backstop.

2.03 FABRICATION

A. General: Provide standard sizes, playground equipment and weights of components as indicated.

2.04 CAST-IN-PLACE CONCRETE

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.

2.05 GENERAL METAL FINISHES

A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are permitted if they are within one-half of the range of reviewed Samples. Noticeable variations in the same piece are not permitted. Variations in appearance of other components are permitted if they are within the range of reviewed Samples and are assembled or installed to minimize contrast.

B. Baked-Enamel Powder-Coat Finish: Manufacturer's standard, baked, polyester-TGIC, powder-coat finish complying with finish manufacturer's written recommendations for surface preparation, including pretreatment, application, baking, and minimum dry film thickness of 3 to 5 mils.

C. PVC Finish: Manufacturer's standard, UV-stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on, PVC-plastisol finish, with flame retardant added, complying with coating manufacturer's written recommendations for pretreatment, application, and minimum dry film thickness of 80 mils.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions for compliance with requirements for Project site clearing, earthwork, surface and sub-grade drainage, and other conditions affecting installation.

B. Do not begin installation before final grading for placing protective surfacing is completed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Verify locations of playground perimeter and pathways. Verify that playground layout and equipment locations comply with requirements for each type and component of equipment.

3.03 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written recommendations unless more stringent requirements are indicated.

B. Basketball Standards: Excavation shall be a minimum of 4-foot deep by 3-foot diameter. The backstop column support shall be installed, plumbed, and shored with the column positioned in a manner so that a minimum column embedment of 3'-6 inch occurs. Fill excavation with concrete. A measured height of 10 feet from top of finish surface to top of ring shall be provided. Maintain shoring in place until concrete is sufficiently hydrated to support backstop column.

C. Volleyball Standard: Provide 2-foot 6-inch deep by 1 foot 6-inch diameter excavation and install top of posts at seven feet above adjacent playing surface. Embed posts 2 feet into concrete.

D. Tetherball Posts: Provide 1 foot 6-inch diameter by three feet deep excavation and install top of posts 8-foot 6-inch above adjacent playing surface, embed post 2-foot 3-inch, provide 6 inches minimum of concrete under post. Provide concrete backfill sloped to drain.

E. Baseball Backstops: Provide 1 foot diameter by 3-foot 6-inch deep concrete footing. Pipe supports shall be embedded in concrete footing to a minimum depth of 36-inch, provide a minimum of 6 inches of concrete under pipe.

F. Install other playground equipment as indicated on the Drawings.

G. Post and Footings:

1. Excavation: Hand-excavate holes for posts and footings to dimensions, profile, spacing, and in locations indicated on Drawings, in firm, undisturbed or compacted subgrade soil. Level bearing surfaces with drainage fill, to required elevation.

2. Post Setting: Install mainframe equipment posts in concrete footing. Protect portion of posts above footing from concrete splatter. Install concrete around posts and vibrate or tamp for consolidation. Verify that posts are set plumb or at the correct angle and are aligned and at the correct height and spacing. Brace posts in position during placement and finishing operations until concrete is sufficiently hydrated. Smooth tops of concrete footings, and slope top surface for positive shedding of water.

3.04 ADJUSTING AND PROTECTION

A. Adjust movable playground equipment components to operate smoothly, easily and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range.

B. Protect the Work of this section until Substantial Completion.

3.05 CLEANING AND CLEANUP

A. After completing playground equipment installation, inspect components. Remove spots and dirt. Repair damaged finishes to match original finish or replace component.

B. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 12 4812

INTERIOR ENTRANCE FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Entrance floor mats to be installed at interiors as indicated on drawings.

B. Related Requirements:

Division 01 - General Requirements.

1. Section 03 3000 - Cast-in-Place Concrete.

2. Section 06 1626 - Engineered Plywood Flooring Underlayment.

3. Section 09 0561 Moisture Testing for Flooring Installation.

1.02 REFERENCES

A. ASTM International (ASTM):

1. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.

2. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials.

3. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

4. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

5. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

6. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs.

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 and cleaning.

C. Samples: Submit Samples of entrance mat in each available color and pattern. Following color selections, submit full size Samples of each selected color and pattern.

D. Maintenance Materials: Before Substantial Completion, deliver one unopened container of each color and pattern of entrance floor mat 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.

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.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during entrance floor mat installation.

D. Close spaces to traffic for 48 hours after entrance floor mat installation.

E. Install entrance floor mats after other finishing operations, including painting, have been completed.

1.07 WARRANTY

A. Provide a five year warranty for material, fabrication, and installation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Shaw Industries, Inc - All Access Collection Path.

B. Tandus centiva - Abrasive Action.

C. Mohawk Industries, Inc - Tuff Stuff II.

D. InterfaceFLOR - Step Repeat Collection Glasbac Walk off Tile.

E. Equal.

2.02 MATERIALS

A. Polypropylene, nylon or polyester carpet fibers with nitrile rubber backing, or thermoplastic polyolefin with fiberglass reinforcement, or styrene butadiene rubber, or polyvinyl butyral: Provide minimum 18 inches by 18 inches carpet tile or rolled product, 1/4 to 3/8 inch thick, conforming to CBC Chapter 11B and ADAAG requirements for non-slip materials. Color as selected by Architect from Manufacturer's full range.

B. Concrete Primer: Non-staining type recommended by manufacturer of recycled rubber walk-off mats. Product shall be approved by OWNER OEHS.

C. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated. Product shall be approved by OWNER OEHS.

D. Interior Installation Adhesive: Water based, low odor type formulated specially for use with entrance floor mat, and manufactured or recommended by manufacturer of entrance floor mat to maintain warranty. Product shall be approved by OWNER OEHS.

SELECT EITHER VINYL (PARAGRAPH E) OR ALUMINUM FRAME (PARAGRAPH F). DELETE PARAGRAPH NOT USED.

E. Vinyl edging strips: Tapered rubber not less than one inch wide, or thickness to match new or existing adjacent flooring.

F. Surface mounted aluminum frame.

G. Comply with the following requirements as a minimum:

1. ASTM D2859, Pill Test: Passes and exceeds the minimum char radius of 3-inch (76.2mm); average char per eight strips tested is ¾ inch (19.05mm) radius.

2. ASTM D2047, Static Coefficient of Friction: Exceeds ADA recommended ratings of .60.

3. ASTM D1630, Taber Abrasion: Less than 0.003 inch at 5000 cycles using H-10 wheels.

4. ASTM E84: Class A Flame Spread Rating of 25 or less.

5. ASTM E662: NBS Smoke Density: Less than 450 per test; NFPA-258

6. Title 16 CFR Chapter II, Subchapter D, Part 1630, Standard for the Surface Flammability of Carpets and Rugs (FF 1-70): Passes.

PART 3 - EXECUTION

3.01 COORDINATION

A. Coordinate with related Work to assure level, smooth and clean finish surfaces to receive entrance floor mat.

3.02 EXAMINATION

A. Complete moisture tests in accordance with Section 09 0561 Moisture Testing for Flooring Installation.

B. Field verify dimensions and other conditions affecting the Work of this section.

C. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of entrance floor mat.

D. Before Work is commenced, examine surfaces that are to receive entrance floor mat, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work. Deficiencies shall be corrected before starting Work of this section.

EDIT NOTE: USE ARTICLE 3.03 BELOW FOR CONCRETE CONSTRUCTION. DELETE IF NOT USED.

3.03 CONCRETE SLAB PREPARATION

A. Do not start preparation until concrete floor slabs are at least 90 days old.

B. 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.

C. 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.

D. Priming: Prime concrete floor slabs on grade; prime other slabs if recommended by flooring manufacturer.

EDIT NOTE: USE ARTICLE 3.04 BELOW FOR WOOD CONSTRUCTION. DELETE IF NOT USED.

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 MAT

A. Comply with manufacturer's written instructions for installing entrance floor mat.

B. Install entrance floor mat when ambient temperature is 70 degrees F. or higher, or as recommended by manufacturer.

C. Install the entrance floor mat adhesive in a thin film evenly with a notched trowel or roll on adhesive with paint roller. Trowel notches and roller nap shall be as recommended by flooring manufacturer.

1. Mix adhesive in accordance with manufacturer’s instructions. Provide safety precaution 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.

D. Mechanically cut flooring material to provide square true edges.

E. Scribe, cut, and fit entrance floor mat and edging to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames. Extend floor mat into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on entrance floor mat as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

3.06 CLEANING AND COMPLETION

A. Maintain flooring surfaces clean as installation progresses. Clean flooring when sufficiently seated and removed foreign substances. Clean adjacent surfaces of adhesive or other defacement.

B. Remove rubbish, debris and waste material and legally dispose of off the Project site.

3.07 PROTECTION

A. Protect and cover entrance floor mats until Substantial Completion.

3.08 INSTRUCTION

A. After Work of this section is complete, flooring manufacture's technical representative shall provide instruction to OWNER flooring maintenance staff.

END OF SECTION

SECTION 26 0500

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies the basic requirements for electrical installations and includes requirements common to more than one section of Division 26. It expands and supplements the requirements specified in sections of Division 01.

B. Related Requirements:

1. Division 01 – General Requirements.
2. Section 03 3000 – Cast-in-Place Concrete.
3. Section 09 9000 – Painting and Coating.
4. Division 14 – Conveying Equipment.
5. Division 23 – HVAC.
6. Division 26 – Electrical.
7. Division 27 – Communications.
8. Division 28 – Electronic Safety and Security.
9. Division 31 – Earthwork.
10. Division 32 – Exterior Improvements.
11. Division 33 – Site Improvements.

C. Related Industry Standards: The most current version of the following industry standards.

1. ASTM D 709 – Laminated Thermosetting materials.
2. ANSI/NEMA FB-1 – Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.
3. ANSI/NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).
4. California Electrical Code (CEC).

5. IEEE C57.12.28 – Standard for Pad-Mounted equipment Enclosure Integrity.

6. IEEE 1584 – Performing Arc-Flash Hazard Calculations.

7. UL/ANSI 1 – Standard for Flexible Metal Conduit.

8. UL/ANSI 1242 – Standard for Electrical Intermediate Metal Conduit.

9. UL/ANSI 506 – Standard for Specialty Transformers.

10. UL/ANSI 6 – Electrical Rigid Metal Conduit-Steel.

11. UL/ANSI 6A – Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel.

12. UL 797 – Electrical Metallic Tubing-Steel.

13. UL/ANSI 870 – Standard for Wireways, Auxiliary Gutters, and Associated Fittings.

14. UL/ANSI 891 – Standard for Safety Switchboards.

1.02 BASIC ELECTRICAL REQUIREMENTS

A. Quality Assurance:

1. Work shall be performed by CONTRACTOR'S personnel possessing the skills and experience obtained in performing work of similar scope and complexity.

2. Refer to related division(s) specifications for other requirements.

B. Drawings and Specifications Coordination:

1. For purposes of clearness and legibility, Drawings are essentially diagrammatic, and the size and location of equipment is indicated to scale whenever possible. Verify conditions, dimensions, indicated equipment sizes, and manufacturer's data and information as necessary to install the Work of this Division. Coordinate location and layout with other Work.

2. Verify final locations for rough ins with field measurements and with the requirements of the equipment to be connected.

3. Drawings indicate required size and points of termination of conduits, number and size of conductors, and diagrammatic routing of conduits. Install conduits with minimum number of bends to conform to structure, avoid obstructions, preserve headroom, keep openings and passageways clear, and comply with applicable code requirements.

4. Routing of conduits may be changed provided that the length of any conduit run is not increased more than 10 percent of length indicated on the Drawings.

5. Outlet locations shall be coordinated with architectural elements prior to start of construction. Locations indicated on the Drawings may be distorted for clarity; CONTRACTOR shall coordinate in the field prior to rough-in work.

6. Coordinate electrical equipment and materials installation with building components and the Work of other trades.

7. Equipment disconnects shall be readily accessible and free of obstructions.

8. When extending or intercepting existing electrical facilities, CONTRACTOR shall Coordinate and verify existing conditions.

C. Terminology:

1. Signal Systems: Applies to clock, bell, fire alarm, annunciator, sound, public address, buzzer, telephone, television, inter-communication, elevator access controls, lighting control systems and security systems.

2. Low Voltage: Applies to signal systems operating at 120 volts and less, and power systems operating at less than 600 volts. Medium voltage: Applies to power systems operating at more than 600 volts.

3. UL: Underwriter's Laboratories Inc, Nationally Recognized Testing Laboratory (NRTL), or equal.

D. Regulations: Work shall comply with the requirements of authorities having jurisdiction and the California Electrical and Building Codes. Material shall conform to regulations of the National Board of Fire Underwriters for electrical wiring and apparatus. Materials shall be new and listed by UL, or another NRTL.

E. Structural Considerations for Conduit Routing:

1. CONTRACTOR shall provide DSA approved calculations and drawings as necessary for any construction and/or alterations requiring conduits to pass through or interfere with any structural members, or where notching, boring or cutting of the structure is necessary, or where special openings through walls, floors, footings, or other buildings elements, or where notches and bored holes in wood or steel are required. All work shall conform to CBC, Part 2, Title 24 requirements.

2. Concrete encasement for underground conduits that abuts a foundation wall or underground structure shall rest on a haunch integral with wall or structure, or shall extend down to footing projection, or shall be doweled into structure unless otherwise indicated. Underground structures shall include maintenance holes; pull boxes, vaults, and buildings.

F. Electrically Operated Equipment and Appliances:

1. Furnished Equipment and Appliances:

a. Work shall include furnishing and installing wiring enclosures and complete connections of electrically operated equipment, appliances and electrical control devices, which are specified to be furnished and installed in this or other sections of the Specifications. Wiring enclosures shall be concealed except where exposed work is indicated on the drawings.

b. Provide all connections necessary for installation of equipment.

1) Equipment shall be tested for proper operation, including proper rotation of motorized equipment.

2) If outlets are of incorrect electrical characteristics, or any specified equipment fails to operate properly, CONTRACTOR shall repair and/or replace the outlet and/or equipment.

3) Utility connections (electrical, controls, gas, etc.) to roof mounted mechanical equipment shall be made through the side of the equipment and not from beneath the unit to facilitate future replacement.

2. Equipment and Appliances Furnished by Others:

a. Equipment and appliances indicated on Drawings as "not in contract" (NIC), "furnished by others," or "furnished by the OWNER," will be delivered to the Project site. Required electrical connections shall be performed for such equipment and appliances. Motorized equipment will be furnished factory-wired to a control panel or junction box unless otherwise indicated. Appliances will be furnished equipped with portable cord and cap. Provide disconnect switches where required.

b. Connections to equipment furnished under this Division shall be part of the Work of this section. Work shall include internal wiring, installation, connection and adjustment of bolted drive motors in which the motor is supplied as a separate unit, and connections only for equipment furnished with factory installed internal wiring, except as further limited by Drawings and this Specification. Work shall include furnishing and installing suitable outlets, disconnecting devices, starters, push-button stations, selector switches, conduit, junction boxes, and wiring necessary for a complete electrical installation. Work shall also include furnishing and installing conduit and boxes for HVAC control systems, furnished under Division 23. Devices and equipment furnished shall be of same type used elsewhere on the Work or as specified.

c. Electrical equipment furnished under other sections, for installation and connection under Work of this section, will be delivered to the Project site ready for installation.

d. Mechanical equipment furnished under other sections, and requiring electrical connection under this section, will be set in place as part of the Work of the section furnishing such equipment unless noted otherwise.

e. Suitability and condition of equipment furnished under other sections shall be determined in advance of installation. Immediate notice of damage, unsuitability, or lack of parts shall be given to the entity providing such equipment.

G. Power Distribution System Reports: For fault current, coordinatization and Arc-Flash system report requirements refer to applicable electrical distribution equipment sections. for specific requirements.

H. Protection of Materials:

1. Protect materials and equipment from damage and provide adequate and proper storage facilities during progress of the Work. Damaged materials and/or equipment shall be replaced.

I. Cleaning:

1. Exposed parts of Work shall be left in a neat, clean, usable condition. Finished painted surfaces shall be unblemished and metal surfaces shall be polished.

2. Thoroughly clean parts of apparatus and equipment. Exposed parts to be painted shall be thoroughly cleaned of cement, plaster, and other materials. Remove grease and oil spots with solvent. Such surfaces shall be wiped, and corners and cracks scraped out. Exposed rough metal shall be smooth, free of sharp edges, carefully steel brushed to remove rust and other spots, and left in proper condition to receive finish painting.

3. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

J. WARRANTIES

1. Provide one-year warranty on all material and labor performed, unless noted otherwise in specific sections.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. Advise the Inspector before starting the Work of this Division.

B. Exposed conduits shall be painted to match the surfaces adjacent to installation.

C. Salvaged materials removed from buildings shall be removed from the Project site as required by the OAR.

D. Trenches outside of barricade limits shall be backfilled and paved within 24 hours after being inspected by the Inspector. Provide traffic plates during the time that trenches are open in traffic areas and in areas accessible to students and staff.

E. Where existing structural walls are cored for new conduit runs, separation between cored holes shall be three inches edge to edge from new or existing holes, unless otherwise required by the Architect. All coring to be laid out and reviewed by Architect prior to drilling. CONTRACTOR to verify location of structural steel, rebar, stress cabling or similar prior to lay out.

F. Electrical equipment shall be braced and anchored for CBC Seismic Design requirements, or as otherwise indicated on the Drawings.

3.02 DELIVERY STORAGE AND HANDLING

A. Deliver products to project site with proper identification, which shall include names, model numbers, types, grades, compliance labels, and similar information needed for District identification; all products and materials shall be adequately packaged and protected to prevent damage during shipment, storage, and handling.

B. Coordinate deliveries of electrical materials and equipment to minimize construction site congestion.

3.03 CUTTING AND PATCHING

A. Cutting and patching of electrical equipment, components, and materials shall include the removal and legal disposal of selected materials, components, and equipment.

B. Do not endanger or damage installed Work through procedures and processes of cutting and patching.

C. Repair or restore other work or surfaces damaged as a result of the work performed under this contract.

3.04 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose off the Project site.

B. Remove equipment and implements of service, and leave entire work area neat and clean, to the satisfaction of the OWNER Authorized Representative.

3.05 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 23 7413

PACKAGED HVAC UNIT NOISE REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.

1.02 SUMMARY

A. The HVAC equipment manufacturer shall furnish factory supplied data showing the sound power levels for the rooftop unit casing, supply air discharge and return air inlet openings for each unit size. In addition, the equipment manufacturer shall furnish factory supplied data showing the sound power levels for the return air inlet of each return air power exhauster.

1.03 REFERENCES

A. ARI Standard 260, Sound Rating of Ducted Air Moving and Conditioning Equipment or a test standard approved by the acoustical consultant. Equivalent test and calculation procedures may be substituted for the above procedures if approved in advance by the Architect.

1.04 SUBMITTALS

A. Submit octave band sound power level data at the design airflow and static pressure conditions for the casing, supply air discharge openings and return air openings for each scheduled HVAC unit. All acoustic data shall be measured and provided in accordance with ARI 260 – Standard Sound Rating of Ducted Air Moving and Conditioning Equipment or a test standard approved by the project Acoustical Consultant. Alternate test procedures must be substituted for review and approval by the Acoustical Consultant in advance of product submission.

PART 2 - PRODUCTS

2.01 HVAC UNIT SOUND POWER LEVELS

A. The sound power levels of each HVAC unit's casing, supply air discharge and return air inlet openings shall not exceed the values list in the schedule below when operating at the maximum design airflow and static pressure conditions. The tabulated criteria apply to all 8 rooftop units being used in the project.

OCTAVE BAND SOUND POWER LEVELS, (dB re: 10^{-12} Watts)								
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
RTU Supply Air	87	79	73	70	67	61	59	53
RTU Return Air	80	76	67	62	61	53	48	43
RTU Casing	83	83	76	75	75	69.5	66	63

B. Should the submitted HVAC unit sound power levels exceed the specified levels in the table above by more than 3 decibels in any octave band, it shall be the option of the contractor to provide

supplemental noise control (in the form of silencers, plenums, duct liner, etc.) to bring each unit into compliance. Supplemental noise control for each unit must be reviewed and approved by the architect and mechanical engineer in advance of installation. The cost associated with all supplemental noise control shall be borne by the contractor until the noise levels of each unit comply with the specified values above.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 26 0513

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Boxes, enclosures, keys and locks.
2. Receptacles and switches.
3. Identifications and signs.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Division 26 – Electrical.
3. Division 27 – Communications.
4. Division 28 - Electronic Safety and Security.

PART 2 - PRODUCTS

2.01 BOXES, ENCLOSURES, KEYS AND LOCKS

A. Outlet Boxes and Fittings:

1. Outlet boxes installed in concealed Work shall be galvanized steel, pressed, or welded type, with knockouts.
2. In exposed Work, where conduit runs change direction or size, outlet boxes and conduit fittings shall be cast metal with threaded hubs cast integral with box or fitting.
3. Fittings shall be cast metal and non-corrosive. Ferrous metal fittings shall be cadmium-plated, or zinc galvanized. Castings shall be true to pattern, smooth, straight, with even edges and corners, of uniform thickness of metal, and shall be free of cracks, gas holes, flaws, excessive shrinkage, and burnt-out sand.
4. Covers for fittings shall be galvanized steel or non-corrosive aluminum and shall be designed for the fitting installed.
5. Light fixture outlets shall be 4-inch octagon, 4-inch square, 2 1/8-inch deep, or larger based on code requirements for the number of conductors and conduits.

6. Plaster rings shall be furnished with round opening with two ears drilled 2 23/32 inches center to center.

7. For local device outlets provide 4-inch square 2 1/8-inch deep, boxes for single gang, 5-inch square boxes for two-gang, and special solid gang boxes with gang plaster ring for more than two switches.

8. For horns and strobes provide manufacturer's supplied back box as needed.

9. For television outlets, provide 4-gang deep boxes and 4-gang plaster rings.

10. Plaster rings shall be provided on flush-mounted outlet boxes except where otherwise indicated or specified. Plaster rings shall be same depth as finished surface. Install approved ring extension to obtain depth to finish surface.

11. In existing plywood wall or drywall construction, and where flexible steel conduit is fished into walls, single-gang and 2-gang outlets for wiring devices may be sectional steel boxes with plaster ears. Boxes shall be fastened to plywood with flat-head screws in each plaster ear screw hole. Boxes fastened to gypsum board shall be Raco, Appleton, Cooper, Bowers, or equal.

12. Altered knockouts shall be sealed with factory made knockout seals.

13. Provide and install weatherproof universal box extension adapters where flexible conduit is extended from flush outlet boxes.

B. Junction and Pull boxes:

1. Junction and pull boxes shall only be used in compliance with codes, recognized industry standards, and contract documents.

2. Interior and non-weatherproof boxes shall be constructed of blue or galvanized steel, boxes shall be provided with ample laps, be spot welded, and be rigid under torsion and deflecting forces. Furnished auxiliary angle iron framing where necessary to ensure rigidity.

3. Covers shall be fastened to box with enough machine screws to ensure continuous. Flush type boxes shall be drilled and tapped for cover screws if boxes are not installed plumb.

4. Surfaces of pull and junction boxes and covers shall be labeled with black marker ink designating system, panelboard and circuit designation shall be indicated in box interiors. In exposed Work, designation shall be located on inside of pullbox or junction box cover.

5. Weatherproof NEMA 3R pull and junction boxes installed in buildings interior shall conform with the following:

a. Cover of flush mounting boxes shall be furnished with a weather-tight gasket cemented and trimmed even with cover all around.

b. Surface or semi-flush mounted pull and junction boxes shall be listed by UL or another Nationally Recognized Testing Laboratory (NRTL) as rain-tight and be furnished complete with threaded conduit hubs.

c. Exposed portions of boxes shall be galvanized, finished with one prime coat and one coat of baked-on gray enamel, unless box(es) are already furnished with factory baked-on finish.

6. Junction and pull boxes shall be rigidly fastened to structure. Junction and pull boxes shall not depend on conduits for support.

7. Underground Concrete Pull Boxes:

a. Pre-cast concrete pull boxes. Concrete pull boxes shall be traffic type, reinforced for H-20 wheel loading, pre-cast concrete. Pull boxes with inside dimensions of 2 feet by 3 feet by 3 feet deep shall consist of a base section, top ring, and cover. Base section shall be furnished with 2 knockouts measuring 10 inches by 10 inches in each 3 feet side, and one 20 inches by 20 inches knockout in each 2-foot side. Pull boxes with inside dimension 4 feet by 4 feet by 4 feet deep shall consist of a base section, midsection, topping, and cover. Base section shall be furnished with 2 knockouts measuring 8-inch by 16-inch on each of two opposite sides, and one 20-inch by 20-inch knockout on each of other two opposite sides. Pull boxes shall be furnished with a minimum of 6-inch diameter sump knockout and one-inch diameter ground rod knockout. In pull boxes, furnish and install cable racks on walls. Racks shall be furnished with 3 porcelain cable holders on vertical steel mounting bars. Pull boxes shall be furnished with 3/4-inch diameter pull irons. Covers shall be traffic-type consisting of steel safety plate bolted to frame. Covers shall be marked as electrical, power, or signal as required, and have code approved size openings for lifting the cover.

b. Provide end bells in duct entrances. Terminate each metal conduit with insulated bushing provided with a grounding terminal.

c. Install pulling irons on opposite walls and below horizontal centerlines of ducts and bricked-up openings, and in bottom. Install pulling irons with each end hooked around a reinforcing bar.

d. Remove floor drain knockout and provide a depth of 24 inches of crushed rock below box extending a minimum of 12 inches beyond on all sides.

e. Permanently and effectively ground metal equipment cases, cable racks, and similar items in pull boxes to site grounding electrode system. Provide grounding conductor in compliance with CEC Article 250.

f. Provide 6-inch deep sand base under pull boxes.

g. Identify power and signal cables by tagging in manholes and pull boxes. Tie securely to cables with nylon cord.

h. Top of steel plate shall provide a minimum coefficient of static friction of 0.5 for either wet or dry locations, when tested for any shoe sole material. Test shall comply with ASTM D 2047 or F 489 or F 609 standards. Submit manufacturer's test results for Architect's review as part of materials and equipment submittals.

i. The use of underground extension boxes shall be limited to not more than 1 times the original depth of pull box.

j. Manhole type boxes are not acceptable.

k. Approved Products: Oldcastle Precast, Jensen Precast, Kistner, Western Precast, or OWNER approved equal.

8. Underground utility boxes shall be reinforced concrete with non-setting shoulders to prevent settlement following installation. Boxes shall be furnished with cast iron cover with finger hole, size as indicated on Drawings. Utility boxes shall be as manufactured by Oldcastle, Jensen, Kistner, Western Precast, or equal.

9. Manholes, vaults, and pull boxes required by a utility company, and installed as part of this Contract, shall meet requirements of servicing utility company.

C. Keys and Locks:

1. Provide two keys with furnished door locks, including cabinet door locks and switchboard locks, two keys for lock switches on switchboards or control panels, and two keys with interlocks or other furnished lock switches. Deliver keys to OAR.

2. Special keys and locks shall only be provided where specified. Locks shall be keyed to Corbin No. 60 or 70 as follows:

a. Access to operate equipment shall be keyed to Corbin 60.

b. Access to service areas shall be keyed to Corbin 70.

2.02 RECEPTACLES AND SWITCHES

A. Receptacles:

1. Duplex receptacles shall be heavy-duty specification grade, grounding type. Terminal screws shall be wired on the side and back with internal screw pressure plates. Mounting strap shall feature heavy-duty brass construction. Receptacle back body shall be PVC. Receptacle face shall be ivory, impact resistant nylon. Receptacles shall have triple wipe brass power contacts. Approved products:

NEMA #	Pass & Seymour	Hubbell	Leviton
(20 amps) NEMA 5-20	PS5362-I	HBL5362-I	5362-I
(15 amps) NEMA 5-15	PS5262-I	HBL5262-I	5262-I

Equal products approved by OWNER may be acceptable.

2. Duplex receptacles on circuits supplied by panel boards with integral surge suppression shall be:

   Pass & Seymour model number PS5262BL (blue).
   Hubbell DRUBTVSS15.
   Leviton 5262-SBU, 15-amps, 120-volts.
   Equal products approved by OWNER may be acceptable.

3. Single receptacles shall be heavy-duty specification grade, grounding type. Terminal screws shall be back and side wire with internal screw pressure plates. Mounting strap shall feature heavy-duty brass construction. Receptacle back body shall be thermoplastic. Receptacle face shall be ivory, impact resistant nylon. Receptacles shall have triple wipe brass power contacts. For circuits consisting of one single receptacle only, ampere rating of receptacle shall be same as circuit breaker or fuse. Approved products:

NEMA #	Pass & Seymour	Hubbell	Leviton
(20 amps) NEMA 5-20R	5361-I	HBL5361-I	5361-I
(15 amps) NEMA 5-15R	5261-I	HBL5261-I	5261-I

   Equal products approved by OWNER may be acceptable.

4. Single 15 and 20-amps receptacles on circuits supplied by panel boards with integral surge suppression shall be blue in color. Approved products:

   Pass & Seymour NEMA 5-20R model number 5361-BL (blue).
   NEMA 5-15R model number 5261-BL (blue).
   OWNER approved equal.

5. Ceiling Mounted Retractable Power Cord Receptacles. Duplex 20-amps heavy duty retractable cord reel with cord length and color as indicated in drawings, Reel shall be equipped with lift/drag ratchet lock and be NEMA 5-20 cap. listed industrial grade steel housing with welded steel frame.
   Approved Manufactures: KH Industries RTB series, REELCRAFT H-7122, or OWNER approved equal.

6. Kiln and range receptacles. provide 3-pole, 4-wire, grounding type, rated 50 amps or as indicated on plans. Receptacle shall be rated 125/250 volts NEMA 14-50R. Provide 2-gang, stainless steel plates. Approved products:

NEMA #	Pass & Seymour	Hubbell	Leviton
NEMA 14-50R	3894	HBL9450A	279
WALL PLATE	SS703	S703	84026

   Equal products approved by OWNER may be acceptable.

7. Dryer receptacles. Provide 3-wire, non-grounding type, rated 30 amps at 125/250 volts, NEMA 10-30R, with 2-gang stainless steel plates. Coordinate location of junction box with the work of Section 10 2815, Hand and Hair Dryers. Approved Products:

NEMA #	Pass& Seymour	Hubbell	Leviton
NEMA 10-30R	3860	HBL9350	5207
WALL PLATE	SS703	S703	84026

   Equal products approved by OWNER may be acceptable.

8. Provide specification grade ground-fault circuit interrupter (GFCI) type receptacles in accordance with 2010 UL standards. GFCI receptacles shall have a trip indication light. Receptacle terminal screws shall be back and side wire with internal screw pressure plates. Test and reset buttons shall match device body and shall be ivory. GFCI receptacles shall be manufactured in standard configuration for installation with stainless steel smooth plates. Exterior mounted receptacles shall be mounted inside weatherproof enclosure. Approved products:

NEMA #	Pass & Seymour	Hubbell	Leviton
NEMA 5-20R	2097TRI	GFRST20IB	G5362-WTI
NEMA 5-15R	1597TRI	GFRST15IB	G5262-WTI

Equal products approved by OWNER may be acceptable.

9. Provide weatherproof receptacles as indicated or specified, Receptacles shall be GFCI type receptacles, with metal plates with die-cast lockable hinged lids and weatherproof mats. Receptacles shall be tamper-resistant with thermoplastic dual mechanism shutter system to help prevent insertion of foreign objects. Receptacles shall have extra heavy-duty brass, and one-piece mounting strap with integral ground. Receptacles shall be ivory color, impact resistant nylon face and back body. Approved products:

NEMA #	Pass & Seymour	Arrow Hart	Leviton
NEMA 5-20R	TR63-I	TR8300V	8300SGI
NEMA 5-15R	TR62-I	TR8200V	8200SGI

Equal products approved by OWNER may be acceptable.

10. Standard GFCI cover plates shall be Pass & Seymour 4600, Raco 5028-0, or equal. GFI cover plates shall be provided with a CAM lock mechanism with two keys or a padlock hasp that does not protrude through the face of the cover and will allow the shank of locks keyed Corbin No. 60 keys.

11. Provide transient voltage surge suppression (TVSS) receptacles offering metal oxide varistors (MOVs) protecting normal and common modes, (L-N, L-G, N-G) with 500V suppressed voltage. TVSS devices shall offer 3-mode equal protection with 210 joules minimum per mode of energy absorption and 13,000-amp maximum surge capability. TVSS devices shall have 3 thermal fuses and two over-current protection fuses. TVSS devices shall have LED visual only surge status indicator to alert user to surge suppression circuit condition. Visual indicator will be illuminated (red) when power is on and surge suppression circuit is fully functional. Visual indicator will not be illuminated when power is off or unit experiences loss of surge suppression protection. Terminals shall be back and side wire including ground terminal. Color shall be blue. Approved Products

NEMA #	Pass& Seymour	Hubbell	Leviton
NEMA 5-20R	5352BLSP	HBL5360SA	5380B
NEMA 5-15R	5252BLSP	HBL5260SA	5280B

Equal products approved by OWNER may be acceptable.

B. Switches

1. Local Switches:

a. Local switches shall be high strength thermoplastic toggle, industrial grade, rated 20 amps at 120-277 volts AC only, with plaster ears, external screw pressure plate back and side wired, and standard size composition cups which fully enclose mechanism. Switches shall be approved for installation at currents up to full rating on resistive, inductive, tungsten filament lamp and fluorescent lamp loads, and for up to 80 percent of rating for motor loads. Switches shall have oversized silver alloy contacts for long life and better heat dissipation. Provide switches as single pole, double pole, 3-way, 4-way, non-lock type. Provide non-lock type switches with ivory handles;

	Pass & Seymour	Hubbell	Leviton
Single pole	PS20AC1I	HBL1221I	1221-2I
Double pole	PS20AC2I	HBL1222I	1222-2I
Three-way	PS20AC3I	HBL1223I	1223-2I
Four-way	PS20AC4I	HBL1224I	1224-2I

Equal products approved by OWNER may be acceptable.

b. Lock type switches shall be specification industrial grade, 20 amp, 120-277 volts with metal or nylon key guides with on/off indication, and operable by same key. Key shall be District standardized vertically oriented, tamper resistant, forked key with two each 5/16-inch long forks, 5/32-inch spacing between forks and 5/16-inch width overall. Approved products:

	Pass & Seymour	Arrow Hart
Single pole	PS20AC1L w/#500 Key-2L	1221L w/1201LK Key
Double pole	PS20AC2Lw/#500 Key	1222L w/1201LK Key
Three-way	PS20AC3L w/#500 Key	1223L w/1201LK Key
Four Way	PS20AC4L w/#500 Key	1224L w/1201LK Key

Equal products approved by OWNER may be acceptable.

c. Rotary lock switches shall incorporate a tumbler type lock to prevent unauthorized operation. Lock shall be tumbler type by Corbin, keyed to a HH41 key. Lock switch to be installed with pin tumblers facing downward. Key shall be removable in all positions. Each device shall be complete with 2 keys. Keys shall be delivered only to the OAR. Switches shall be rated at 20 amps, 120-volt or 277-volt AC. Switch plates shall be of stainless steel, engraved with on and off positions indicated. Approved products:

	Arrow Hart
Single pole	AH1191N
Double pole	AH1192N
Three-way	AH1193N

Equal products approved by OWNER may be acceptable.

d. Pilot light switches shall be rated 20 amps and shall conform to specifications for local switches. Switches shall be furnished with red, Lexan handles that are lighted by LED lamps. Pilot light shall light when load is on. Approved products for 120 and 277 Volts:

1) Pilot light 120-Volt switches. Approved products. Approved products:

	Pass& Seymour	Hubbell	Leviton
Single pole	PS20AC1-RPL	HBL1221-PL	1221-PLR
Double pole	PS20AC2-RPL	HBL1222-PL	1222-PLR
Three-way	PS20AC3-RPL	HBL1223-PL	1223-PLR

Equal products approved by OWNER may be acceptable.

2) Pilot light 277-Volt switches shall be single pole and shall conform to specifications for local switches, and the requirements of paragraph d above. Approved Products:

Pass & Seymour	Leviton	Hubbell
PS20AC1-RPL	1221-7PR	HBL1221-PL7

Equal products approved by OWNER may be acceptable

e. Provide remote control switches for mechanically held contactors arranged for 3-wire control, toggle type, momentary contact, single pole, 3-position with center off position, rated 20 amps at 120-277 volts AC only, with plaster ears, binding screws for side wiring, standard size composition cups which fully enclose mechanism, and ivory handles. Approved products:

Pass & Seymour	Hubbell	Leviton
1251-I	HBL1557-I	1285-I

Equal products approved by OWNER may be acceptable.

f. Provide remote control switches for magnetically held contactors arranged for 3-wire control, toggle type, maintained contact, single pole, 3-position with center off position, rated 20 amps at 120-277 volts AC only, with plaster ears, binding screws for side wiring, standard size composition cups which fully enclosed mechanism, and ivory handles. Approved products:

Pass and Seymour	Hubbell	Leviton
1225-I	HBL 1385	1285-I

Equal products approved by OWNER may be acceptable.

g. Momentary Contact locking key type switch. 20A 120/277V center off. Key shall be District standardized vertically oriented, tamper resistant, forked key with two each 5/16” long forks, 5/32” spacing between forks and 5/16” width overall. Approved products:

Arrow Hart AH1995L w/ AH2000 key
Equal products approved by OWNER may be acceptable.

h. Momentary Contact switch low voltage 1 pole 3A 24VAC 3 position center off. Key for locking switch shall be District standardized vertically oriented, tamper resistant, forked key with two each 5/16” long forks, 5/31” spacing between forks and 5/16” width overall. Approved products:

Pass and Seymour Toggle 1081I, Locking 1081KGRY w/#500 Key. Equal products approved by OWNER may be acceptable.

2. Emergency Lighting Control Unit

a. The Emergency Lighting Control Unit shall provide all required functionality to allow a standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building.

b. The emergency lighting control unit shall allow control of emergency lighting fixture in tandem with normal lighting in an area while ensuring that emergency lighting will turn on immediately to full brightness upon loss of normal power supplying the control device. Emergency lighting operation shall be independent for each controlled area and shall not require a generalized power failure for proper operation.

c. The device shall have normally closed dry contacts capable of switching 10-amp emergency ballast loads at 120-277 VAC, 60 Hz., 2-amp tungsten loads at 120 VAC, 60Hz., LED loads at 120-277V VAC, 60 Hz

d. The device shall have universal rated voltage inputs provided for normal power sense and normal switched power at 120-277 VAC, 60 Hz.

e. The device shall provide separate LEDs to indicate the presence of normal and emergency power sources. The LEDs shall indicate the unit's current operational mode (normal or emergency)

f. The device's normal power input terminal shall be connected to the line side of the control device such that any upstream fault causing a loss of power, including the tripping of the branch circuit breaker, will force the unit into the emergency mode and turn on the emergency lighting.

g. The unit shall automatically switch emergency lighting on and off as normal lighting is switched. When normal power is not available, the unit shall force and hold emergency lighting on regardless of the state of any external control device until normal power is restored.

h. Approved products: WattStopper ELCU-100 Emergency Lighting Control Unit, LVS #EPC-PM Series, Lighting Control Design #GR 2001 series, or OWNER approved equal.

2.03 IDENTIFICATION AND SIGNS

A. Identification Plates:

1. Provide identification plates for the following unless otherwise specified, for switchboards, unit substations, motor control centers, control panels, push-button stations, time switches, contactors, motor starters, motor switches, panelboards, and terminal cabinets.

2. Identification plates shall be of plastic stock and shall adequately describe function, voltage and phase of identified equipment. Where identification plates are detailed or described on Drawings, inscription and size of letters shall be as indicated. For lighting and power panels, identification plates shall indicate panel designation, voltage, and phase of panel. For terminal cabinets, identification plates shall indicate system contained in terminal cabinet.

3. Identification plates shall be black-and-white nameplate stock of bakelite with characters cut through black exposing white. Plates shall be furnished with beveled edges and shall be securely fastened in place with No. 4 Phillips-head, cadmium-plated steel, self-tapping screws. Characters shall be 3/16 inch high, unless otherwise indicated.

B. Markings:

1. Install identification markings to surface-mounted starters, switches, disconnect switches, contactors, and other devices controlling motors and appliances. Provide abbreviations required along with an identifying number. Markings to be provided with locking type stencils using paint of a contrasting color. Figures shall be 3/8 inch high unless otherwise indicated. Dymo Industries Inc., self-sticking plastic labels, with embossed characters made with a typewriter may be installed instead of stencils and paint; p-touch self-adhesive plastic, or Brother P-Touch self-sticking laminated plastic labels may be installed.

2. High Voltage: High voltage switchboards, cabinets, boxes, and conduits exposed in accessible locations, including under buildings and in attics, are required to be marked "WARNING-HIGH VOLTAGE – ABOVE 600 VOLTS". Markings for switchboards shall consist of 18 gage steel, porcelain enamel sign of standard manufacture. Markings for boxes, cabinets, and conduits shall be by means of stenciling or printed self-adhesive markers, Westline Tel-A-Pipe, or equal. Provide letters of black on orange background and not less than 1-7/8 inches high. On conduit runs, install markings at intervals not exceeding 10 feet in any individual area. Markings shall be installed after other painting Work is complete.

C. Warning Signs:

1. Provide a warning sign on outside of each door or gate to rooms or enclosures containing high voltage equipment. Signs required reading, "WARNING - HIGH VOLTAGE - KEEP OUT". Provide 2-inch high lettering.

2. Provide a warning sign on each high-voltage non-load break disconnect and fused cutout (not oil filled). Signs required reading, "DO NOT OPEN UNDER LOAD". Provide 2-inch-high lettering.

3. Provide signs of standard manufacture, 18 gage steel, with porcelain enamel finish. Provide red lettering on a white background.

PART 3 - EXECUTION

3.01 INSTALLATION AND SUPPORT OF BOXES

A. Install outlet boxes flush with finished surface of wall or ceiling. Install plumb and securely fastened to structure, independent of conduit. Except where otherwise indicated, provide factory-fabricated adjustable attachment bar hangers between studs to support outlet boxes. When installation is performed in fire rated walls, maintain the wall's rating integrity by means of approved fire stop methods.

B. Outlet boxes installed in suspended or furred ceilings with steel runner or furring channels shall be supported, except where otherwise indicated, by a Unistrut P-4000, Tessco A1200HS-10, or Cooper B-Line B22s-HG, or OWNER approved equal channel spanning main ceiling runner channels.

1. Each box shall be supported from its channel by a 3/8-inch 16 threaded steel rod with a Unistrut P-4008, Fastenal #48604, Copper B-Line 78101140346 or OWNER approved equal; and nut and Tomic No. 711-B Adapta-Stud, or OWNER approved equal.

2. Rod shall be tightened to a jamb fit with channel and its nut. Box shall be locked to rod by means of a 1/2-inch locknut on stud and a 3/8-inch 16 hex nut locking stud to rod.

C. Heights of outlets and equipment indicated on Drawings shall govern. In absence of such indications, following heights shall be maintained with heights measured to centerline unless otherwise noted. Compliance with American with Disability Act is required. Coordinate with Architect and OWNER prior to installation.

1. Install wall-mounted switches at 48 inches above finished floor.

2. Outlet boxes for fire alarm pull stations shall be mounted at a mounting height above finished floor that ensures that the operating handle of the initiating device is no higher than 48 inches from finished floor.

3. Wall mounted fire alarm strobe or horn/strobe devices shall be mounted such that the entire lens is not less than 80 inches above finished floor. If ceiling heights allow, wall mounted appliances shall have bottom of lens a minimum of 80 inches but not more than 96 inches to the top of lens.

4. Install outdoor fire alarm audible devices or fire alarm sprinkler flow bells at least 10 feet but not more than 12 feet above finished floor to center. Provide STI or other OWNER approved protective covers as required in plans.

5. Voice evacuation speakers mounted indoors shall be mounted in ceiling space or if mounted on wall shall not be less than 10 feet to center above finished floor.

6. Install clocks and speakers, in classrooms and offices, 8 feet above finished floor. Unless otherwise indicated.

7. In rooms other than places of assembly such as, but not limited to, multipurpose rooms, auditoriums, and libraries, clock outlets and speakers in classrooms and offices shall be mounted 8 feet above finished floors.

8. Install fire alarm strobe lights 80 inches to bottom of light above finished floor.

9. Install outside bells and yard light outlets 4 feet above second floor level for 2 or more story buildings, 12 inches below top plate level for one story buildings without covered porch or arcade, and 12 inches below covered porch and arcade ceilings.

10. Install desk telephones, power receptacle outlets, and data outlets 15 inches above finished floor.

11. Install panelboards and terminal cabinets 6 feet 6 inches from finish floor to top of cabinet.

12. Install television outlets at a height corresponding to location of television monitor, or as indicated on plans.

13. The use of extension boxes shall be limited to not more than 1 times the original depth of junction box.

3.02 COVER PLATES

A. Provide a plate on each switch, plug, pilot light, data, interphone, public telephone, and television outlet, and on existing and reset outlets where so indicated or required. Plates shall be of stainless steel unless otherwise specified.

B. Flush wiring device and signal system outlets indicated to be blank covered, shall be covered with blank stainless-steel plates. Flush lighting outlets to be blanked shall be covered with Wiremold 5736 steel covers, or equal, painted to match surrounding finish. Provide stainless steel covers to blank indicated or required surface-mounted outlets.

C. In the following cases, and at required locations. Switch and receptacle plates shall be engraved with the device(s), or fixtures being controlled, or as indicated:

1. Three-gang and larger gang switches in locations other than classrooms.

2. Lock switches.

3. Pilot switches.

4. Switches so located that operator cannot see fixtures, or items of equipment controlled while his hand is on the switch.

5. Switches not in same room with fixtures or items of unit heaters, air curtains, fly fans, etcetera.

6. Receptacles operating at other than 120 V shall be identified with the operating voltage.

7. Switches operating on 277 V shall be identified with the operating voltage.

8. Where indicated on Drawings.

D. Designations shall be as indicated on Drawings or as specified by Architect.

3.03 IDENTIFICATION OF CIRCUITS AND EQUIPMENT

A. Provide descriptive nameplates or tags permanently attached to switchboards, motor control centers, transformers, panelboards, circuit breakers, disconnect switches, starters, pushbutton control stations and other apparatus installed for operation or control of circuits, appliances, fire alarm control panel(s), fire alarm annunciator(s), power supplies, terminal cabinets, energy management control units, and Information technology system backbone and distribution equipment points.

B. Provide nameplates of engraved laminated plastic, or etched metal. Submit Shop Drawings denoting dimensions and format to Architect before installation. Fasten to equipment with escutcheon pins, rivets, self-tapping screws, or machine screws. Self-adhering or adhesive backed nameplates are not permitted.

C. Fasten tags to feeder wiring in conduits at every point where runs are broken or terminated, including pull wires in empty conduits. Indicate circuit, phase, and function. Tag branch circuits in panel boards and motor control centers. Tags may be manufactured of pressure-sensitive plastic or embossed self-attached stainless steel or brass ribbon.

D. Provide circuit identification cards and cardholders in all panel boards. Cardholders shall consist of metal frame retaining a clear plastic cover permanently attached to inside of panel door. List of circuits shall be typewritten on a card. Circuit description shall include name or number of circuit’s area and connected load.

E. Junction and pull boxes shall have covers stenciled with box number when indicated on Drawings, or circuit numbers according to panel schedules. Data shall be lettered in a conspicuous manner with a color contrasting with finish.

F. Name shall be correctly engraved, with a legend indicating function or areas, when required by codes or indicated on Drawings.

3.04 PROTECTION

A. Protect Work of this section until Substantial Completion.

3.05 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

END OF SECTION

SECTION 26 0519

LOW-VOLTAGE WIRES (600 VOLT AC)

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of Division 01 apply to this section.

B. Section Includes: Low-voltage wire, splices, terminations and installation.

1.02 SUBMITTALS

A. Provide in accordance with Division 01.

B. List of Materials: Submit a complete list of proposed materials.

C. Shop Drawings: Provide detailed and dimensioned Shop Drawings indicating kind, weight and thickness of materials, insulation type, resistivity, conductivity, impedance, and conductance. Drawings shall contain sufficient information to assemble and install equipment at the Project site without further instructions.

D. Prior to start of construction; provide letter from wiring and electrical cables manufacturer certifying that the products are qualified/ listed as low electromagnetic field products.

1.03 SUBSTITUTIONS

A. Deviations/Substitutions from these requirements shall not be accepted without written approval from OWNER'S Design Standards Section and Maintenance and Operations Technical Unit. When deviating are proposed the following information shall be submitted:

1. Substitution request form stating reasons and benefits to OWNER.

2. OWNER'S approval shall be obtained for any equipment or materials substitutions.

3. Proposed substitutions requests shall provide proof of compliance with OWNER'S requirements and applicable standards.

B. Submittals must comply with contract general provisions.

1.04 QUALITY ASSURANCE

A. Components and materials shall be listed and approved for the intended application by Underwriter's Laboratories (UL), or other Nationally Recognized Testing Laboratory (NRTL), and in compliance with applicable industry standards and codes.

B. Wiring installation shall be performed under the supervision of state certified electricians. Contractor or Installer's electricians shall be certified in accordance with Labor Code sections 3099, and 3099.2 and section 209.0 of the California Code of Regulations.

C. Contractor shall have adequate experience installing systems of similar size and complexity.

1. Qualifications of Installer: Minimum five years of experience installing products and systems of similar scope and complexity.

2. Installer shall have completed at least five projects of equivalent scope and complexity.

3. Contractor shall have completed and commissioned a minimum of five service agreements that provide similar support services to those needed for this project.

4. System startup and testing shall be performed under direct observation of the Project Inspector and OAR.

D. The Project Inspector will observe installation of feeder cables. Notify the Project Inspector not less than two working days in advance of the proposed time of feeder installation.

1.05 WARRANTY

A. Provide a one year labor warranty.

B. Provide material warranty of no less than 10 years.

C. Warranty period begins at substantial completion or project acceptance for beneficial occupancy.

D. CONTRACTOR shall warranty all products and materials. Multiple warranty sources is not acceptable.

PART 2 - PRODUCTS

2.01 WIRES

A. Pressure cable connectors shall be pre-insulated 3M Scotchlok, Ideal Wing Nut, O-Z/Gedney or equal.

B. 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 a maximum continuous conductor temperature in dry locations of 90 degrees C. and 75 degrees C. in wet locations. Wires and cables shall be listed by Underwriter's Laboratories (UL) Standard 83 for thermoplastic insulated wires, and listed for installation in accordance with Article 310 of the California Electrical Code (CEC).

C. Conductors shall be solid copper for 12 AWG and smaller conductors, and stranded copper for 10 AWG and larger conductors.

D. Conductors shall be insulated with PVC and sheathed with nylon.

E. 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.

F. Wires shall be tested in accordance with the requirements of UL standard for types THWN and THHN.

G. 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).

2.02 STANDARDS

A. THWN/THHN wires shall comply with the following standards:

1. UL 83 for thermoplastic insulated wires.

2. UL 1063 for machine tool wires and cables.

PART 3 - EXECUTION

3.01 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, Yellow, Red, or Blue spring-loaded twist-on type, may be furnished in splicing number 8 AWG or smaller wires for wiring systems. Listed Push-in spring clamp wire connectors, Ideal In-Sure, or equal may be used in luminaires for fixture wiring.

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.

2. Utilize the services of an approved independent testing laboratory or a qualified contractor's employee (Technician certified in accordance with ANSI/NETA ETT-2000 Standard for Certification of Electrical Testing Personnel) to perform megger time-resistance insulation testing of branch circuit conductors. Tests must be conducted with wires disconnected at both ends.

    a. Test equipment and report requirements stipulated under paragraph 3.01.N.1 apply to branch circuit testing.

3. Tests shall be performed in the presence of the Project Inspector.

4. Insulation resistance shall not be less than 100 mega-ohms.

3.02 COLOR CODES

A. General Wiring:

1. 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.

2. 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.

3. Where two voltage systems are combined in an enclosure; CONTRACTOR shall apply a permanent color code label where the circuits originate.

B. Signal Systems: Wires for signal systems shall be color-coded and installed under observation of the Project Inspector. Except where otherwise specified, color-coding shall be as follows:

EDIT NOTE: IN NEW SCHOOLS AND SOME EXISTING SCHOOLS THE PROGRAM SIGNAL IS THROUGH THE PA SYSTEM; PROGRAM BELLS ARE NOT PRESENT. DELETE REFERENCE TO PROGRAM BELLS AS NEEDED.

SYSTEM	COLOR CODE
Clocks	Pink, Gray and Orange
Program Bells (some existing elementary schools)	White (Common)Black
Initiating Devices (Non-Addressable)	Red (+) and Black (-)
Program Bells (some existing secondary schools)	White (120 volt, common) Black (C.R. program) Blue (Shop program) Brown (Gym program) Yellow (Auditorium fire alarm)
Fire Alarm Horns	Pink (+) and Gray (-)
Fire Alarm Strobes	Orange (+) and Blue (-)
Un-Interruptible 24 Volt	Yellow (+) and White (-)

Power (Annunciator, Water Flow, and Audible Device)	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 (-)

3.03 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.

3.04 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.

3.05 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.06 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 26 0526

GROUNDING AND BONDING

PART 1 - GENERAL

1.01 SUMMARY

A. Provide and install an effective grounding and bonding system.

B. Related Requirements:

1. Refer to related sections for their system grounding requirements.
2. Division 01 - General Requirements.
3. Division 26 – Electrical.
4. Division 27 – Communications.
5. Division 28 - Electronic Safety and Security.

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. IEEE 142 Green Book.
2. Underwriter's Laboratories (UL).
3. California Electrical Code.
4. Building Industry Consultant Services International (BICSI).
5. EIA/TIA (Signal and power).
6. Nationally Recognized Testing Laboratory (NRTL).

1.03 SYSTEM DESCRIPTION

A. Equipment, components, or materials that enclose electrical conductors, or are likely to be energized by electrical currents shall be effectively grounded.

B. Metal equipment parts such as switchboards, panelboards, metal enclosures, raceways, equipment grounding conductors, and earth grounding electrodes shall be effectively bonded into a continuous grounding path.

C. Metallic systems or electrically conductive materials shall be effectively bonded to the building’s grounding electrode system.

D. A separately derived AC system shall be grounded to the equipment grounding conductor and to a separate “made” electrode of building grounding electrode system.

E. Provide effective electrical equipment bond continuity to all metal raceways and enclosures. Grounding shall be achieved through a code sized green insulated grounding conductor provided within each raceway.

1. Each flexible conduit over six feet in length shall be provided with a green insulated grounding conductor of required size.

2. Provide code sized equipment grounding conductor in all flexible conduits as required by CEC.

3. The length of flexible conduit installations shall not be less than six feet.

4. Effectively ground metal raceways and enclosures at each end.

F. Cold water, or other utility piping systems, shall not be utilized as grounding electrodes. In addition to bonding to cold water pipe provide at least one of the following made grounding electrodes:

1. A dedicated “made” electrode, fabricated of at least 20 feet of uncoated galvanized 1/2 inch diameter rebar encased by at least two inches of concrete, and placed next to the bottom of a concrete foundation, or footing in direct contact with earth A welded extended portion shall surface at the location of the common grounding electrode bus bar and be extended by a 3/0 exothermic welded bare copper cable, or be welded directly to the bus. The exothermic weld shall be at least four inches above finished floor in a dry location. The main grounding electrode and associated grounding conductors shall be in an enclosure and in conduit.

3. Concrete enclosed electrode, fabricated of at least 20 feet of No. 2 AWG, minimum size, bare copper conductor, encased by at least two inches of concrete, located within or near bottom of a concrete foundation, or footing, which is in direct contact with earth. Footing rebar shall be connected to copper wire with approved connectors.

4. An external grounding electrode, as specified hereafter or as required by the CEC shall be installed and connected to foundation or footing rebar.

G. Non-current carrying metal parts of high-voltage (1000 Volts or more) equipment enclosures, signal and power conduits, switchboard and panelboard enclosures, motor frames, equipment cabinets, and metal frames of buildings shall be permanently and effectively bonded to the grounding system. Provide a CEC sized equipment grounding conductor in every raceway.

H. Metallic or semi-conducting shields and lead sheaths of cables operating above 1000 Volts 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 solidly grounded at only one point within the Project site for that particular service. Preferable location of grounding point shall be at the service switchboard, or main switch.

2. Equipment and conduit grounding conductors shall be bonded to that grounding point.

3. If other buildings or structures on the Project site 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 shall be installed from switchboard to each individual building. At building, grounding conductor shall be bonded with power equipment enclosures, metal frames of building, etc., to “made” electrode for that building.

5. Feeder neutrals shall be bonded at service entrance point only; neutrals of separately derived systems shall be bonded at the source only.

J. If there is a distribution transformer at a building the secondary neutral conductor shall be grounded to “made” electrode serving the building.

K. Within every building, the main switchboard or panelboard, shall be bonded to the cold water line. Metallic piping systems such as gas, fire sprinkler, or other systems shall be bonded to the cold water line.

1.04 SUBMITTALS

A. Provide in accordance with Division 01.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Furnished yard boxes shall be precast concrete and shall be approximately 14 inches wide by 19 inches long by 12 inches deep or larger.

a. Boxes shall be furnished with bolt-down, checkered, cast iron covers and cast-iron frames cast into the yard boxes.

b. Yard boxes shall comply with LAUSD standard detail E-102.

c. Provide yard boxes with hinged Frame Locking Cover.

d. Approved products include Brooks No. 36 HFL, Jensen Precast, Oldcastle Precast, Western Precast, Kistner, or equal.

B. External ground electrodes shall be copper-clad steel ground rods, minimum 3/4-inch diameter by ten feet long.

C. Clamps and fittings used in ground boxes below grade shall be listed for direct burial.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Grounding electrodes shall be installed in the nearest suitable 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, finish elevation of concrete yard boxes shall be two inches above planting surfaces.

B. If concrete enclosed electrode is provided, grounding wire shall be terminated to a suitable copper plate with grounding lugs and must be enclosed in a raceway or box.

C. Grounding rods shall be driven to a depth of not less than eight feet. Permanent ground enhancement material, (GEM) as manufactured by Erico Electrical Products, Loresco Powerset, Tessco Ultrafil or equal, shall be installed at each ground rod to improve grounding effectiveness. Install in accordance with manufacture's installation instructions.

D. Grounding electrodes shall provide a resistance to ground of not more than 25 ohms.

E. When installing grounding rods, if resistance to ground exceeds 25 ohms, two or more rods connected in parallel, or coupled together shall be provided to meet CEC grounding resistance requirements.

F. Ground rods shall be separated from one another by not less than ten feet.

G. Parallel grounding rods shall be bonded together with listed fittings and grounding conductors in galvanized rigid steel conduit, buried not less than 12 inches below finish grade.

3.02 TESTING

A. Provide the services of an approved independent testing laboratory to test grounding resistance of “made” electrodes, ground rods, bonding of building steel, water pipes, gas pipes and other utility piping. Tests shall be performed 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 hand railings at building entrances and at handicapped ramps shall also be tested.

4. Test shall be performed in the presence of the Inspector.

B. Submit 3 copies of test results to the Architect. Test results shall be submitted on an official form from the independent testing laboratory recording Project location, test engineer, test conditions, test equipment data, ground system layout or diagram, and final test results.

3.03 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.04 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 26 0533

RACEWAYS, BOXES, FITTINGS, AND SUPPORTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Raceways and wire ways.
2. Conduit installation.
3. Underground requirements.

B. Related Requirements:

1. Section 26 0500: Common Work Results for Electrical.
2. Section 26 0513: Basic Electrical Materials and Methods.
3. Division 27: Communications.
4. Division 28 - Electronic Safety and Security.

C. Applicable Standards and Codes.

1. EIA/TIA 569 Standards.
2. National American Standards Institute (ANSI).
3. National Electrical Manufacturer’s Association (NEMA).
4. Nationally Recognized Testing Laboratory (NRTL).
5. California Electrical Code (CEC).
6. Uniform Building Code (UBC).
7. Underwriters Laboratory (UL).

1.02 SUBMITTALS

A. Materials List: Provide in accordance with Division 01.

PART 2 - PRODUCTS

2.01 RACEWAYS

A. Conduit Materials:

1. Metallic conduit, and tubing shall be manufactured under the supervision of an UL, or another NRTL factory inspection and label service program. Each ten-foot length of conduit and tubing shall bear the UL or another NRTL label and manufacturer's name.

2. Rigid metallic conduit shall be rigid steel, heavy wall, mild steel, zinc-coated, with an inside and outside protective coating manufactured in accordance with ANSI C 80.1. Couplings, elbows, bends, conduits, bushings and other fittings shall be the same materials and finish as the rigid metallic conduit. Fittings, connectors, and couplings shall be threaded type, manufactured in accordance with ANSI C 80.1 and UL 6.

3. Electrical metallic tubing shall be steel tubing, zinc-coated with a protective enamel coating inside, manufactured in accordance with NEMA C 80.3. Fittings, couplings, and connectors shall be gland compression type, set screw couplings and connectors not permitted. All parts shall be manufactured in accordance with NEMA C80.3 and UL 6A Electrical metallic tubing is designated hereinafter as EMT. Steel and rain tight fittings shall be approved and listed for the intended application.

4. Flexible steel conduit shall be of flexible interlocking strip construction with continuous zinc coating on strips, manufactured in accordance with UL 1.

   a. Connectors and couplings shall be required fittings of the type, which threads into convolutions of flexible conduit.

5. Liquid-tight flexible metal conduit shall be galvanized heavy wall, flexible locked steel strip construction, UV rated, with smooth moisture and oil-proof, abrasion-resistant, extruded plastic jacket. Connectors shall be as required for installation with liquid-tight flexible conduit and shall be installed to provide a liquid-tight connection.

6. Non-metallic conduit shall be rigid PVC electrical conduit extruded to schedule 40 dimensions of Type II. Grade 1 high impact, polyvinyl chloride, sweeps, couplings, reducers and terminating fittings shall be listed under the UL, or another NRTL, and shall bear the manufacturer's listed marking.

7. Multi-cell raceway shall be four inch PVC, Type 40, UL or another NRTL listed for underground use with optical fiber and signal system cables. Raceway shall be furnished with 3-1/2 inch factory installed inner ducts with required internal spacers, and required couplers, sweeps, and end bells. Multicell raceway shall be Carlon Multigard, or District approved equal.

8. Metal Clad (MC) cable system is not allowed.

B. Sleeves for Conduits: Sleeves shall be adjustable type by Carlon, U.S. Plastic, PEP Plastic or equal.

C. 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, equivalent Cooper Crouse Hinds Thru-Wall, Legrand Thru-Wall, or equal.

D. Expansion Joints-Seismic Separations between building(s) and other locations as indicated on drawings:

1. Provide Thomas & Betts XJG-TB, O-Z/Gedney. type AX with bonding strap and clamps, Cooper XJGD or equal. At exterior locations, provide Thomas & Betts XJG-TB, O-Z/Gedney type EX, Cooper XJGD, or equal. Provide O-Z/Gedney type AXDX, or equal combination deflection/expansion fittings at all seismic separations. Provide manufacture's internal and external bonding jumpers at all locations. Liquid-tight metal conduit or flexible metal conduit shall not be approved at expansion joints, separations between buildings or seismic separations.

2. Provide expansion fittings at intervals not exceeding 100 feet in conduits exposed to direct sunlight. Fittings may be installed in the conduit run or where conduit attaches to junction or pull boxes. OZ/Gedney type AX, TX or EXE series, or equivalent by Thomas and Betts, Crouse-Hinds or approved equal.

E. Conduit Seal Fittings:

1. Provide conduit seal fittings where indicated on the Drawings. Conduit seals shall be of rigid galvanized steel. Seals in horizontal conduit installations shall be Thomas & Betts EYS, Appleton Type ESU, Crouse Hinds Type EYS, or equal. Seals in vertical conduit installations shall be Thomas & Betts EYD, Appleton Type SF, Crouse Hinds Type EYD, or equal, with continuous drain. When installing conduit seals make provision for percent fill space reduction in accordance with CEC.

2. Install sealing compound after wire has been installed. Ensure drain is not blocked in vertical seals when installing compound. Where conduit seals are installed in hazardous area applications, there shall be no conduit coupling, fitting, etc., between seal and boundary of hazardous area.

F. Surface Steel Raceway:

1. The surface steel raceway system for branch circuit wiring, data network, voice, video, and other low voltage wiring shall be as manufactured by the Wiremold Company, Hubbell, or Mono-Systems, Inc. or equal. The raceway system may be supplied pre-wired in accordance with all sections of these specifications and requirements herein, and shall be UL or another NRTL listed. Computer data installation shall be as required by other sections of this Division.

a. If furnished pre-wired, the system must be listed in accordance with UL or another NRTL for "Multiple Outlet Assemblies" and so labeled on interior of the assembly. The pre-wired installation must contain no extra wire splices in the raceway as compared to a contractor assembled installation assembled from components. The pre-wired steel raceway shall be Hi-Pot tested at the factory to prevent any potential bare wire or shot circuit defects.

2. The raceway base, cover, and device bracket shall be manufactured of steel and finished in ivory, gray enamel or custom colors suitable for field painting to match adjacent finishes.

3. The raceway shall be a two-piece design with a metal base and snap-on metal cover, except for the Wiremold V700 system, Hubbell HBL750 series and Mono-Systems Inc. S145-700 series that shall be a one-piece design. The base and cover sections shall be a minimum of 0.040 inch wall thickness. The base section shall be available in ten-foot lengths. A hand-operated cutting tool shall be available for the base and cover to ensure clean, square cuts. Wiremold V500, Hubbell V500, and Mono Systems inc. SM500 series are not permitted.

4. A full complement of fittings shall be furnished, including but not limited to, flat internal and external elbows, tees, entrance fittings, wire clips, cover clips, couplings, support clips, C-hangers and end caps. The fitting color shall match the raceway color. Fittings shall be supplied with a base where indicated and/or required. A take-off fitting shall be furnished as required to adapt to existing flush wall boxes.

5. Device brackets shall be furnished for mounting single or two-gang devices within the raceway. Devices shall be provided with the ability of mounting flush or in conjunction with standard steel, stainless steel, or manufacturer's metal faceplates.

6. The raceway shall be furnished with a complete line of connectivity outlets and modular inserts for unshielded twisted pair including category 5, fiber-optic, coaxial, and other cabling types with face plates and bezels to facilitate installation. Computer data installation shall be as required by other sections of this Division, and Division 27.

7. Raceway shall be furnished with corner elbows and tee fittings to maintain a cable bend radius which meets the requirements of fiber-optic and copper cables under EIA/TIA 569 for communications pathways.

G. Factory Pre-Wired Surface Metal Raceway:

1. Furnish and install pre-wired surface metal raceways as indicated on Drawings and as specified.

2. Metal Raceway shall be galvanized steel Wiremold V4000, Hubbell 4000 series, or Mono-Systems Inc. SMS-4000 series complete with raceway base, cover, fittings, receptacles and mounting plates required for a complete assembly. Raceway shall have two wiring compartments with integral dividing barrier for isolating the wiring compartments.

3. Pre-wired assembly shall be UL, or another NRTL listed as a multi-outlet assembly and surface raceway as labeled on interior of assembly.

4. Wiring devices and other components shall be factory installed, electrically wired and covers labeled as indicated on drawings. Each receptacle shall be identified with panelboard and circuit number from which it was fed.

Grounding shall be maintained by means of factory installed grounding conductors.

5. Where shown on Drawings, Raceway covers shall have provisions for mounting computer data outlets.
6. Complete assembly is to consist of required fittings such as elbows, slide couplings for joining raceway sections, blank end caps and flat tees.
7. Prewired assembly must contain no wire splices.
8. Receptacles and wiring shall be as indicated on drawings and as specified.
9. Where raceway is used for power and computer data outlets, installation of data outlets shall be as required by other sections of this specification.
10. Prior and during installation, verify and comply with manufacturer's installation instructions.
11. Entire assembly shall be tested for shorts, opens, ground faults, and wire insulation at factory and certified. Raceways shall be electrically continuous and bonded in accordance with California Electrical Code.
12. Submit shop drawings for approval showing the complete layout of all components of each raceway, raceway lengths, each component description, location and circuit identification.
13. All wiring devices shall be removable without requiring disassembly of wireway.
14. Standard non OEM wiring devices shall be used as specified in District's specifications.

H. Wireways shall be 16 gage galvanized steel enclosed hinge/screw wiring troughs, surface metal raceway, wireway, and auxiliary gutter designed to enclose electrical wiring. Wireway fittings shall be furnished with removable covers and sides to permit complete installation of conductors throughout the entire wireway run. Cover shall be furnished with keyhole slots to accept captive screws locking the cover securely closed. Wireways shall be UL or another NRTL listed, and shall be Square D Type LDB NEMA-1 enclosure for interior applications, or Type RDB NEMA-3R enclosure for exterior applications, or equal by Cooper B-line, Hoffman, Wire Guard, or Circle AW.

I. Penetration in Fire-Rated Structures: Provide 3M, or equal, sealant and fire barriers for installing fire-rated seals around penetrations through floors, walls, and elevator hoistways. Fire stop system must be UL, or another NRTL listed, and classified for through-penetration applications of metallic conduits and busways.

J. Pull Wires: Install 1/8 inch polypropylene cords in empty or spare conduits.

PART 3 - EXECUTION

3.01 CONDUIT INSTALLATION

A. General Requirements:

1. Provide complete and continuous systems of rigid metallic conduit, outlet boxes, junction boxes, fittings and cabinets for systems of electrical wiring including lighting, power, and signal systems, except as otherwise specified.

2. EMT may be installed in interior concealed applications and in areas approved by owner. EMT shall not be installed in concrete, directly buried underground, outdoors, in boiler rooms, elevator pits, or where subject to damage.

3. Within buildings, flexible steel conduit may be installed instead of rigid steel conduit where permitted by code. Flexible steel conduit shall be installed:

   a. For continuous lengths not exceeding more than 50 feet between pull points (pull boxes, outlet boxes, etcetera).

   b. With no maximum total raceway length located within a building interior when the flex is located in concealed locations.

4. Flexible Steel conduit shall not exceed 1-1/2 inches in size.

5. Liquid-tight flexible steel conduit shall only be installed, except where otherwise specified, for final connection of motor terminal boxes, shop equipment, cafeteria equipment, HVAC equipment and other equipment, or for frequent interchange, and shall be of sufficient length, not exceeding 36 inches, to permit full travel or adjustment of motor on its base. Liquid-tight flexible conduit shall not be used for equipment not requiring adjustment or frequent interchange.

6. Connectors for flexible metal conduit shall be made of steel, and of the types which threads into convolutions of conduit. Connectors for watertight flexible metal conduit shall be as required for installation and shall be installed to provide a watertight connection.

7. Exposed conduit shall be installed vertically and horizontally following the general configuration of the equipment, using cast threaded hub conduit fittings where required and shall be clamped to equipment with suitable iron brackets and one hole pipe strap.

8. If connection is from a flush wall-mounted junction box, install an approved extension box.

9. Underground feeder distribution conduits for systems may be non-metallic conduit instead of rigid conduit except where otherwise specified or indicated.

10. Conduit shall be concealed unless otherwise indicated. Conduits exposed to view, except those in attic spaces and under buildings, shall be installed parallel or at right angles to structural members, walls, or lines of building. Conduits shall be installed to clear access openings.

11. Bends or offsets will not be permitted unless absolutely necessary. Radius of each conduit bend or offset shall be as required by ordinance. Bends and offsets shall be performed with standard industry tools and equipment or may be factory fabricated bends or elbows complying with requirements for radius of bend specified. Heating of metallic conduit to facilitate bending is not permitted. Public telephone conduit bends and offsets shall be provided with a

radius which is not less than ten times trade size of conduit unless otherwise permitted. Refer to underground installation, specified in this section, for radius of bends and offsets required for underground installations.

12. Running threads are not permitted. Provide conduit unions where union joints are necessary. Conduit shall be maintained at least six inches from covering of hot water and steam pipes and 18 inches from flues and breechings. Open ends of conduits shall be sealed with permitted conduit seals during construction of buildings and during installation of underground systems.

13. Expansion Joints/Seismic Separations/Separations between buildings/Locations Indicated: Provide Thomas & Betts XJG-TB, O-Z Electrical Mfg. Co. Inc. Type AX with bonding strap and clamps. Crouse Hinds XJGD, or equal. At exterior locations, provide Thomas & Betts XJG-TB, O-Z Electrical Mfg. Co. Inc. Type EX, Crouse Hinds XJGD, or equal. Provide Crouse Hinds, Thomas & Betts, or O-Z Electrical Mfg. Co. Type AXDX, or equal Combination Deflection/Expansion Fittings at all seismic separations. Provide manufactures internal and external Bonding Jumpers at all locations. Liquid-tight flexible conduit shall not be approved at expansion joints or seismic separations.

14. Where conduits are terminated in groups at panelboards, switchboards, and signal cabinets, etc., provide templates or spacers to fasten conduits in proper position and to preserve alignment. Conduits terminating at signal cabinets shall only enter cabinets in the following locations:

    a. Conduits entering top, side, and bottom of cabinets shall be aligned in a single row, centered two inches from rear of cabinet.

    b. Conduits entering back of cabinet shall be aligned in a single row centered two inches from top of cabinet.

    c. Conduits shall not be spaced closer than three inches on centers.

15. Conduits above metal lath ceilings shall be rigidly suspended with pipe hangers or pipe racks or shall be secured to superstructure with factory fabricated 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 feet apart, shall fasten conduit tight against channels and studs at point of tie and shall not support any of conduit weight. Tie wire shall be 16 gage galvanized double annealed steel.

16. Where auxiliary supports, saddles, brackets, etc., are required to meet special conditions, they shall be fastened rigid and secure before conduit is attached.

17. Conduit in ceiling spaces, stud walls, and under floors, shall be supported with factory fabricated pipe straps or shall be suspended with pipe hangers or pipe racks. Pipe straps shall be attached to and shall fasten conduit tight at point of support against ceiling and floor joists, rafters, and wall studs, or two-inch x four-inch headers fitted between joists or wall studs.

18. Conduits installed on exposed steel trusses and rafters shall be fastened with factory fabricated conduit straps or clamps, which shall fasten conduit tight against supporting member at point of support.

19. Conduits installed under buildings shall be strapped with factory fabricated 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 are not permitted to be placed directly on grade; they shall be suspended from building or shall be buried below surface or ground. 1-1/4 inch and larger conduits under buildings shall be installed with conduit hangers or racks.

20. Pipe hangers for individual conduits shall be factory fabricated. Steel rods shall be 3/8 inch for two-inch conduit hangers and smaller and shall be 1/2 inch for 2 ½-inch conduit hangers and larger.

21. Pipe racks for groups of parallel conduits and for supporting total weights not exceeding 500 pounds shall be trapeze type and shall consist of a cross channel, Steel City Kindorf B-900, Unistrut P-1000, equivalent Cooper B-Line or equal, suspended with a 3/8 inch minimum diameter steel rod at each end. Rods shall be fastened with nuts, top and bottom to cross-channel and with square washers on top of channel. Conduits shall be clamped to top for cross-channel with conduit clamps, Steel City Kindorf C-105 or Unistrut P-1111 through P-1124, equivalent Cooper B-Line, or equal. Conduits shall not be stacked one on top of another, but a maximum of two tiers may be on same rack providing an additional cross-channel is installed. Where a pipe rack is to be longer than 24 inches, or if the supported weight exceeds 500 pounds, submit Shop Drawings of installation to the Architect for review.

22. Conduits suspended on rods more than two feet long shall be rigidly braced to prevent horizontal motion or swaying. Installation shall meet zone 4 seismic requirements.

23. Factory fabricated pipe straps shall be one or two-hole formed galvanized clamps, heavy-duty type, except where otherwise specified.

24. Hangers, straps, rods, or pipe supports under concrete shall be attached to inserts set at time concrete is placed, or with approved concrete anchors. Under wood, install bolts, lag bolts, or lag screws; under steel joists or trusses, install beam clamps. Contractor shall submit size of anchors, bolts, screws, and installation method to Architect for approval prior to start of any work.

25. Conduits shall be supported at intervals required by code, but not to exceed ten feet. One inch and smaller exposed conduits shall be fastened with one-hole malleable iron straps. Perforated straps and plumber's tape is not permitted for the support of conduits.

26. Conduits stubbed up through a roof or an arcade shall be flashed with a waterproof flashing. Refer to Division 07 for additional requirements.

27. Bushings and locknuts for rigid steel conduit shall be steel threaded insulating type. Setscrew bushings are not permitted.

28. Flex conduits shall be cut square and not at an angle.

29. Routing of conduits may be changed providing length of any conduit run is not increased more than ten percent of the length indicated on Drawings.

B. Underground Requirements:

1. Conduits and multicell raceways installed underground shall be entirely encased in three inch thick concrete on all sides , except where otherwise specified. Provide required spacers to prevent any deflection when concrete is placed and to preserve position and alignment. Conduits and raceways shall be tied to spacers. Anchors shall be installed to prevent floating of conduits and raceways during placing of concrete. Provide red colored concrete to encase conduits of systems operating above 600 volts.

2. Underground conduits and raceways shall be buried to a depth of not less than 24 inches below finished grade to top of the concrete envelope, unless otherwise specified.

3. Assemble sections of conduit with required fittings. Cut ends of conduit shall be reamed to remove rough edges. Joints in conduits shall be provided liquid-tight. Bends at risers shall be completely below surface where possible.

4. Conduits and raceways in a common trench shall be separated by at least three inches of concrete. Electrical power and/or lighting conduit runs installed in a common trench with conduits containing signal system wiring such as public address, telephone, intrusion detection, fire alarm, television, computer networking, and clock systems shall maintain a separation of a minimum of six inches from these types of signal system conduits and raceways. Electrical power, lighting and signal conduits and raceways installed in a common trench with other utility lines such as gas, water, sewer and storm lines shall maintain 12 inches separation from these types of utility lines.

5. The Inspector will observe underground installations before and during concrete placement. A mandrel shall be drawn through each run of conduit in presence of the Inspector before and after placing concrete. Mandrel shall be six inches in length minimum, and have a diameter that is within 1/4 inches of diameter of conduit to be tested.

6. Non-metallic conduit installations shall comply with following additional requirements. Joints in PVC conduit shall be sealed by means of required solvent-weld cement supplied by conduit manufacturer. Non-metallic conduit bends and deflections shall comply with requirements of applicable electrical code, except that minimum radius of any bend or offset for conduits sized from 1/2 inch to 1 ½-inch inclusive shall not be less than 24 inches. Bends at risers and risers shall be PVC-coated rigid steel conduit. Radius of curve of bends or offsets in non-metallic conduit for public telephone system shall be not less than ten times trade size of conduit, unless otherwise specifically permitted.

7. Furnish and install a six-inch wide, polyethylene, red underground barrier type 12 inches above full length of concrete reading, "CAUTION ELECTRIC LINE BURIED BELOW".

8. Underground conduit systems provided for utility companies shall be furnished to meet the requirements of the utility companies requiring service.

9. Protect inside of conduit and raceway from dirt and rubbish during construction by capping openings.

10. Add bell-end bushings for conduit stub-up including underground entries to pull boxes, and manholes. Under floor standing switchboards and motor control centers provide a four-inch galvanized nipple with ground bushing.

11. Underground conduit for systems operating above 600 volts shall be a minimum size of four inches.

12. At portable classroom all stub ups shall be installed with a coupling flush to finish grade.

13. Underground conduits and raceways shall be swabbed prior to wire pull.

C. Rooftop conduit shall be supported from channels, stands, clamps, trapezes, rollers, or structures mounted on 100% rubber, UV resistant rooftop supports with reflective strips, Dura-Blok, or equal. Roller type supports shall be provided below and above conduit to prevent its dislodgement. Bottom of conduits shall clear the roof surface by 10 inches.

1. At PVC roofing provide walk tread, polyester reinforced, UV resistant, with surface embossment at rooftop supports. Heat welding of walk pads shall only be done by manufacturer certified installers.

a. Sika-Sarnafil and Carlisle: Walk tread shall be no more than one inch larger than the plan area of the pipe support blocks and adhered to the roof membrane with Sika 1A or Carlisle Universal Single-Ply sealant, as applicable.

b. Johns Manville: Walk tread shall be installed under the pipe support blocks and adhered to the blocks, if possible, and left loose laid on top of the PVC roof system. Walk-pad shall have a minimum of 4 inches of material past perimeter on all 4 sides of block.

2. Built-up roofing: Provide APP granulated modified torch-down at each pipe support block. Torch-down shall extend 2 to 4 inches beyond the edges of the block and adhered by torch application over existing cap sheet membrane. This work shall be performed by a certified roofer.

D. General Installation Requirements for Computer Network System Conduits:

1. Location of outlet boxes and equipment on Drawings is approximate, unless dimensions are indicated. Drawings shall not be scaled to determine position and routing of wireways, drops, 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 start of Work.

2. The maximum pulling tensions of the specified cables shall not be exceeded and proper radius of cable bends shall be maintained.

3. For computer network wiring, conduit types shall be limited to rigid metal conduit, electrical metallic tubing, schedule 40 PVC, multi-cell raceways, and flexible metallic conduit for lengths less than six feet.

4. Interior section of conduit run shall be not longer than 100 feet and shall not contain more than two bends of 90 degrees between pull points or pull boxes.

5. The inside radius of a conduit bend shall be at least six times the internal diameter of the conduit. When the conduit size is greater than two inches, the inside radius shall be at least ten times the internal diameter of the conduit. For fiber-optic cable, the inside radius of a conduit bend shall be at least ten times the internal diameter of the conduit.

6. Conduit shall be sized in accordance with Table 4.4-1 of EIA/ TIA 569 standard.

7. Splicing or terminating cables in pull boxes is not permitted.

8. For indoor application, a pull box shall be provided in conduit run where:

   a. The length is over 100 feet.

   b. There are more than two bends of 90 degrees.

   c. There is a reverse bend in the run.

9. Boxes shall be provided in a straight section of conduit and shall not be installed in lieu of a bend. The corresponding conduit ends are to be aligned with each other. Conduit fittings shall not be installed in place of pull boxes.

10. Where a pull box is provided with raceways, pull box shall comply with the following:

    a. For straight pull-through, provide a length of at least eight times the trade-size diameter of the largest raceway.

    b. For angle and U-pulls:

       1) Provide a distance between each raceway entry inside the box and the opposite wall of the box of at least six times the trade-size diameter of the largest raceway, this distance being increased by the sum of the trade-size diameters of the other raceways on the same wall of the box.

       2) Provide a distance between the nearest edges of each raceway entry enclosing the same conductor of at least:

          a) Six times the trade-size diameter of the raceway; or

          b) Six times the trade-size diameter of the larger raceway if they are of different size.

          c) For a raceway entering the wall of a pull box opposite to a removable cover, provide a distance from the wall to

the cover of not less than the trade-size diameter of the largest raceway plus six times the diameter of the largest conductor.

11. Drawings generally indicate Work to be installed, but do not indicate all bends, transitions of special fittings required to clear beams, girders or other Work already in place. Investigate conditions where conduits and wireways are to be installed, and furnish and install required fittings.

E. Slabs on Grade:

1. Unless specifically reviewed by the Architect and DSA, conduits 1 ¼-inches and larger are not permitted to be installed in structural concrete slabs. Where conduits are permitted, and are installed in concrete slabs on grade, slabs shall be thickened at bottom where conduits occur to provide three inches of concrete between conduit and earth. Required excavation shall be part of the Work of this section.

2. If concrete slab is five inches or more in thickness with a moisture barrier plastic sheet between earth and slab, one inch and smaller conduits shall be installed in the slab with a minimum of one inch concrete between earth and conduit.

F. Concrete Walls, Beams, and Floors: Provide sleeves where conduits pierce concrete walls, beams, and floors, except floor slabs on grade. Sleeves shall provide 1/2 inch clearance around conduits. Sleeves shall not extend beyond exposed surfaces of concrete and shall be securely fastened to forms. Where conduits pass through walls below grade, seal with required sealant and backer materials between conduit and sleeve to provide a watertight joint. Sealant shall be as indicated in Section 07 9200: Joint Sealants.

3.02 STUBS

A. Panelboard: Install two one inch conduits from each flush mounted panelboard to access under floor space and to access above ceiling space where these conditions occur. Cap conduits with standard galvanized pipe caps.

B. Floor: At points where floor stubs are indicated in open floor areas, for connections to machines and equipment, conduits shall be terminated with couplings, tops flush with finished floor. Stubs shall extend above couplings the indicated distance. Where capped stubs are designated, couplings shall be closed with cast iron plugs with screw drive slots.

C. Underground:

1. Underground conduit stubs shall be terminated at locations indicated, and shall extend five feet beyond building foundations, steps, arcades, concrete walks and paving. Rigid metallic conduit stubs and non-metallic conduit stubs shall be capped by installing a coupling flush in end wall of concrete encasement and plugging with a permitted plug. Project record drawings shall indicate location of ends of underground conduit stubs fully dimensioned and triangulated with reference to buildings or permanent landmarks. These dimensions, including depth below finished grade, shall be marked on project record drawings in

presence of the Inspector before backfilling trench. Where extending existing concrete encased stubs, clean, chip and wire brush end of existing concrete and brush on a heavy coat of neat cement paste or epoxy bonding agent.

2. Over ends of individual underground conduit stubs or groups of conduit stubs, install four-inch by 18-inch deep PVC filled with concrete, flush with finished grade in asphaltic concrete or lawns, and two inches above finished grade in planting areas. Cast a three-inch by three-inch brass plate engraved "ELECT" flush in top of concrete. Secure plate to concrete with brass dowels or as indicated on drawings.

3.03 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.04 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 26 0800

ELECTRICAL SYSTEMS COMMISSIONING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Section Includes:

1. General requirements for Commissioning (Cx) of lighting systems components, lighting controls and HVAC systems line voltage interconnection components, 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 1, Section 01 9113 General Commissioning Requirements. Coordinate work with the Commissioning Services Provider (CxSP).

1.02 RELATED REQUIREMENTS

A. Division 01 - General Requirements.

B. Section 01 9113: General Commissioning Requirements.

C. Section 01 7900: Maintenance and Operations Staff Demonstration and Training.

D. Section 23 8000: Heating, Ventilation, and Air Conditioning Equipment.

E. Section 23 0800: HVAC Systems Commissioning.

F. Section 23 0923: Environmental Control and Energy Management Systems.

G. Section 23 0813: Environmental Controls and Energy Management System Commissioning.

H. Section 26 0500: Common Work Results for Electrical.

I. Section 26 0513: Basic Electrical Materials and Methods.

J. Section 26 0526: Grounding and Bonding.

K. Section 26 0519: Low Voltage Wires (600 Volt AC).

L. Section 26 5010: Solid State (LED) Lighting.

M. Section 26 0923: Lighting Control Systems.

1.03 REFERENCES

A. Applicable codes, standards, and references: inspections and tests shall be in accordance with the following applicable codes and standards:

1. National Electrical Testing Association – NETA.
2. National Electrical manufacturer's Association – NEMA.
3. American Society for Testing and Materials – ASTM.
4. Institute of Electrical and Electronic 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 Green Building Standards Code (CalGreen).
10. Conglomerate for High Performance Schools (CHPS).
11. Insulated Power Cables Engineers Association – IPCEA.
12. Occupational Safety and Health Administration – OSHA.
13. National Institute of Standards and Technology – NIST.
14. National Fire Protection Association – NFPA.
15. California Electrical Code.
16. ANSI/NFPA 70B – Electrical Equipment Maintenance.
17. NFPA 70E – Electrical Safety Requirements for Employee Work Places.
18. ANSI/NFPA 101– Life Safety Code.

1.04 SUBMITTALS

A. Submittals shall include the following:

1. Submit required Cx submittals in accordance with Division 1 Specification Sections.
2. Copy of the Architect's reviewed and accepted submittals to the CxSP via the OAR.
3. List of team members who will represent the CONTRACTOR in the Pre-functional Equipment Checks 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 Pre-functional Tests, at least four weeks prior to the start of Pre-functional Performance Tests.

6. 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.

1.05 MEETINGS, SEQUENCING AND SCHEDULING

A. Meetings: Attend (Cx) meetings as required under Section 01 9113 and the Cx Plan.

B. Sequencing and Scheduling: The work described in this Section shall begin only after work required in related Division 26 Sections has been successfully completed, and tests, inspection reports and Operation and Maintenance manuals required in Division 26 Sections have been submitted and approved. 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. Refer to the project's Cx Plan for more details.

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 Cx plan.

1.06 QUALITY CONTROL

A. Comply with OWNER's Quality Control Specifications, Sections 01 4516 – 01 4519, as applicable.

B. Incorporate manufacturer's recommended Cx procedures for the systems and equipment to be commissioned under this Section.

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 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 per NIST Standards.

4. Testing equipment shall be UL Listed.

PART 3 – EXECUTION

3.01 COMMISSIONING PROCESS REQUIREMENTS

A. Work to be performed prior to commissioning:

1. Complete all phases of the work so the system(s) can be started, tested, adjusted, balanced, and otherwise commissioned.

2. Start-up services required to bring each system into full operational state and ready for functional performance testing:

a. Completion of authorized manufacturer representative's start-up procedures and recommendations.

1. Provide Manufacture's start-up completed forms.

b. Completion of pre-functional checklists.

c. Copy of required manufacturer and field testing.

d. Motor rotation check.

e. Control sequences of operation.

f. Full and partial load performance.

3. If modifications or corrections to the installed systems are required to bring the system(s) to acceptance levels due to CONTRACTOR's incorrect installation or defective materials, such modifications or corrections shall be made at no additional cost to the OWNER.

4. Functional tests shall not start until each system is complete and the above items have been documented and submitted to the Engineer of Record, Cx Services Provider and OWNER for review.

B. Pre-commissioning Responsibilities: Inspection, calibration and testing of the equipment and devices necessary to commission the following systems:

1. Electrical Lighting Systems.

2. Lighting Controls.

3. HVAC line voltage electrical components.

4. Line voltage interface of Environmental Controls and Energy Management System with other systems.

5. Photovoltaic Systems.

C. Commissioning Process Requirements: Refer to Section 01 9113 General Commissioning Requirements, related sections and Cx Plan for information on meetings, start-up plans, Pre-Functional and Functional Performance Testing (FPT), operations and maintenance data, and other Commissioning activities.

3.02 PREPARATION

A. Provide certified electricians and/or qualified personnel as required with adequate tools and equipment necessary to perform Cx activities.

B. Provide all equipment required for the commissioning of equipment and systems indicated in article 3.01.B.

C. Provide certified testing agency personnel or report(s) as required in the Cx Plan.

3.03 TESTING

A. Testing documentation 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 the first commissioning test, or a retest following correction of a previously identified 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, and status and operating conditions that impact the results of the test.
7. Systems and assemblies test results, performance and compliance with contract requirements.
8. Issue number and description of corrected issue that prompted retesting.
9. Name and signature(s) of witnesses and the person(s) who performed the test(s).

B. Test lighting and controls systems to verify performance, operation, functionality, light levels, energy usage, and compliance with construction documents.

1. Start up, test and document results under the observation of the CxSP.
2. Execute the Functional Performance Test (FPT) under the observation of the CxSP.
3. Provide completed and signed FPTs to CxSP for inclusion in the commissioning report.
4. Functions and Testing Conditions:

a. Occupancy sensors and timer controls for lighting:

1) Verify that specified functions and features are set up, debugged and fully operable at time of test.

2) Verify that occupant override feature functions as intended in the contract documents.

3) Verify that sensors response times/durations are set properly.

4) Test the sequence of operation for features and modes and confirm that adjustable times match the design specifications and contract documents.

5) Verify that sensors are located per manufacturer's recommendations.

b. Electric lighting dimming, photocells and controls:

1) Test the dimming controls during daytime when conditions are such that controls should be dimming electric lighting.

2) Verify that amperage changes in light fixtures are proportional to external light changes. Verify that dimmed light levels uniformity at the specified work plane remain within specified limits.

3) Verify that delays and ramp times are set and functioning so that the speed of change of light fixture output is slow enough to not bother occupants, and in compliance with the specifications.

4) Verify that dimming does not cause lower than specified light levels in adjacent "non-dimmed" spaces.

5) Verify that the controls and sensors cannot be easily overridden or disabled by occupants.

6) Verify that dimming systems in places of assembly are interfaced with the Central Fire Alarm system.

7) Verify that dimmed lighting in these areas shall come back to full bright during a fire alarm or emergency condition.

c. Illumination Levels, Night Conditions:

1) Verify that lighting throughout the building is operating automatically.

2) Test with doors closed (to simulate actual occupancy) and after finishes are complete.

d. Illumination Levels, Day Conditions:

1) Verify that lighting levels comply with average maintained foot-candle levels shown on plans.

2) Verify that lighting throughout the building is operating automatically.

2) Test with doors closed (to simulate actual occupancy), after finishes are complete, and room is furnished.

3) Test at different times during the day, or under OWNER-approved simulated conditions, to ensure proper system response and to determine that lighting levels are within specified requirements.

4) In classrooms and educational spaces test the system for the different pre-determined settings. Quiet time, AV mode, all on/off, up/down dimming, and standard operations.

e. Lighting Power Density: Verify building lighting power density. Perform the test with interior lighting turned on and any manual or automatic controls temporarily overridden. Provide statement of compliance with 100% design energy report. Measurements shall be taken at least one minute after lights are turned on.

f. Emergency Lighting System: Verify that the system operates automatically under any condition, without human intervention, and that it resets back to normal operations after the power failure or emergency condition is over or cleared.

5. Acceptance Criteria:

a. Lighting Controls: For the conditions, sequences and modes tested; dimming, occupancy, photocell, and timing controls, integral components and related equipment shall respond to changing conditions and parameters defined in the Contract Documents.

b. Illumination Levels: Average light levels in the tested space at the work plane elevation shall be in the range of plus or minus 10% of the specified light level range for the space.

c. Lighting Power Density: Average instantaneous lighting power density shall be within plus or minus ten percent of that indicated in the Construction Documents.

d. Power factors on lighting circuits shall be greater or equal to 0.95, or as required by lighting fixture specifications.

e. Electrical system total harmonic distortion shall be smaller than 20%.

f. Electrical equipment AIC ratings shall be as indicated in construction drawings.

g. Feeders % voltage drop. Flag feeders with voltage drop greater than 3%.

6. Sampling Strategy for Identical Units:

a. Lighting Controls: Test all automatic interior lighting controls.

b. Illumination Levels: Test all spaces, zones and rooms to verify as proper light levels.

C. HVAC Electrical Component Testing

1. Document HVAC Division 23 electrical components using the startup procedure submitted by CONTRACTOR and accepted by the CxSP.
2. Complete and submit Start-up, Pre-functional, and Functional Checklists.
3. Verify the following information prior to HVAC system equipment startup.
    a. Voltage.
    b. Phase.
    c. Motor Size.
    d. Lock Rotor Amperage.
    e. Full Load Amperage.
    g. Minimum and Maximum Circuit Ampacity.
    h. Feeder protection or branch circuit protection, breaker or fuse size as applicable.
4. Coordinate and check corresponding unit electrical protection.

3.04 ADJUSTING

A. Incorrect installations, including improper adjustments may result in additional work being required for Cx acceptance.
    1. Perform work required to correct 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 the Cx Plan for retesting requirements necessary to achieve required system performance.
    2. If the systems' Cx deadline, as defined in the Cx Plan, goes beyond the scheduled completion of commissioning without resolution of the problem, the OWNER reserves the right to obtain supplementary services or equipment to resolve the problem.
        a. The cost of additional and/or supplementary services inquired by OWNER as a result of CONTRACTOR's lack of performance, or inability to resolve identified issues will be solely the responsibility of the CONTRACTOR.

3.05 TRAINING

A. Provide training and documentation as required in construction documents.

END OF SECTION

SECTION 26 0923

LIGHTING CONTROL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Low-voltage lighting control system.

2. Coordination with Theatrical and Broadcast Lighting Controls in Multi-Purpose Room, Auditorium, Flexible Drama Classroom and/or Media Production Classroom when they are included in the project.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 26 0500 – Common Work Results for Electrical.

3. Section 26 0513 – Basic Electrical Materials and Methods.

4. Section 26 0519 – Low-Voltage Wires (600 Volt AC).

5. Section 26_0526 – Grounding and Bonding.

6. Section 26 0533 – Raceways, Boxes, Fittings, and Supports.

7. Section 26 0800 – Electrical Systems Commissioning.

8. Section 26 2416 – Panelboards and Signal Terminal Cabinets.

9. Section 26 5000 – Lighting.

10. Section 26 5010 – Solid State (LED) Lighting.

11. Section 26 5200 – Emergency Power.

C. Applicable Codes and Industry Standards:

1. California Electrical Code, Title 24, Part 3.

2. California Energy Code, Title 24, Part 6.

3. California Building Codes, Chapter 27 – Electrical.

4. California Civil Code Title 1.81.26 – Security of Connected Devices.

5. ANSI C137.5-2021 – Energy Reporting Requirements for Lighting Devices.

6. ANSI C137.6-2020 – Data Tagging Vocabulary (Semantic Model Elements) for Interoperability.

7. ANSI C136.50 – Energy Measurement for a Network Lighting Control (NLC) Devices.

8. ANSI C136.52 – Metering Performance Requirements for LED Drivers with Integral Energy Measurement.

9. ANSI/UL 2900-1 – Standard for Software Cybersecurity for Network-Connectable Products, Part1: General Requirements.

10. ANSI/UL 2900-2-3 – Mitigation of Cybersecurity Risk.

11. NEMA-100 – Wire Insultation Colors for Lighting Systems.

12. ISO 27001 – Standards for Information Security Management Systems.

13. UL 916 – Standard for Safety Energy Management Equipment.

14. UL 924 - Standard for Safety Emergency Lighting and Power Equipment.

1.02 SUBMITTALS

A. Provide in accordance with Division 01.

B. Submit a complete one-line diagram of the proposed system configuration for Architect/Engineer's review. The riser diagram shall identify all wiring, equipment, components, system backbone network, interconnection with other systems, including IT network equipment, and location and type of raceways.

C. Manufacturer's Data: Submit catalog cuts and description of each system component.

D. Provide wiring diagrams and installation details for lighting control equipment.

E. Provide a complete sequence of operation and system interface requirements with fire alarm, building management system, demand response, and other applicable systems as depicted in construction documents.

F. Shop Drawings: Submit a complete set of detailed Shop Drawings for the entire lighting control system; the shop drawings shall include but not limited to relay panels with designations and dimensions, day light sensors locations based on manufacturer's recommendations, and system components with manufacturer's part numbers.

G. Provide completed CONRACTOR's startup and commissioning worksheet(s) prior to onsite startup and programming.

H. Submit manufacturer's written installation instructions, wiring diagrams. Instructions shall include recommendations for handling of equipment and parts, and protection and storage requirements.

I. Provide software flow diagram(s) and complete sequence of operations.

J. Software licenses and electronic keys, and list of assigned passwords.

K. Provide a statement of compliance applicable with industry standards indicated in 1.01.C.

L. A complete list of recommended spare parts with pricing for the OWNER's use in keeping the environmental control system downtime to a minimum.

M. Submit complete operation and service manuals. Manuals shall be bound in flexible binders, data shall be typewritten or drafted.

1. Manuals shall include instructions necessary for proper operation and servicing of system and shall include complete wiring circuit diagrams of system, wiring destination schedules for circuits and replacement part numbers.

2. Manuals shall include as-built cable, project site plot and floor plans indicating cables, both underground and in each building with conduit, and as-built coding used on cables.

3. Manuals shall include complete programming forms.

N. Record drawings: Provide (3) printed and one electronic copy on flush media of as built documents in latest version of AutoCAD of the entire system; including, floor plans with equipment, and devices layouts and wiring, interconnections with other systems, conduit and cable runs, programmed configurations, sequence of operations, system labeling codes, system passwords, and other pertinent information.

1.03 SUBSTITUTIONS

A. Documentation must comply with contract general provisions and the following requirements:

1. Provide a comparison matrix that with substantiating evidence that depicts how the proposed system meets the requirements of this section.

1.04 QUALITY ASSURANCE

A. Components shall be listed, labeled, and comply with the applicable requirements indicated under article 1.01.C. Listing by another Nationally Recognized Testing Laboratory (NRTL) that proves compliance with the applicable standards is acceptable.

B. Lighting control system and peripheral devices with IP addresses shall be UL listed in compliance with UL-2900-1 – Standard for Safety, Software Cybersecurity for Network-Connectable Products.

C. System components shall comply with Communications Federal Regulations (CFR) Title 47, Part 15 standards where applicable.

D. The lighting control system shall comply with the applicable requirements of the California Civil Code Title 1.81.26 – Security of Connected Devices.

E. The system components shall comply with Cal. Prop. 65 carcinogenic substances content restrictions, or RoHS compliance equivalent.

F. Conduct a coordination meeting with the lighting control CONTRACTOR, electrical CONTRACTOR, EOR, Manufacturer Representative, Commissioning Agent, and the OAR to validate the location of lighting control system components, including daylight, vacancy, motion sensors. Sensors shall be located based on manufacturer's recommendations.

G. Systems components shall be Title 24 compliant and listed as California Energy Commission approved products.

H. System startup shall be performed by qualified personnel approved or certified by the equipment manufacturer.

I. The System shall provide optional cellular connectivity to assist OWNER with remote support within the continental United States.

1.05 COMMISSIONING

A. CONTRACTOR shall follow the commissioning responsibilities stated in Section 01 9113, General Commissioning Requirements.

B. A Commissioning Services Provider (CxSP) retained by the OWNER will lead and provide Commissioning (Cx) and test and acceptance of the lighting control system, including submittal review, installation, testing, documentation, and training as indicated in section 26 0800 – Electrical Systems Commissioning.

C. CONTRACTOR shall provide all tools and personnel, and perform start-up, prefunctional and functional performance testing in the presence of the OWNER's Commissioning Services Provider.

1.06 WARRANTY

A. Lighting control system shall be warranted to be free from defects in materials and fabrication for a period of three-years from the date of substantial completion.

B. Installer shall provide a 2-year installation warranty.

C. Warranty exclusion for third party components is not acceptable.

1.07 TRAINING

A. Provide competent instructors who are factory trained and have comprehensive knowledge of system components and operations.

B. Provide full training and instruction about the installed system and equipment to OWNER's designated personnel.

C. Training shall include system operation, maintenance, programming, components replacement and monitoring.

D. Training shall include system overview, time schedules, override commands, emergency operation, and programming and report generation for school based non-technical personnel.

E. Provide two four hours hands on training sessions for OWNER's school-based personnel and Maintenance and Operations technical employees; this training sessions shall cover and provide the following:

1. As-built drawings of System layouts and point to point connection diagrams.

2. System components cut sheets.

3. Operations and maintenance procedures.

4. Components replacement and functional testing.

5. Programming and maintenance training: database entry; trend logs application programs, diagnostic routines, reporting, failure recovery and calibration, and expose the trainees to system's features, components, system architecture, operations, programming and reprogramming, report generation, communications, reading and interpreting alarms, and any other pertinent information required for the operations and maintenance of the system.

6. Training sessions shall accommodate a minimum of 20 persons and be facilitated at CONTRACTOR's training facility, which should be no more than 40 miles from the Project Site.

7. Obtain OWNER's approval for training locations exceeding 40 miles. In such cases, the CONTRACTOR shall be responsible for transportation expenses.

8. CONTRACTOR shall provide training computers for all attendees. Computers shall be ready for live training sessions.

9. Instructor(s) shall give the trainees the opportunity to practice on simulated and actual (installed) systems.

F. The 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.

PART 2 - PRODUCTS

2.01. SYSTEM REQUIREMENTS

A. The system architecture shall be a distributed networkable intelligent lighting control system that communicates via common data lines, is capable of wireless communications, has options for standalone lighting control zones using distributed intelligence, and remote, time based, and global operation.

B. System Controller shall be multi-tasking, real-time digital controller consisting of modular hardware with plug-in enclosed processors, communication controllers, and power supplies. The Controller shall perform the following functions:

1. Global communication between and among the controlled areas or zones.

2. The system shall interface via a Cat 5e or Cat 6 cable with all system components and devices.

3. Automatic detection and time-based control of all network devices connected to it.

4. System shall connect to the school's Local Area Network (LAN) via IEEE 802.3 Wired connection. The system shall have option for 802.11.x Wireless connection.

C. The system shall be capable of functioning via a system backbone that allows remote, time based, and global operations.

D. The system shall be furnished with networkable and individually addressable relay panels (complete with relays, transformers, and control electronics), intelligent lighting control devices that shall include but not limited to Remote Room Controllers (RRC), Remote Relay Panels (RRP), Remote Dimmer Packs (RDP), indoor occupancy and vacancy sensors, indoor and outdoor motion sensors, photocell sensor, contact closure input/output, master override switches, local wall switches, dimmer switches, scene switches, input/output auxiliary devices, other devices indicated in construction drawings, and conduit and wiring for a complete and functional installation.

1. Software shall be resident in the lighting control system.

2. System shall provide local access to programming functions at the master Lighting Control Panel (LCP) or master IP Controller and remote access to programming functions via computers or other intelligent communication devices running an industry standard internet browser.

3. System software shall provide real time status of all components and ancillary devices.

4. The system shall connect to various software interfaces, including management interface, historical database and analytics interface, visualization interface, and personal control applications.

5. For on-site access, the lighting control system shall have a built-in touchscreen and/or common dataline port for PC/Laptop connection to allow access to localized control and programming by authorized individuals.

E. Areas controlled by occupancy sensor(s); such as rooms with one luminaire and emergency fixtures designed to operate 24 hours a day, seven days a week shall be programmed accordingly.

F. The system controller shall connect the lighting control system to the system software interface and to the building management systems via BACnet/IP or BACnet MS/TP protocol.

1. The lighting control shall provide an integrative Lighting Control System with Floor Plan Graphics to be mirrored in the Energy Management System.

a) Integrate the Lighting Control System (LCS) with the energy management system to display all lighting control points on floor plan graphics, including room set-up showing visual representation of the space. This integration shall be achieved through the following functionalities:

1) Data Acquisition:

a. The LCS shall share real-time lighting data with the EMS via BACnet communication protocol.

b. The data shall include system and component level. At the system level, the following shall be reported:

1. Overall System Status: Operational (On/Off), Faults, Alerts, Warnings.

2. Dimming levels: Average across zones, manual or automatic control.

3. Occupancy sensor status: Occupied/Vacant status per zone.

4. Rooms or zones status: On/Off.

5. Scheduled Operations: On/Off times, dimming profiles, event triggers.

c. At the component and peripheral devices level the following shall be reported:

1. Control Devices: status of gateways, controllers, communication failures.

2. Sensors: Occupancy, vacancy, daylight, and motion sensor status. Presets - settings and calibration.

3. Emergency Lighting: System operational, UPS and battery status, faults and alarm conditions.

4. Timers: Schedule adherence, overrides, manual interventions.

5. Power Supplies: Voltage, current, temperature, efficiency metrics.

d. Report data at appropriate levels (system, room, zone).

2) Sequence of Operations and points to monitor:

a. ADR programming and status.

b. Dimming Control – Monitor dimming response, and compliance with schedules.

c. Fault Detection and Response – Alert for system components failures, communication losses, sensor malfunctions.

d. Maintenance Alerts –Set customizable thresholds for faults, warnings, and alerts to prioritize critical issues.

e. Data Logging and Trend Analysis: Track long-term system performance.

3) Visualization:

a. The EMS shall display the acquired lighting data on floor plan graphics alongside the existing HVAC system information but be capable to isolate lighting and HVAC to show both systems independently of each other. Present information in clear, user-friendly dashboards for easy monitoring and analysis.

b. All available system BACnet points shall be mapped to the EMS and presented graphically with the ability to read and write (control or override) the points via the graphics.

c. The site and floor plans graphics shall include the location of the exterior photocell(s) and Lighting Control Panel(s). Space graphics should have a visual representation of the space showing the lighting layout, light level, room controller, and its

accessories. There should also be a link to any interlocked equipment.

d. Lighting zones shall be represented using clear and distinct visual elements (e.g., color coding, icons) that are readily identifiable on the floor plan.

e. The interface shall allow for dynamic updates to lighting data, reflecting real-time changes in the LCS.

4) Control: The EMS shall offer basic control functionalities for the LCS, enabling users to turn individual lighting zones on/off, Adjust the dimming level of individual zones or groups of zones, and create and schedule lighting scenes for different needs and times of day.

5) Security: Provide user authentication and authorization mechanisms to restrict access to sensitive information and control functions of the LCS. Provide user authentication and authorization protocols in compliance with LAUSD ITS requirements.

6) Performance: Integrate the LCS with EMS in a manner that does not adversely affect the overall performance of the EMS.

7) Documentation:

b) Provide comprehensive documentation for the integration of the LCS, including detailed descriptions of data formats, communication protocols, sequence of operations, and control functionalities.

c) The documentation shall be made readily accessible to system administrators and authorized users.

G. The system shall support activation of demand response levels from Demand Response Automation Servers (DRAS) via the Open ADR 2.0a protocol or equal.

H. The system shall have a server built into the master LCP or master IP Controller. The server shall effectively work/operate through HTML pages from any authorized workstation.

1. WEB front end shall be accessible over an OWNER provided Ethernet 10/100 Mpbs to the local area network.

2. Protocol shall be TCP/IP and allow either http (hypertext transfer protocol) or https (hypertext transfer protocol secured) connections.

I. PC/Laptops computers are not part of this section and will be provided by others. Non-networked, non-digital, non-server capable systems are not acceptable.

J. Lighting control system shall be able to be monitored and take commands from a remote Personal Computer (PC); should the remote PC go off-line system programming uploaded to the lighting control system shall continue to operate as intended. Systems requiring an on-line PC or server for normal operation are not acceptable

K. Devices shall be factory pre-addressed but be able to be field addressable also. Systems requiring field addressing only are not acceptable. Devices shall automatically detect all networked devices connected to it, including those connected to wired and wireless communication bridges.

L. Programs, schedules, time of day, etcetera, shall be held in non-volatile memory at power failure. At restoration of power, lighting control system shall implement programs required by current time and date.

M. System shall be capable of flashing lighting OFF/ON for any relay or lighting zone prior to the lights beings turned OFF. The warning interval time between the flash and the final lights off signal shall be definable for each zone. Occupant shall be able to override any scheduled OFF sweep using local lighting zone override switches within the zone or occupied space. Occupant override time shall be pre-programmed not to exceed two hours, or current California Title 24 requirements.

N. The system shall be capable of implementing ON, OFF, Raise (dimming), and Lower (dimming), and preset commands, group or zone by means of devices connected to programmable inputs in the lighting control system.

O. Programming, scheduling, and configuration shall be done at the master LCP or master IP Controller/Gateway and local area devices if non-networked, and/or remotely via the Internet, or system application. Remote connections shall function in real time control and real time feedback.

P. System may consist of centralized relay panels, distributed room controllers (relay packs and dimmer packs), digital switches, analog switches, photocells, occupancy and vacancy sensors (indoor), motion sensors (outdoor), lumen control devices, dimmer switches, and various digital interfaces. All system components, including remote and centralized room controllers, digital switches, etc. shall operate and be integrated as a network.

1. Remote Room Controllers (RRC) shall control lighting fixtures in that area or space.

2. The RRC shall provide power to ancillary and control devices, such as occupancy sensors, and take input from controlling devices, such as daylight and occupancy/vacancy sensors.

3. RRPs and/or digital-analog interfaces shall be capable of taking inputs from OWNER specification line voltage type switches.

Q. RRC, switches, photocells and occupancy sensors, and ancillary devices and components shall be integrated per lighting control manufacturer’s instructions.

R. Location of devices and relay panels or relay controllers installed above ceilings shall be identified with a printed label attached to ceiling elements. Locate label directly below equipment location.

S. System shall interface and communicate with the school's energy management system (EMS) and shall be programed to address demand respond signals from EMS.

T. Dimming signal shall be open source type: 0-10vdc, phase dimming, forward phase, and/or reverse phase. Remote relay panels, relay packs, dimmer packs, switches, photocells and occupancy sensors shall be wired per lighting control manufacturer's instructions.

U. All system devices shall support local and remote firmware updates.

V. Refer to attachment A – Lighting Controls Approved Manufacturers and Products for a listing of approved systems.

2.02. LIGHTING CONTROL OVERVIEW-BY AREA CONTROLLED

A. Classrooms:

Classrooms shall be provided with a combination of vacancy sensors, daylight controllers and dimmers switches.

1. The vacancy sensor shall automatically switch lights OFF when the room is not occupied for 15 minutes.
2. Daylight controls shall automatically adjust light intensity according to the natural light level in the room to maintain a uniform level of lighting as indicated in the construction documents.
3. The daylight sensors shall be enabled and disabled by the vacancy sensors to ensure daylight-controlled lights never automatically turn ON when room is unoccupied. The lighting control system shall allow an authorized person to disable the daylight sensors and dimming controls.
4. Wall switches, and dimmers shall manually switch lights ON/OFF and allow manual dimming controls. Switches shall comply with the operational requirements of the current T24, and include location of device, accessibility and override capability. The classroom shall be provided with two switch banks as follows:
   a. Provide a teacher and a classroom entrance dimming switch bank, each with five buttons multi-scene low voltage switches as follows:

Classroom Switch Banks		
1	All On	Set at 30 fc.
2	All Off	All Off
3	Audio/Visual.	Preset at 20 fc max. Down dimmable.
4	Teacher's whiteboard	on/off and up/down dimming capability

5	Quiet Time	Preset at 40 fc. for a period of 1 hour.

5. Quiet time switch shall dim up or down general lighting to 40 fc. The switch shall temporarily bypass the occupancy sensors for a pre-programmed period of one hour, or as indicated on drawings, and shall not allow the lighting to be modified or dimmed by any other means during the preset class period.

B. Drama and Media Production Classrooms: Classroom lighting shall be capable of being controlled by the theatrical and/or broadcast lighting controls. CONTRACTOR shall coordinate with Theatrical and/or Broadcast Lighting Consultant to provide an integrated system.

C. Multi-Purpose Rooms and Auditoriums: Architectural lighting shall be controlled by the theatrical lighting system. See theatrical lighting specification sections and coordinate with Theatrical Lighting Consultant.

D. Corridors and Open Areas:

Corridors and other common areas shall be controlled by a combination of programmable low voltage keyed switches and programmed time schedules.

1. Low voltage keyed switches shall manually switch lights ON and OFF.
2. The central timer shall automatically sweep lights OFF after hours and provide scheduling capability where occupancy sensors are not used.
3. Provide interior corridors with occupancy sensors. Utilize central timer to enable/disable occupancy sensing profiles based on school operating hours. During school hours, lights operate as High/Low based on occupancy (High = high end light output when occupants are detected; Low = 50% light output – no occupants in corridors). During after school hours, lights operate as High/Low/Off based on occupancy.

E. Custodial, Unsupervised and Equipment Rooms:

Provide occupancy sensors with automatic on-off capability in addition to manual switches, and programming features indicated on plans. These sensors shall turn off the lights in the room via 15 minutes pre-set programmable interval after the room has been vacated.

F. Exterior Security Lights:

Program exterior wall packs and security lights to be controlled via exterior light sensors, and time switches as indicated on drawings.

1. Program lights to ON state when natural lighting is below 5 foot-candles
2. Program lights to OFF when natural light level is greater than 5 foot-candles.

E. Exterior, Non-Security Lights:

Exterior non-security lighting in parking lots, corridors and pathways, and decorative lights shall be controlled via exterior light sensor working in conjunction with programmable controlled time schedules via the lighting control system.

1. Program lights to ON state when natural lighting is below 5 foot-candles, and when scheduled time is set to ON.
2. Program lights to OFF state when natural light level is greater than 5 foot-candles, and when scheduled time is set to OFF.
3. Motion sensors shall also be used for reduction of lighting to 50% when lights are on, but no occupant are in the vicinity.

F. Restrooms Lighting:

1. Students Restrooms and exhaust fans (fans interlocked with lighting):

a. Restroom lights shall be controlled from the lighting control panel via assigned relays or Remote Room Controllers (RRC).

b. Provide by-pass lock type, vandal resistance key operated switch adjacent to the door, and ceiling mounted occupancy sensors for on/off controls. Sensors shall be suitable for the environment.

c. The sensor shall turn off the lights via a programmable pre-set 15 minutes interval, after the room has been vacated.

2. Staff Restrooms Lights and Exhaust Fans (Fans interlocked with lights):

a. Restrooms lights and fan shall be controlled from the lighting control panel via assigned relays or RRC's.

b. Provide ceiling mounted occupancy sensors, and by-pass toggle switches for system override adjacent to the door.

c. The sensor shall turn off the lights via a programmable pre-set 15 minutes interval, after the room has been vacated.

G. Emergency Lighting:

1. Provide emergency lighting controls circuitry to achieve override or bypass of manually operated switches, lighting control systems, dimmers and occupancy sensors during power failures.

2. Each area of luminaries or groups of luminaries shall be equipped with and be controlled by a UL924 listed emergency lighting control unit to allow the detection of localized power failures.

2.03. SYSTEM BACKBONE & IP CONTROLLER

A. System IP Controller shall be a multi-tasking, real-time digital control processor consisting of modular hardware with plug-in enclosed processors, communication controllers, and power supplies.

B. System IP Controller shall perform the following functions:

1. Facilitation of global network communication between different areas and control zones.
2. Time-based control of downstream wired and wireless network devices.
3. System must be capable of interfacing directly with networked wired (Cat5e) and networked wireless lighting control devices including relay panels (complete with relays, transformers, and control electronics), intelligent lighting control devices that shall include but not limited to RRC's, remote relay and dimmer packs, occupancy sensor (indoor), motion sensor (outdoor), photocell sensor (indoor and outdoor), contact closure input/output, master override switches, local wall switches, dimmer switches, scene switches and input/output auxiliary devices.
4. Linking into an Ethernet network.
5. Integration with Building Management Systems (BMS) and Heating, Ventilation and Air Conditioning (HVAC) equipment.
6. Connection to various software interfaces, including management interface, historical database and analytics interface, visualization interface, and personal control applications.
7. The system shall support activation of demand response levels from Demand Response Automation Servers (DRAS) via the OpenADR 2.0a protocol.

C. System IP Controller shall not require a dedicated PC or a dedicated cloud connection.

D. Device shall automatically detect all networked devices connected to it, including those connected to wired and wireless communication bridges.

E. Device shall have a standard and astronomical internal time clock.

F. System IP Controller shall support BACnet/IP and BACnet/MSTP protocols to directly interface with BMS and HVAC equipment without the need for additional protocol translation gateways.

2.04. CENTRAL LIGHTING CONTROL PANELS

A. Central Lighting Control Panel (CLCP) shall be located in MDF room. Peripheral lighting control panels shall be in electrical rooms or electrical closets.

B. Panels shall be surface or flush mounted type as indicated on Drawings, with a hinged door assembly. Doors shall be furnished with flush type locks, spring latching, Corbin locks for metal doors, keyed to Corbin No. 60 keys. Panels shall include the following components or features:

1. Shall be preassembled and preaddressed with control equipment and relays as indicated on the lighting plans.
2. Shall be equipped with suitable dividers separating Class 1 and Class 2 compartments, 120v and 277v compartments as well as "normal and emergency" compartments.

3. Lighting control relays as indicated on Drawings. Provide 10 percent spare relays for centralized relay panels up to the maximum capacity of panel.

4. Shall be equipped with a neatly typewritten schedule with number and name of rooms or areas served by the relay circuits. Room numbers and names used shall be determined at the Project site and may not be those indicated on Drawings. Schedule shall indicate panel designation and voltage and shall be mounted in a frame under transparent plastic 1/32-inch-thick on inside of panel cabinet.

5. Each panel shall be rated for 120 or 277 VAC and UL 924 listed for controls of emergency lighting circuits.

6. Shall be preassembled, preprogrammed and include relays capable of switching 20 amps lighting loads minimum, for 120 or 277 VAC.

2.05. REMOTE ROOM CONTROLLERS

A. Remote Room Controllers (RRC) shall be mounted in the ceiling space as indicated on plans.

1. Each RRC shall be connected to the network lighting control system using manufacturer's recommended wiring method and configuration.

2. Provide a printed label "RLCP" to the T-bar grid below the RRC".

3. RRC shall have option for UL924 emergency bypass, without additional devices or accessories.

B. Each RRC shall contain the following hardware features:

1. Digital dataline switch inputs.

2. 12 VDC and/or 24 VDC inputs for occupancy sensors requiring DC voltage for analog occupancy sensors, or Digital dataline type inputs for occupancy and light sensors.

C. Switches shall be capable of switching individual relays, local groups of relays within the panel or global groups of relays system wide. Each switch shall be configured to be ON, OFF, RAISE, LOWER, Toggle, or preset scene.

D. The sensors shall be configured for automatic ON/OFF, OFF only (vacancy mode), Partial modes, or partial ON/OFF switching scenarios required for compliance with the California Energy Commission, T24 code requirements.

E. 0-10vdc dimming pack shall incorporate one optional Class 1 relay, optional 0-10vdc dimming output, contribute low voltage Class 2 power to rest of the system, and meets NEMA 410 ratings for LED/electronic ballast/driver inrush.

F. Photo sensor shall be linked with occupancy sensing so that when light levels are high enough, the occupancy/vacancy sensor will not switch the photo-controlled relays ON.

G. Devices shall be capable of being programmed and configured locally and remotely.

2.06. RELAYS

A. Relays shall be warranted for a minimum of 3-years.

B. Relays shall be individually added or replaced. Lighting control systems incapable of replacing individual relays are not acceptable.

C. Each lighting control relay shall be capable of controlling incandescent, fluorescent, LED driver sources, and HID lighting loads. Relays not rated for all types of lighting loads are not acceptable.

2.07. LOW VOLTAGE SWITCHES

A. Low voltage switches shall be wired in compliance with manufactures requirements. Digital switches shall be part of the lighting control system network. Provide stainless steel switch plates, unless noted otherwise in construction documents.

B. Physical removal of any single switch shall have no effect on the network lighting controls system communications. Lighting control systems requiring continuous connection of all low voltage switches is not acceptable.

Keyed switches shall be digital and provided with steel switch plates, unless noted otherwise in construction documents.

C. Classrooms with controlling luminaires in classrooms shall be digital and be wired to programmable inputs in the lighting control system network.

1. Each switch shall be programmed to control ON only, OFF only or ON and OFF, dimming, audio/visual, and quiet time mode.

2. Whiteboard luminaires shall be controlled independently with On, Off, and dimming capabilities.

D. High abuse areas (common areas, gymnasiums, etcetera) shall be controlled using a vandal resistant, touch sensitive high abuse switch and available with up to three buttons in a single gang. Multi gang versions shall also be available.

1. Touch pads shall be stainless steel and capable of handling both high abuse and power wash cleaning crews' activities.

2. Switches shall be digital or analog as indicted on plans.

3. High abuse switch touch buttons shall control a single relay or group(s) of relays of the lighting control system.

4. Touch buttons shall be controllable via programmed commands to enable or disable, ON, OFF, dimming, preset scene, toggle or maintain operation functions. Programming shall be done locally or remotely.

5. Touch pad(s) shall be identified as to function by an engraved label.

E. Switches must be capable of handling electrostatic discharges of at least 30,000 volts (1cm spark) without any interruption or failure in operation.

2.08. INTERIOR DAYLIGHT SENSORS

A. Interior daylight sensors shall cause light fixtures to brighten or dim to maintain pre-determined and uniform light levels.

B. The sensors shall permit any relay to switch at a unique light level and shall attempt to maintain a constant light level by switching individual relays ON or OFF as the ambient light level changes.

C. Controllers offering single set point controls are not acceptable.

D. Each interior daylight sensor shall continuously monitor the true light level and shall broadcast this level to lighting control network. Controllers requiring readings at the sensor head itself are not acceptable.

E. Each interior daylight sensor shall be fully adjustable via the lighting control software. Controllers requiring adjustments at the sensor head are not acceptable.

F. Provide daylight sensors in all rooms with windows, skylights, or daylight filtration. Refer to lighting plans to determine which switch legs are controlled by the daylight controller.

2.09. EXTERIOR LIGHT SENSORS

A. One exterior light sensor shall permit different relays to switch at different light levels. Sensors offering less than 14 remotely settable trip points are note acceptable.

B. Exterior light sensor shall continuously monitor light levels and shall broadcast this level over the lighting control network. Exterior light sensor shall be fully adjustable via the networked lighting control system.

C. Sensors and controllers requiring adjustments at the sensor head are not acceptable.

D. Sensors shall be UL or NRTL listed for exterior application.

2.10. DIMMING CONTROLLER

A. Remote relay panels or remote room controllers shall be capable of outputting 0–10vdc dimming signals. LED Dimming drivers shall be controlled by industry standard 0V-10V control input.

B. LED Drivers using proprietary control protocols shall not be acceptable.

C. To maximize daylight harvesting and minimize disruption to occupants, each dimming output shall provide adjustment for baseline, start point, mid-point, end point, trim fade up rate, fade down rate, time delay and enable/disable masking.

D. Photocell(s) settings must be remotely accessible.

E. Systems that provide ON, OFF with Time Delay only and systems that do not provide remote accessibility are not acceptable.

F. Mount photocells in locations indicated on plans and according to manufacturer's recommendations for daylight system type, open or closed loop. Trip points shall be able to be programmed and altered remotely via programming functions at the master Lighting Control Panel (LCP) and remote access to programming functions via computers or other intelligent communication devices.

G. Photocells requiring manual trip point adjustment, or systems that provide local adjustment only are not acceptable.

H. Photocells used for interior lighting control shall have multiple settings such as start-point, mid-point, off-point, fade-up rate, fade-down etc.

2.11. OCCUPANCY SENSORS

A. Occupancy Sensors:

1. Ceiling-Mounted Dual Technology Sensors:

a. Sensors shall be dual technology infrared-ultrasonic or infrared-microphonic capable of detecting presence in floor area to be controlled, by detecting Doppler shifts in transmitted ultrasound or passively detecting audible sounds, and infrared technology.

b. ADI-Voice technology may be used in addition to the required infrared-ultrasonic features.

c. Detection shall be maintained when a person moves only within a maximum distance of 12 inches, in either a horizontal or vertical manner, at approximate speed of 12 inches per second. Lights shall not go off when a person is reading or writing while seated at a desk.

d. Each sensor shall be furnished with a convenient shunt provision, which will enable a person to by-pass sensor in event of failure.

e. Sensitivity shall not change more than ten percent in temperature range of 0 degrees F. to 120 degrees F., and in humidity range of ten percent to 80 percent. Sensitivity adjustment shall be provided for each technology.

f. Time delay range shall be adjustable from 15 seconds to 15 minutes.

g. Sensors shall be powered by low voltage dataline or power pack, consisting of a transformer and contact closure relay in one package. Power output of transformer shall be capable of operating a minimum of two sensors.

2. Dual Technology Passive Infrared Wall Switch Sensors with Daylight Controls:

a. Sensors shall be capable of detecting presence in floor area to be controlled, by detecting changes in infrared-ultrasonic energy. Small movements shall be detected such as when a person is writing while seated at a desk.

b. Passive infrared sensor shall utilize a dual-element sensor and a multi-element fresnel lens.

c. Sensor shall be furnished with a daylight filter which ensures that sensor is insensitive to short-wavelength infrared waves, such as those emitted by the sun.

d. Sensors shall be furnished with convenient bypass provisions, which enable lighting to be turned on in case of failure.

e. Time delay range shall be adjustable from 15 seconds to 15 minutes.

f. Sensitivity adjustment shall range from 0 (off) to ten (maximum).

g. Adjustments and mounting hardware shall be concealed under a removable cover to prevent tampering with adjustments and hardware.

h. Each sensor shall cover up to 800 square feet, with a field-of-view of 180 degrees.

i. Sensor shall be digital or line voltage as indicated on drawings.

j. Power shall be provided via an internal transformer.

k. Switching mechanism shall be a latching dry contact relay.

l. Sensor shall be capable of switching from 30 to 1000 Watts, LED, incandescent or fluorescent light sources.

m. Sensor shall be furnished with a daylight feature, adjustable from ten to 400 foot-candles, that maintains lighting off when a desired foot-candle level is present.

n. Sensors shall be dual voltage, 120 volt and 277 Volt if line voltage powered.

2.12. UNIT INVERTERS

A. Unit Inverters shall be rapid start type consisting of emergency power packs designed to be installed in channels of new lighting fixtures.

B. Power pack construction shall be of durable polycarbonate housing.

C. Units shall be furnished with test switches and pilot lights.

D. Units shall automatically power designated lamp(s) for 90 minutes of emergency service upon failure of utility power.

E. Upon return of utility power, battery shall automatically recharge.

F. Batteries shall be field-replaceable, sealed, rechargeable, spill-proof, maintenance-free nickel cadmium.

G. High efficiency inverter/charger design shall include low voltage disconnects to prevent deep discharge of battery and dual voltage designed for connection to either 120 or 277 volts. Chargers shall recharge fully discharged batteries to provide 90 minutes operation within 24 hours. Power pack shall not operate if shut off manually.

H. An unconditional five-year warranty is required.

I. Approved products: Dual-Lite UFO-5 Series, Bodine, Iota I series, Beghelli Luce, or equal.

2.13. INTERFACE TO BUILDING MANAGEMENT SYSTEM (BMS) AND DEMAND RESPONSE (ADR)

A. When interface to the Building Management System is required, The lighting control system shall provide a BACnet/IP interface module that communicates with the BMS via a BACnet/IP network. (a collection of one or more IP sub networks (IP domains) that are assigned a single BACnet network number). Verify if interface to BMS is required.

B. BACnet/IP interface module shall provide the capability for the BMS to:

1. Communicate directly with each relay in the lighting control system network and each group used within the lighting control system.

2. Monitor the status and status changes of each relay and each group.

C. Install wiring and confirm operation of the lighting control BACnet/IP interface module per the lighting control manufacturer’s instructions. Installing, wiring, and interfacing of BMS components to the lighting control system.

D. Demand Response (ADR): The lighting control system shall be equipped with an ADR interface device.

1. The ADR interface shall be certified to current Title 24 code requirements for ADR standards-based protocol communication.

2. Provide all required programming, integration, and interface to EMS.

PART 3 – EXECUTION

3.01 GENERAL

A. Lighting control system shall not be used for any other purpose other than its intended use and application.

B. Provide required interconnections with other systems such as emergency power sources, fire alarm systems, and building management system as required or indicated on drawings.

C. Installation shall meet or exceed standard practice of workmanship and quality.

D. Drawings are diagrammatic in nature and indicate work to be provided, but do not provide means and methods, 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 furnished and install required fittings.

3.02 INSTALLATION AND SET-UP

A. Verify that conduit for line voltage wires enters panel and RCC in line voltage areas and conduit for low-voltage control wires enters panel on low-voltage areas. Refer to manufacturer's drawings for location of line and low-voltage areas.

B. Provide for digital type switches and make all connections according to lighting control manufactures requirements.

C. Central Lighting Control Panels and Remote Room Controllers shall be connected via a data line. Connect entire lighting control system per manufacturer’s requirements. Do not exceed manufacturer’s total data line length requirement.

D. Panels shall be located so that they are readily accessible and not exposed to physical damage.

E. Panel locations shall be furnished with enough working space around panels to comply with the California Electrical Code.

F. Panels shall be securely fastened to the mounting surface by at least four points.

G. Unused openings in the cabinet shall be effectively closed.

H. Cabinets shall be grounded in accordance with Article 250 of the California Electrical Code, and manufacturer’s recommendations.

I. Lugs shall be suitable and listed for installation with the conductor being connected.

J. Conductor lengths shall be maintained to a minimum within the wiring gutter space. Conductors shall be long enough to reach the terminal location in a manner that avoids strain on the connecting lugs.

K. Maintain the required bending radius of conductors inside cabinets.

L. Clean cabinets of foreign material such as cement, plaster and paint.

M. Distribute and arrange conductors neatly in the wiring gutters.

N. Follow the manufacturer's torque values to tighten lugs.

O. Before energizing the panelboard, the following steps shall be taken:

1. Retighten connections to the manufacturer's torque specifications. Verify that required connections have been furnished.

2. Remove shipping blocks from component devices and the panel interior.

3. Remove debris from panelboard interior.

P. Follow manufacturers' instructions for installation.

3.03 PROTECTION

A. Protect all work, equipment and components of the lighting control system until Substantial Completion.

3.04 TESTING

A. Set-up, commissioning and testing of the lighting control system, and OWNER instruction shall include:

1. Confirmation of system programming.

2. Confirmation of operation of individual relays, switches, occupancy sensors and daylight sensors.

3. Operation of system's features under normal and emergency operations.

4. Before energizing check and demonstrate in the presence of the Project Inspector that cables and wire connections are free from short circuits, ground faults, and that there is continuity, and necessary insulation.

5. Confirm system operations and functionality.

6. Check system interface response to other systems such as fire alarm and emergency power system conditions.

3.05 SPARE PARTS

A. Provide a minimum of five percent spare parts of each type of relay, sensors, switches, and peripheral devices.

3.06 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

ATTACHMENT A

LIGHTING CONTROL APPROVED SYSTEMS COMPONENTS

EQUIPMENT		nLight (by Acuity Brands)	NX Lighting Controls (by Current)	WattStopper (by Legrand)
		Catalog No.	Catalog No.	Catalog No.
1	System Controller	NECY-MVOLT-BAC-ADR-ENC-GFXK w/ NBRG-8-KIT	NXAC2-120	LMJA-8000-300R
2	Central Lighting Control Panel	NECY-MVOLT-BAC-ADR-ENC-GFXK w/ NBRG-8-KIT	NXENC-D	LMNC-2-8

3	Lighting Control Panel	ARP-INTENC	NXP2-PNL-8-8-U-S	LMCP8-10V-115/277-8HD
4	Remote Room Controller	NPP & NSP5	NXRCFX2-1RD-UNV	LMRC-211
5	Dimming Controller	NPP & NSP5	NA	LMRC-221
6	Light Level Controller	NCM-ADCX-RJB	NA	LMCT-100-2
7	Relays	ARPA-FCR40	NXP2-RL-SP/DP	LMPL-111-20M
8	Key Switched (LV)	NPODA-KEY	NXSW2-KEY-MNTD1 NSXW2-KEY-MTRY1	1250-7
9	Wall Switches	NPODMA	NXSW2	LMDM-101-W
10	Wall Switch with Motion Sensor	NWSXA-PDT-LV-DX	NXSMDT	LMDM-101-W
11	2 switches Switch Bank	NPODMA-2P-DX	NXSW2	LMDW-102-W
12	3 switches Switch Bank		NXSW2	LMDW-105-W
13	4 switches Switch Bank	NPODMA-4P-DX	NXSW2	LMDW-105-W
14	5 switches Switch Bank	NPOD-TOUCH	NXSW2	LM-EQ41
15	6 switches Switch Bank	NPOD-TOUCH	NXSW2	LM-EQ41
16	Interior Daylight Sensors	NCM-ADCX-RJB	NXSDS	LMLS
17	Exterior Light Sensors	NIO-PC-KIT	NXSDS-O	LMPO-200
18	Occupancy Sensors	NCM & NWV-PDT-16-KIT	NXSMDT-OMNI	LMDC-100
19	Dual Technology Passive/Infrared Wall Switch Sensor with Day Light Controls	WSXA-PDT	LHRDMMTS2-N	
20	Automatic Demand Response Interface	NECY-MVOLT-BAC-ADR-ENC-GFXK w/ NBRG-8-KIT	NXOADR2	LMJA-8000-300R

ATTACHMENT A - LIGHTING CONTROL APPROVED SYSTEMS COMPONENTS
LOS ANGELES UNIFIED SCHOOL DISTRICT FACILITIES SERVICES DIVISION

LIGHTING CONTROL SYSTEMS APPROVED COMPONENTS - ATTACHMENT A

	EQUIPMENT	nLight (Acuity Brands)	NX Lighting Controls (Current)	WattStopper (Legrand)
		Catalog No.	Catalog No.	Catalog No.
1	System Controller	NECY-MVOLT-BAC-ADR-ENC-GFXK w/ NBRG-8-KIT	NXAC2-120	LMJA-8000-300R
2	Central Lighting Control Panel	NECY-MVOLT-BAC-ADR-ENC-GFXK w/ NBRG-8-KIT	NXENC-D	LMNC-2-8
3	Lighting Control Panel	ARP-INTENC	NXP2-PNL-8-8-LI-S	LMCP8-10V-115/277-8HD
4	Remote Room Controller	NPP & NSPS	NXRCFX2-1RD-UNV	LMRC-211
5	Dimming Controller	NPP & NSPS	NA	LMRC-221
6	Light Level Controller	NCM-ADCX-RJ8	NA	LMCT-100-2
7	Relays	ARPA-FCR40	NXP2-RL-SP/DP	LMPL-111-20M
8	Key Switched (LV)	NPODA-KEY	NXSW2-KEY-MNTD1 NSXW2-KEY-MTRY1	1250-7
9	Wall Switches	NPODMA	NXSW2	LMDM-101-W
10	Wall Switch with Motion Sensor	NWSXA-PDT-LV-DX	NXSMDT	LMDW-101-W
			NXSW2	LMDW-102-W
12	2 switches Switch Bank	NPODMA-2P-DX	NXSW2	LMSW-105-W
13	3 switches Switch Bank		NXSW2	LMSW-105-W
14	4 switches Switch Bank	NPODMA-4P-DX	NXSW2	LMSW-105-W
15	5 switches Switch Bank	NPOD-TOUCH	NXSW2	LM-EQ41
16	6 switches Switch Bank	NPOD-TOUCH	NXSW2	LM-EQ41
17	Interior Daylight Sensors	NCM-ADCX-RJ8	NXSDS	LMLS
18	Exterior Light Sensors	NID-PC-KIT	NXSDS-O	LMPO-200
19	Occupancy Sensors	NCM & NWV-PDT-16-KIT	NXSMDT-OMNI	LMDC-100
				LMPC-100
				LMDX-100
20	Dual Technology Passive/Infrared Wall Switch Sensor with Day Light Controls	WSXA-PDT	LHRDMMTS2-N	
21	Automatic Demand Response Interface	NECY-MVOLT-BAC-ADR-ENC-GFXK w/ NBRG-8-KIT	NXOADR2	LMJA-8000-300R

SECTION 26 2200

LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: This specification covers single-phase and three-phase general purpose individually mounted dry-type transformers, 600 V maximum, for power and lighting applications. It includes transformers as specified and as indicated on Drawings.

B. Work, material or equipment shall comply with the codes, ordinances and regulations of the local government having jurisdiction, including the regulations of serving utilities and any participating government agencies having jurisdiction.

C. Related Requirements:

1. Division 01 - General Requirements.

2. Section 26 0500: Common Work Results for Electrical.

3. Section 26 0513: Basic Electrical Materials and Methods.

4. Section 26 0526: Grounding and Bonding.

5. Section 26 0519: Low-Voltage Wires (600 Volts AC)

6. Section 26 0533: Raceways and Boxes, Fittings and Supports.

7. Section 26 0800: Electrical Systems Commissioning.

8. Section 26 2600: Power Distribution Units.

9. Division 27: Communications.

D. Codes and Applicable standards: Products and installation shall meet or exceed the latest edition of the following standards.

1. ANSI/IEEE C57.96, Distribution and Power Transformers, Guide for Loading Dry-Type Transformers; Appendix to ANSI C57.12 Standards.

2. Department of Energy, Energy Act of 2005.

3. International Electrical Code adopted by the State of California.

4. ANSI/NEMA 250 Enclosure for Electrical Equipment (1000 Volts Maximum).

5. IEEE C57.12.91, Test Code for Dry-Type Distribution and Power Transformers.

6. IEEE C57.110 – IEEE Recommended Practice for establishing liquid-filled and dry-type power and distribution transformer capability when supplying nonsinusoidal load currents.

7. 1100-IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment.

8. NEMA standard 20, Dry-Type Transformers for General applications.

9. UL 506, Specialty Transformers.

10. UL 1561, Dry-Type General Purpose and Power Transformers.

11. NEMA TP-1, Guide for Determining Energy Efficiency for Distribution Transformers.

12. NEMA TP-2, Standard Test Method for Measuring the Energy Consumption of Distribution Transformers.

13. NEMA TP-3, Standard for the Labeling of Distribution Transformer Efficiency.

14. CSA 802.2-00 Minimum Efficiency Values for Dry Type Transformers

15. California Building Code (CBC)

16. Tri-axial shake test results conducted in accordance with AC156 test protocol.

17. California Electric Code

E. No requirement of these drawings and specifications shall be construed to void any of the provisions of the above standards. Any conflicts or changes required to the contract documents in order to obtain compliance with applicable codes shall be brought to the immediate attention of the Owner Authorized Representative by the CONTRACTOR.

F. ACRONYMS

ANSI American National Standards Institute

AOR Architect of Record

CEC	California Electrical Code
EOR	Engineer of Record
IBC	International Building Code
IEEE	Institute of Electrical and Electronics Engineers
NEC	National Electrical Code
NEMA	National Electrical manufacturers Association

1.02 SUBMITTALS

A. Provide submittals in accordance with Division 01.

B. Shop Drawings: Include make, catalog number, dimensions, weight, KVA Rating, Percent Impedance, finish, type, insulation class, design temperature, sound levels, efficiency and taps provided. Include regulation at 80 percent and 100 percent of full load, no-load loss, full-load loss, percent efficiency, percent impedance, noise level and continuous capacity rating.

C. Provide manufacturers data and inspection report that confirms transformers compliance with UL 1561, DOE, and NL-UL or NLP-UL (Refer to 1.02.Q).

D. Provide a connection schematic diagram.

E. Provide the following tests reports: Project Inspector will review the reports for conformance with specified criteria, and compliance with the applicable standards. Submit one copy for each set of shop drawings being submitted.

1. Load Losses: Measurements shall be taken at multiple load levels and plotted to show compliance with specifications and correlated to efficiency curve for the transformer size and type.

2. Provide No-Load and Total Losses report.

3. Applied Voltage.

4. Temperature Rise.

5. Induced Voltage.

6. Sound Level.

7. Impulse Test.

8. Manufacturer's nonlinear load test representing real world load mix. Transformers not meeting this requirement shall not be installed.

F. Submit harmonics test plan as follows:

1. NEMA ST-20.

a. Open Circuit Test (no load losses):

1) Use for both Linear and non-Linear.

2) Measure Power.

b. Short Circuit Test (load losses):

1) Short Primary Winding: Linear Test complete with linear profile through secondary winding.

c. Non-Linear Test.

1) Complete with non-linear profile through secondary windings.

2) Measure Power.

d. Provide data and graph efficiency:

1) Graph-1 – Linear Loads 0 to 100 Percent Loads.

2) Graph 2 – Non-Linear Profile K-13 0 to 100 Percent loads.

2. Test Plans measuring Power In and Power Out will not be accepted since procedures are not covered by any standard.

1.03 SUBSTITUTIONS

A. Transformers that deviate from these requirements shall not be accepted without written approval from OWNER'S Design Standards and Maintenance and Operations Technical Units. When deviating or proposing substitutions the following information shall be submitted:

1. Substitution request form substantiating reasons for the deviation and benefits to the OWNER.

2. Proposed substitutions requests shall provide proof of compliance with transformers characteristics indicated in this specifications section.

B. Submittals must comply with contract general provisions.

1.04 QUALITY ASSURANCE

A. Installation shall be performed by State approved/ certified electricians.

B. Transformers shall be listed and approved for the intended application by Underwriter's Laboratories (UL), or other Nationally Recognized Testing Laboratory (NRTL), and in compliance with applicable industry standards and codes, including those mentioned under REFERENCES.

C. Provide labor, engineering, design, testing, supervision, material and equipment required.

D. Equipment shall be new and high quality. Manufacturer shall have been continuously manufacturing distribution transformers for at least 10 years.

1.05 COMMISSIONING

A. A Commissioning Services Provider (CxSP) retained by the OWNER will lead and provide Commissioning (Cx) of power distribution systems and assemblies, including submittal review, installation, testing, documentation, and training as indicated in section 26 0800 – Electrical Systems Commissioning.

B. CONTRACTOR shall follow the commissioning responsibilities stated in Section 01 9113, General Commissioning Requirements.

C. CONTRACTOR shall provide all tools and personnel, and perform start-up, prefunctional and functional performance testing in the presence of the OWNER’s Commissioning Services Provider.

1.06 WARRANTY

A. Provide a one-year labor warranty.

B. Transformers shall be warranted to be free from defects in materials and fabrication for a period of three years from the date of substantial completion.

C. Warranty period begins at project acceptance for beneficial occupancy.

D. Warranty exclusions for third party components is not acceptable.

PART 2 - PRODUCTS

2.01 DESIGN REQUIREMENTS

A. Premium Efficiency transformers with internal losses at 35 percent loading reduced by 30 percent when using temperature and material correction factor to 75 degrees C per NEMA Standard TP1

B. Load Mix: Transformer shall be UL 1561 listed to feed a mix of equipment load profiles such as computer without detracting or significant degradation of efficiency.

C. The transformer shall be labeled with a K-13 Rating in accordance with UL 1561 35.21 and 34.2.

D. Transformer shall be certified as required by the California Energy Commission, Title 20 – Appliance Efficiency Regulations, unless otherwise EXEMPT under 110.10(a).

E. Construction: Windings shall be continuous wound copper with brazed or welded terminations.

1. Insulation and Varnish Systems: Epoxy Polyester impregnation

2. Terminals, including those for changing taps must be readily accessible by removing a front cover plate.

F. Performance of transformers shall meet or exceed the requirements of applicable codes and standards, the DOE Energy Policy Act of 2005 - Public Law 109-58 and the latest requirements of the California Energy Commission Appliance Efficiency Regulations. In addition; transformers shall be designed to an efficiency standard higher than the lowest legal standard for the purpose of contributing to LEED Energy and Atmosphere (Optimized Energy Performance) and Utility Rebates.

G. Transformers shall be self-cooled type with 220 degrees C. insulation and a maximum temperature rise of 130 degrees C. under continuous full load conditions with an ambient of 40 degrees C.

H. Transformers shall be furnished with four 2.50 percent (two above and two below normal voltage) taps. Windings shall be of fire-resistant type, designed for natural convection cooling through normal air circulation.

I. Core mounting frames and enclosures shall be of welded and bolted construction with sufficient mechanical strength and rigidity to withstand shipping, installation, and short circuit stresses.

J. Enclosure cover plates shall be sheet steel, captive bolted to enclosure framework.

1. Enclosure shall provide suitable ventilating openings with rodent-proof screens, NEMA 1 enclosure.

2. Enclosure shall be provided with lifting lugs and jacking plates as required.

3. Transformers installed outdoors shall be provided with weatherproof NEMA 3R enclosure and weatherproof kit.

4. Transformers shall be provided with rodent-proof screen Submit rodent-proof screen sample for OWNER's approval.

K. Transformers shall be furnished complete with mounting channels and mounting bolts. Metal parts, excepting cores and core mounting frames shall be furnished clean, rust-proofed, and provided with a coat of an inert primer.

L. Transformers up to 35 KVA shall not exceed 40 decibels. Transformers 36 KVA or more shall be a minimum of 5 decibels below NEMA standards per unit. Transformers shall be provided with vibration dampers consisting of California Dynamic, Mason Industries, Korfund or equal neoprene mounting pad and Elastorib sheeting. Size and number of shock mounts shall be in accordance with manufacturer's recommendations.

M. Transformers shall be UL listed.

N. Each transformer to be installed under this section shall be sound tested at the factory. CONTRACTOR shall provide two copies of transformers tests reports for EOR's review.

O. Equipment shown on drawings to scale is approximate only and based upon a general class of equipment specified. The CONTRACTOR shall verify dimensions and clearances prior to commencement of work.

P. Verify points of connection with the manufacturer's requirements, instructions, or recommendations prior to installation. Actual dimensions, weights, clearances and installation requirements shall be verified and coordinated by the CONTRACTOR.

Q. K-rated transformers type NL-UL and NLP-UL shall be equipped with the following features:

1. Electrostatic shield.

2. NLP series shall have a maximum sound level of 3 dB below NEMA standards.

3. Double-size neutral terminal.

4. Additional coil capacity to compensate for higher non-linear load loss.

5. Heavy gage ventilated indoor enclosures (provide weather shields where installed indoors).

6. K-rated transformers shall meet other requirements of this section.

2.02 EQUIPMENT

A. Transformers manufactures Siemens, Square D, General Electric, PowerSmiths, MGM, Eaton, or equal approved by OWNER.

B. There shall be no openings through which foreign objects such as sticks, rods, wires, or the like might enter and contact live parts. Provide means for padlocking compartment doors.

1. Connection terminal points shall be bottom fed and located as far as possible below vent openings, or below top connections.

2. Terminals shall be protected from external/foreign objects contact.

PART 3 - EXECUTION

3.01 DELIVERY AND STORAGE

A. Deliver, storage, protect and handle products in accordance with the manufacturer's recommendations.

3.02 INSTALLATION

A. Transformer core frame shall be installed level on shock absorbing pads within enclosure. Comply with seismic requirements of CBC.

B. Mounting bolts on floor mounted transformers shall be extended into pads only and shall not be in direct contact with building structural members.

C. Flexible jumpers shall be installed for grounding continuity from enclosure to conduits or bus ducts where required.

D. Transformers installed outdoors or below grade shall be mounted on concrete pads as specified in Section 03 3000: Cast-In-Place Concrete.

E. Install transformer ventilation openings not closer than 6 inches from wall surfaces.

F. Do not install transformers in corrosive environments such as swimming pool pump and boiler rooms, or similar areas.

3.03 VOLTAGE CHECK

A. Set taps on transformers to provide satisfactory operating voltages with present loads energized, including new loads and existing loads. A check shall be performed in the presence of the Project Inspector at a panel fed from each transformer, which is farthest from transformer. Voltages at transformers ranging from 118 to 122 volts inclusive, for 120-volt systems and proportionately equivalent for higher voltage systems are permitted.

B. Provide instruments and accessories required to perform checks. Voltmeters shall be accurate within .075 percent or one percent and shall have scales permitting voltage readings to be performed on upper half of scale. Calibration of the meters shall be observed by the Project Inspector.

C. Adjust transformer taps under full load operating conditions, to provide normal operating voltages at the loads.

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 Project site.

B. Repair scratched or marred surfaces affected during the execution of work. Repair surfaces shall match original finish.

END OF SECTION

SECTION 26 2416

PANELBOARDS AND SIGNAL TERMINAL CABINETS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Lighting and power distribution facilities, including panelboards.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 26 0500: Common Work Results for Electrical.
3. Section 26 0513: Basic Electrical Materials and Methods.
4. Section 26 2600: Power Distribution Units.
5. Section 26 5000: Lighting.
6. Division 27: Communications.
7. Division 28: Electronic Safety and Security.

1.02 SUBMITTALS

A. Provide in accordance with Division 01.

B. Shop Drawings: Include a front elevation indicating cabinet dimensions, make, location and capacity of equipment, size of gutters, type of mounting, finish, and catalog number of locks. General layout of internal devices, wiring drawings with wire numbers and device connections, vendor cut sheets of devices in enclosure and bill of materials listing description, manufacturer, part number, and quantity of items shall be included.

C. Installation Instructions: Submit manufacturer's written installation instructions.

1.03 DESIGN REQUIREMENTS

A. Panelboards:

1. Panelboards shall be wall-mounted, enclosed safety type with 120/240 volt, three-wire solid neutral 277/480 volt, four-wire or 120/208 volt, four-wire solid neutral mains as indicated on Drawings or specified. First panelboard of each building shall be provided with main or sub-feeder circuit breakers where so indicated.

2. Single pole branches shall be molded case, thermal magnetic circuit breakers with inverse time delay, trip free, quick-make, quick-break mechanism and silver alloy contacts. Circuit breakers shall be fully rated, with ampere rating marked on handle and shall indicate on/off and tripped positions. Ground fault interrupters shall be incorporated into circuit breakers where indicated. They shall be listed by UL, or other NRTL as ground fault devices. Provide appropriate lug kit of sufficient size to accommodate the feeders.

3. Two- and three-pole branches shall be enclosed, and shall be thermal magnetic circuit breakers with inverse time delay, tamper-proof, ambient compensated, single handle, internal common trip, and quick-make, quick-break mechanism with silver alloy contacts. Circuit breakers shall be fully rated or as otherwise indicated on the Drawings.

4. Main and subfeeder circuit breakers shall be enclosed, thermal magnetic type with inverse time delay, single handle common trip, quick-make, quick-break mechanism, corrosion-resistant bearings and silver alloy contacts. Ampere frame size and trip rating shall be as indicated on Drawings. Breakers over 225 amperes shall be furnished with interchangeable trip units. Handles of main and subfeeder circuit breakers shall be provided cabinet door. Voltage rating shall be as indicated on Drawings.

5. Circuit breakers shall be fully rated and of one-piece, bolt-on type and shall meet short-circuit interrupting capacity requirements indicated on Drawings. Series rated circuit breaker combinations are not acceptable.

6. Internal connections shall be fabricated with plated copper bus bars and the busses shall extend for full length of space available for branch circuit breakers. Feeder cable connectors shall be installed at point of feeder entrance. Terminals shall be furnished with copper conductors. Panelboards fed by conductors having over-current protection greater than 200 amperes shall be protected on supply side by over-current devices having a rating not greater than that of panelboards. Copper bussing shall be fully rated. Heat rated bussing is not acceptable.

7. Except where otherwise indicated, circuit breakers shall be in two vertical rows connected to bus bars in a distributed phase arrangement. Two-pole branches shall be balanced on busses. Single pole branches shall be numbered adjacent to its circuit breaker, with odd numbers on left and even numbers on right.

8. Specified circuit breaker spaces shall be furnished with hardware required for future installation of circuit breakers.

9. Provide locking devices for individual circuit breakers. Padlocking devices shall be secured to circuit breakers and by panel dead front plates.

B. Surge Suppressors: Where indicated on Drawings, provide transient voltage surge suppressors as an integral part of panelboards. Panelboards shall be complete with 200

percent rated copper neutral bus, ground bus and isolated ground bus in addition to requirements of this section. Surge suppressors shall be as follows:

1. Surge Capacity:

    a. Line-to-neutral for wye systems: 80 KA.

    b. Line-to-ground: 80 KA.

    c. Neutral-to-ground: 80 KA, three-phase wye.

    d. Line-to-neutral plus line-to-ground: 160 KA.

2. UL 1449 2nd Edition Suppressed Voltage Rating for 208/120 Wye System:

    a. Line-to-neutral: 400 volts.

    b. Line-to-ground: 400 volts.

    c. Neutral-to-ground: 400 volts.

    d. Maximum continuous over-voltage: 150 volts.

3. EMI/RFI High-Frequency Noise Power Filter (Characteristics):

    a. 100 KHz at 444 dB.

    b. 100 MHz at 44 dB.

    c. 10 MHz at 44 dB.

    d. 100 MHz at 444 dB.

4. MOVs shall be thermally protected for low current faults and shall be fused with surge-rated fuses. The surge-rated surge current passes and clears the circuit safely if the surge capacity is exceeded. Enhanced diagnostics shall continuously monitor the unit's status and shall include LEDs to signal a reduction in surge capacity or the loss of a suppression circuit. An audible alarm, with test and silence features, shall be furnished in diagnostic package.

5. Each phase or the entire unit shall be replaceable and have bolted-on, tin-plated copper connections. Unit to have UL witnessed fault current rating of 65,000 symmetrical amperes.

6. Surge suppression units shall comply with the following:

    a. UL certified.

    b. UL 1283.

c. UL 1449.

d. IEEE C 62.45.

e. IEEE C 62.41.

f. Nationally Recognized Testing Laboratory (NRTL) or equal.

C. Panelboard Cabinets:

1. Panelboard cabinets shall be code gage galvanized steel or blue steel; fronts, doors, and trims shall be code gage furniture steel. Cabinets shall be furnished with at least six-inch high gutters at top and bottom where feeder cable size exceeds four gage or where feeder cable passes through cabinet vertically. Cabinets shall be furnished with top and bottom gutters sized as required by inspection department having jurisdiction, but never less than six inches where more than one feeder enters top or bottom of cabinets. Side gutters shall not be less than four inches wide. Width of cabinets shall be 20 inches, unless otherwise indicated on Drawings.

2. Doors shall be cut true, shall accurately fit opening and finish smooth across joints. Rabbets shall be inside. Hinges shall be entirely concealed except for barrels and pins. Hinge flanges shall be welded to door and trim. Doors shall be equipped with flush type, spring-latching, Corbin locks for metal doors, keyed to Corbin No. 60 keys.

3. Where contactors, time switches, and control devices are specified or indicated to be installed within panelboard cabinets, a separate compartment and door shall be provided at top of cabinet for such devices. Door shall be sized as required to permit removal of contactor and other devices intact. Gutters shall be provided at sides and top of compartment. Doors shall be equipped with flush type, spring-latching, Corbin locks for metal doors keyed to Corbin No. 60 keys.

4. Provide and install panelboard manufacturer’s permanent circuit number kit option.

5. Panelboards with control devices in compartment shall arrive at the Project site completely assembled with control devices installed and wired.

6. Outdoor cabinets shall be NEMA Type 3R. Construction shall be formed from code gage galvanized steel with ANSI No. 61 gray enamel finish. Provide heavy-duty, three point latching, vault type door handles with padlocking provisions. Provide stainless steel or galvanized butt hinges on doors. Padlocks shall be furnished, keyed to Corbin No. 60 keys.

7. Self-tapping screws and bolts not permitted.

D. Panelboard Schedule: Provide a neatly typewritten schedule with number or name of room or area, or load served by each panelboard circuit. Room numbers or names shall be determined at the Project site and shall not necessarily be those indicated on the Drawings. Schedule shall also indicate panel designation, voltage and phase, building and distribution panel or switchboard from which it is fed. Schedule shall be installed in a frame under transparent plastic 1/32 inch thick on inside of each panelboard cabinet door.

E. Panelboard nameplate: Provide a nameplate identifying panelboard. Plates shall be black and white plastic nameplate stock, with character cut through black exposing white and shall bare designation of service. Name plate shall be mechanically fastened to switchboard.

F. Provide additional labeling on dead-front of panelboard. Label shall be a P-Touch or equal with a minimum width of 3/8 inch with black letters on white background. Label shall re-identify panelboard and also identify name and location of power source feeding this panel. Location information shall include building name if located in different building and name or room location. If power source is installed in same room, label should indicate source name and "In this Room"

G. Panelboard Standards: Panelboards shall be UL, or other NRTL listed and labeled. Panelboards shall meet latest revisions of following standards:

1. California Electric Code, Article 384.

2. UL 67, Panelboards.

3. UL 50, Cabinets and Boxes.

4. UL 943, GFCI.

5. UL 489, Molded Case Circuit Breakers.

6. NEMA PB1.

7. Federal Specifications W-P- 115C and WC-375B.

H. Signal Terminal Cabinets:

1. Signal terminal cabinets shall conform to the Specifications for panelboard cabinets, except as modified herein.

2. Terminal cabinets shall be flush type, with two-inch trim or surface mounted type, as indicated on Drawings. Terminal cabinets shall be furnished with sections and barriers to separate each system. Sections over 24 inches in width shall be provided with double doors and locks. Terminal cabinets, or sections of terminals housing separate systems, shall measure 12 inches long by 18 inches

high by 5 ¾-inch deep, unless otherwise indicated on Drawings. Trims for sectional cabinets shall be of one-piece construction.

3. Terminal cabinets shall be furnished with ¾ inch thick plywood. Plywood shall be fastened in place with machine screws or factory installed mounting screws.

4. Flush-mounted terminal cabinets shall be finished as specified for flush-mounted panelboard cabinets. Surface and semi-flush mounted terminal cabinets shall be finished as specified for surface-mounted panelboard cabinets.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Panelboards shall be manufactured by Siemens, W.A. Benjamin, General Electric, Cutler Hammer, Square D or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Panelboards shall be located so they are readily accessible and not exposed to physical damage.

B. Panelboards installed outdoors shall be specifically listed for wet locations and shall be weatherproof in NEMA Type 3R cabinets.

C. Panelboard locations shall provide sufficient working space around panels to comply with the California Electrical Code.

D. Panelboards shall be securely fastened to structure and mounted on surface by at least four points.

E. Unused openings in cabinets shall be effectively closed as required by the manufacturer.

F. Cabinets shall be grounded as specified in Article 250 of the California Electrical Code.

G. Conduits shall be installed so as to prevent moisture or water from entering and accumulating within the enclosure.

H. Lugs shall be suitable and listed for installation with the conductor being connected.

I. Conductor lengths shall be maintained to a minimum within the wiring gutter space. Conductors shall be long enough to reach the terminal location in a manner that avoids strain on the connecting lugs.

J. Maintain the required bending radius of conductors inside the cabinet.

K. Clean the cabinet of foreign material such as cement, plaster, and paint.

L. Distribute and arrange conductors neatly in the wiring gutters.

M. Use the manufacturer's torque values to tighten lugs.

N. Before energizing panelboards, the following steps shall be taken:

1. Retighten connections to the manufacturer's torque specifications. Verify that required connections have been provided.

2. Remove shipping blocks from component devices and panelboard interiors.

3. Manually exercise circuit breakers to verify they operate freely.

4. Remove debris from panelboard interior.

O. Follow manufacturer's instructions for installation.

P. Do not install in highly corrosive environments, unless rated for the application.

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 26 2600

POWER DISTRIBUTION UNITS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Power centers suitable for outdoor locations.

B. Related Requirements: Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and other applicable specification sections, including:

1. Division 01 - General Requirements.
2. Section 03 3000: Cast-In-Place Concrete.
3. Section 05 5000: Metal Fabrications.
4. Section 26 0513: Basic Electrical Materials and Methods.
5. Section 26 0526: Grounding and Bonding.
6. Section 26 2200: Low-Voltage Transformers.
7. Section 26 2416: Panelboards and Signal Terminal Cabinets.
8. Section 26 0800: Electrical Systems Commissioning.

C. RELATED STANDARDS

1. ANSI/NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).
2. California Electrical Code (CEC).
3. IEEE C57.12.28 – Standard for Pad-Mounted equipment Enclosure Integrity.
4. IEEE 551 - Recommended Practice for Calculating AC Short-Circuit Currents in Industrial and Commercial Power Systems.
5. IEEE 1584 – Performing Arc-Flash Hazard Calculations.
6. NETA-ATS – Standard for Acceptance Testing for Electrical Power Equipment and Systems.

7. UL/ANSI 891 – Standard for Safety Switchboards.

1.02 SUBMITTALS

A. Provide in accordance with Division 01.

B. Shop Drawings:

1. Indicate dimensions, finish, elevations, and locking devices.

2. Indicate equipment make, catalog number, size and/or capacity, line and load conduit entrance location. Layout shall indicate locations of equipment.

3. Include data as required for transformers. Refer to Section 26 2200: Low-Voltage Transformers.

4. Indicate size and/or capacity of bussing, barriers, catalog numbers of locks, nameplate inscriptions, and interlocking facilities.

C. Fault Current, Coordination and Arc-Flash Reports: the following reports shall be prepared using SKM Systems Analysis, ETAP Powering Success, EasyPower, or equal.

1. Provide a short-circuit and coordination report signed and stamp by a registered electrical engineer. Studies shall be in accordance with applicable IEEE guidelines. Submit two copies of each study for review prior to ordering and installing equipment.

2. Provide a system coordination report for main and branch circuit protective devices including transformers secondary protective devices. Study shall be recorded on log paper. The circuit protective devices shall be set based on the coordination study. A final written record of protective device settings shall be submitted.

3. Provide a complete arch-flash report based on installed equipment, and feeders' sizes and lengths. Prepare the report in accordance with code requirements and IEEE 1584 standard. The report shall indicate trip times for protective device(s) settings, arcing fault current values, and incident energy and flash boundaries. The arc-flash report shall indicate clothing requirements for each piece of equipment.

4. Provide installation detail and seismic anchorage notes for switchboards.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Power center shall consist of a transformer, a primary main circuit breaker and/or a panel and a secondary distribution panel with a main circuit breaker.

B. As indicated on construction drawings distribution units shall be provided with multifunctional digital meter(s) with true RMS measured Amperes (each phase and neutral) Volts (line-to-line and line-to-neutral), Power Factor, VA, VAR, Watts, and KWH. Meter(s) shall be Veris Industries 8163 Energy series or equal.

1. Meter communication protocol shall match those of the site's energy management system.

2. Meter with peripheral devices and equipment shall be integral to the power center enclosure and be installed by the manufacturer of the power distribution equipment.

C. Transformers:

1. Copper wound, dry type, totally enclosed, class H insulation with a maximum winding temperature of 150 degrees C. Furnish with four 2 ½ percent taps, two above and two below voltage.

2. Constructed and tested in accordance with NEMA standards; wound with copper conductors, to equal or exceed NEMA published criteria.

3. For other electrical characteristics, refer to Section 26 2200: Low-Voltage Transformers.

4. Manufactured by Siemens, Benjamin Electric Company, Square D Company, General Electric, Cutler-Hammer, or equal.

D. Power Center Enclosures:

1. Weatherproof formed sheet steel. Provide with catch and lock on doors of breakers and panels; furnish with padlocks.

2. Manufactured by Siemens, Benjamin Electric Company, Square D Company, General Electric, Cutler-Hammer, or equal.

E. Panelboards: Panelboards shall comply with Section 26 2416-Panelboards and Signal Terminal Cabinets.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Transformer shall be delivered to enclosure manufacturer for assembly and subsequent delivery to the Project site.

B. Isolate and separate primary main circuit breaker and distribution panel from transformer by means of steel barrier. Bolt circuit breakers to panel with panel manufacture's machine bolts, or equal. Self-tapping screws are not allowed.

C. Install two, 2-inch underground conduit stub-outs, from each panel to outside edge of concrete pad. Refer to Section 26 0533: Raceways and Boxes Fitting and Supports.

D. Install bollards as indicated. Refer to Section 05 5000: Metal Fabrications.

E. Functional operation of the power center shall be demonstrated to Project Inspector.

F. Do not install in highly corrosive environments, unless rated for the application and approved by Project Inspector.

G. Distribution equipment and system components shall be free from short circuits and grounds, other than required grounds. The contractor shall be responsible for the testing of bolted electrical connections, perform insulation resistance tests on each bus section, phase-to-phase and phase-to-ground for one minute in accordance with requirements stated in NETA-ATS 2007 table 100.

1. Utilize the services of an approved independent testing laboratory to perform megger time-resistance insulation testing of bussing, circuit breakers and/or fused switches. The fused switches shall be equipped with fuses or temporary jumpers in place of fuses. Breaker and fused switches shall be tested in the closed position. No wiring shall be connected to the line or load side of the power distribution unit during testing.

    a. Provide calibration program records to assure the testing instruments 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.

2. Tests shall be performed in the presence of the Project Inspector.

3. During testing, provisions shall be made to prevent damage to any solid-state components, or electronic equipment such as TVSS equipment that may be tied onto power distribution unit bussing.

4. Test results shall meet manufacturer's recommendations or NETA ATS-2017 recommendations, whichever is more stringent.

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 26 5010

SOLID STATE (LED) LIGHTING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: LED Luminaires, LED modules, drivers, wiring, and lighting controls.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 26 0500: Common Work Results for Electrical.
3. Section 26 0513: Basic Electrical Materials and Methods.
4. Section 26 0526: Grounding and Bonding.
5. Section 26 0519: Low-Voltage Wires (<600 Volt AC).
6. Section 26 0923: Lighting Controls Systems.
7. Section 32 1313 - Site Concrete Work.

1.02 REFERENCES

The latest version of the following industry standards applies:

A. American National Standards Institute/American National Standard Lighting Group ANSI/ANSLG – C78.377-2008 Specifications for the Chromaticity of Solid-State Lighting Products.

B. American National Standards Institute/American National Standard Lighting Group ANSI/ANSLG – C82.77-2002 Harmonics Emission Limits.

C. Federal Communication Commission (FCC) 47 CFR Part 15 – Radio Frequency Devices.

D. Illuminating Engineering Society of North America (IESNA) LM-79-, LM-80-15, and TM-21.

E. National Electrical Manufacturers Association (NEMA) SSL-1-2010 Electronic Drivers for LED Devices, Arrays, or Systems.

F. SSL-3-2010 Solid State Lighting High Power LED Binning for General Illumination.

G. SSL-4-2012 Solid State Lighting Retrofit Lamps.

H. National Fire Protection Association (NFPA) NEC-70-2011

I. Underwriters Laboratories (UL) 8750-Light Emitting Diode (LED) Equipment for Use in Lighting Products.

J. Underwriters Laboratories (UL) 1598C- Light Emitting Diode (LED) Retrofit Luminaire Conversion Kits.

1.03 SUBMITTALS

A. List of Materials: Submit a complete list of proposed materials.

B. Shop Drawings: Provide detailed and dimensioned Shop Drawings indicating kind, weight and thickness of materials, method of fitting and fastening parts together, location and number of sockets, size of lamps, and complete details of method of fitting suspension and fastening luminaires in place. Provide wiring diagrams for lighting control equipment. Drawings shall contain sufficient information to assemble and install equipment at the Project site without further instructions.

C. Prior to start of construction; provide photometric calculations with graphic of lighting foot-candle levels at work plane, ceiling and walls. Calculations shall comply with IESNA recommendations.

D. Installation Instructions: Submit manufacturer's written installation instructions for luminaires and accessories.

1.04 SUBSTITUTIONS

A. Luminaires that deviate from these requirements shall not be accepted without written approval from OWNER'S Design Standards Section and Maintenance and Operations Technical Unit. When deviating or substituting luminaires, the following information shall be submitted:

1. Substitution request form with clear indication of reasons and benefits to OWNER.

2. Provide substantiating evidence of benefits and pros and cons on favor of the proposed material/equipment/components substitution.

3. OWNER'S approval shall be obtained for any equipment or materials substitutions.

4. Submit a completed OWNER's LED luminaires evaluation form with supporting documentation for any and all fixtures' performance claims. The

form can be found at the following electronic address: http://www.laschools.org/documents/file?file_id=310976408

5. Fixtures manufacturer LM-79 and LM-80 test reports shall be from a third-party testing lab.

B. Submittals must comply with contract general provisions, and provide as a minimum necessary installation details, lighting Foot-Candle level calculations in compliance with LAUSD illumination requirements indicated in OWNER's School Design Guide Section 3.7.B.

1.05 QUALITY ASSURANCE

A. Design of lighting luminaires, accessories, supports, and method of luminaire installation shall comply with requirements for earthquake-resistant construction of the State of California.

B. Provide suspension points at no more than two feet from luminaire ends. Spacing between supports shall not exceed eight feet.

C. Components and luminaires shall be listed and approved for the intended application by Underwriter's Laboratories (UL), or other Nationally Recognized Testing Laboratory (NRTL), and in compliance with applicable industry standards and codes, including those mentioned under article 1.02 – References.

1.06 COMMISSIONING

A. A Commissioning Services Provider (CxSP) retained by the OWNER will lead and provide Commissioning (Cx) of lighting systems and lighting controls, including submittal review, installation, testing, documentation, and training.

B. CONTRACTOR shall follow the commissioning responsibilities stated in Section 01 9113, General Commissioning Requirements.

C. CONTRACTOR shall provide all tools and personnel, and perform start-up, prefunctional and functional performance testing in the presence of the OWNER's CxSP.

1.07 WARRANTY

A. Provide the following warranties:

1. One-year labor warranty.

2. Material warranty:

a. LED modules: five years minimum.

b. Drivers: five years minimum.

c. Lighting Pole (Standards): five year minimum.

B. Warranty period shall begin at substantial completion or at project acceptance for beneficial occupancy, whichever occurs first.

C. CONTRACTOR shall warranty Luminaires, including drivers, LED modules and ancillary components via a single warranty source. Multiple warranty sources are not acceptable.

PART 2 - PRODUCTS

2.01 MATERIAL AND FABRICATION

A. Luminaires of same type shall be of one manufacturer.

B. Manufacturer and model number references are indicated as a standard of performance and quality; other manufacturers' models may be submitted for review, provided the product meets or exceeds the product's specified requirements and substantially complies with OWNER'S LED Luminaires Evaluation Requirements Form.

C. Conductors that pass over edges or through metal opening(s) shall be secured from contacting the edges and be protected from cutting and abrasion. This requirement shall be met through one of the following:

1. Rolling the edge of the metal not less than 120 degrees.

2. A bushing or grommet of a material other than rubber at least 1.2 mm (0.047") thick.

3. Glass sleeving at least 0.025 mm (0.010") thick.

D. Lighting luminaires shall meet the following requirements:

1. Industry standards as indicated under Article 1.02.

2. Luminaire shall be from a manufacturer who has been in the business of manufacturing LED lighting luminaires for interior and exterior applications for a minimum of 5 years.

3. Luminaires shall comply with the California Health and Safety Code requirements for products containing substances identified in the California Lighting Efficiency and Toxics Reduction Act or follow the European Restriction of Hazardous Substances (RoHS), whichever is more stringent.

4. Luminaires shall be baked-on enamel or powder-coated, unless otherwise specified in this section.

5. The luminaire(s) lens, including end caps shall be 0.187 nominal thickness.

6. Drivers shall be easily accessible without the use of special tools.

7. Wiring cavity shall be field accessible for service or repairs.

8. Luminaires shall be capable of being operated by standard motion/ vacancy sensors, daylight sensors, and dimmers.

9. Luminaires shall be provided with a manufacturer's stencil or permanent legible sticker that states manufacturer business information and date of delivery.

10. Temperature rating; -20 degrees Celsius minimum starting temperature. Luminaire accessories including LEDs and drivers shall be able to withstand temperatures in excess of 110 Fahrenheit degrees.

11. Color Rendering Index (CRI):

    1) Interior Applications: +85 CRI.

    2) Exterior Applications: +70 CRI

12. Power factor: Greater than 0.9 at 120V and 277V.

13. Total Harmonic Distortion: Less than 20% at 120V and 277V.

14. Color Correlated Temperature (CCT): 4000K minimum ± 275K degrees.

15. LEDs and drivers' life expectancy: 50,000 minimum projected hours at 6,000 hours testing for both LEDs and drivers.

16. Luminaires in contact with insulation materials shall be IC rated.

2.02 DRIVERS and LED MODULES

A. Drivers:

1. Approved Drivers Manufacturers:

    a. Osram – Optotronic.

    b. Signify – Advance and Xitanium.

    c. Universal Lighting Technologies – Everline.

    d. General Electric – Lightech.

    e. Thomas Research Products

f. Kenall – Low Profile LED Driver

g. EldoLED

h. Equal. Only if approved by OWNER's M&O Technical Services and Design Standards units through a deviation request.

2. Driver Type and Characteristics:

a. Comply with the state of California Health and Safety Code requirements for products containing substances identified in the California Lighting Efficiency and Toxics Reduction Act, or be RoHS compliant, whichever is more stringent.

b. Dimming for 0-10-volt DC control circuits. Drivers shall be specifically compatible with the lighting control system being provided.

c. Comply with applicable state, federal, and industry standards listed under References article.

d. Wattage as stated in Luminaire's LM-79 test report.

e. Driver performance requirements: Refer to Attachment A.

B. Light Emitting Diodes (LEDs):

1. Approved Manufacturers:

a. General Electric.

b. Signify.

c. NICHIA

d. Samsung LED Co.

e. CREE

f. Equal. With OWNER's approval.

2. LEDs Characteristics:

a. Color Correlated Temperature (CCT):

1) Chromaticity target Duv and tolerance 0.001 plus/minus 0.006.

2) Nominal CCT for 4000K, target CCT 3985K ± 275K.

3) CCT measurements in compliance with ANSI C78.377-2008.

b. Lumen Maintenance: Greater than 90% at 50^0 C degrees.

c. LEDs must be from same manufacturer and batch.

d. TM-21 and LM-80 reported hours of no less than 50,000 at minimum of 6000 hours testing.

e. LM-79 reported CCT and CRI in compliance with articles 2.01.D.11 and 14.

2.03 LUMINAIRES

A. Luminaires types and minimum requirements:

1. Ceiling Surface-Mounted with wraparound diffusers:

a. Lens shall be extruded of clear acrylic plastic, 12 pattern prismatic with minimum 25 DR meeting the ASTM specifications for methacrylate molding compounds D-788-69A. The overall length of the lens, including end caps shall be 0.187 nominal thickness.

b. Furnish luminaires with number of LED strips as indicated on drawings.

c. Spring-loaded barrel latches shall consist of sliding steel pins or rods operating through spring-loaded steel cylinders tack-welded or pop-riveted to luminaire body. Pins shall be fabricated of solid steel with round cross-sectional areas of enough size to prevent bending when operating latches. Latches shall engage when pins are fitted into corresponding catches on diffusers. Latches shall disengage by applying finger pressure to a portion of the pin, turned up at 90 degrees, at operating end. Alternative latches mechanisms are discouraged.

d. Luminaire channels shall be formed as single pieces of 20 gage metal without joints or splices and shall be assembled by means of spot-welding. Metal surfaces of luminaires shall be powder-coat painted after fabrication. Provide two 8-32 screw knockouts for alignment on each end plate.

2. Linear Suspended Direct/Indirect:

a. Luminaire shall be minimum 20 gage CRS with die-cast end cap mechanically attached with no exposed fasteners.

b. Housing shall come in three styles perforated, pierced or solid with a clear acrylic dust cover.

c. Cable suspension canopy shall be a minimum of 3 ½-inch diameter with 1/16 inches diameter stainless steel aircraft cable adjustable up to 36 inches.

d. Reflector shall be semi-specular aluminum.

e. Furnish luminaires with LED strips as indicated on drawings.

3. Ceiling Recessed Troffer Luminaires:

a. Luminaire shall be 20 gage cold rolled steel housing with no exposed fasteners or hardware.

b. Approximately 4 ½-inch maximum depth housing with full length die-formed stiffeners, and contoured ballast wireway cover.

c. Positive cam action steel latches and safety lock T-hinges to allow hinging and latching on either side.

d. Baked white enamel finish.

e. Trim shall be painted to match ceiling color.

f. Reflector reflectance shall equal or exceed 89 percent.

g. Flat non-glare acrylic panel.

h. Minimum lens thickness 0.187 inch.

i. Furnish luminaires with LED strips as indicated on drawings. Mounting shall be compatible with standard or slot T-grid systems.

j. Furnish mounting frames on recessed luminaires in plaster and tile surfaces.

4. Linear Suspended or Wall Mounted Wall Washer:

a. Luminaire shall be 20-gage die formed steel.

b. Reflector shall be die-formed white and/or semi specular.

c. Luminaire shall be an asymmetric distribution.

d. Luminaire shall come with the option for prismatic lens or louver.

e. Luminaire shall have an option to be wall mounted or suspended.

f. .

5. Wall or Recess Mounted fixtures

   a. Luminaire shall be 20 gage extruded aluminum with die cast end caps.

   b. Opal polycarbonate lens.

   c. Furnish luminaires with LED strips as indicated on drawings.

   d. Luminaire mounting as indicated on drawings.

   e. Luminaire shall be listed for damp and wet location.

6. Down Lights:

   a. 4 to 6-inch round LED downlight.

   b. Color trim as specified in construction drawings.

   c. Trim attachment to frame-in kit via push-in connector on frame.

   d. Removable cover for access.

   e. Complete luminaire including all peripheral devices including frame-in kit, light engine, trim kit, etc. shall be provided.

   f. Approved luminaires: Calculite C4LDL40K, Lightolier Calculite C6LDL40K, Lithonia LDN440/30, Lithonia LDN6 Cylinder, Gotham Lighting EVO40, or OWNER approved equal.

7. Floodlight Luminaires:

   a. Narrow, medium, rectangular and wide light distributions.

   b. Housing shall be marine-grade die-cast aluminum, coated with electrostatically deposited and thermally set powdered polyester paint. Luminaire shall be supplied with a mounting yoke, or slip fitter as required for the installation and as indicated on drawings.

   c. IP rating of IP66 for dust and water.

   d. High impact UV stabilized acrylic or tempered glass lens with thermal and physical shock.

   e. Visor option for lighting control.

   f. Photocells and motion control capabilities.

g. Listed for wet locations and suitable for ground mounting.

h. Luminaires shall be capable of being aimed in any direction from any mounting surface orientation. Door fastening devices shall be captive.

i. Electrical components shall be removable and replaceable as single units without disturbing aiming.

j. Finish color shall be as selected by Architect from manufacturer's standard colors.

2.04 EXIT ILLUMINATION

1. Low Level Exit Signs:

a. Luminaires shall be:

1) L.E.D. boards, green lettering, or as indicated on drawings.

2) Die cast aluminum body and face plate with white finish.

3) Polycarbonate shields.

4) Area of refuge listing is required when luminaires are used in such locations.

b. Emergency battery pack operation shall be as indicated on Drawings.

2.05 LIGHT POLES (STANDARDS)

A. Standards shall be 25 feet high, tapered galvanized steel. Starting at the base, a minimum of 12 inches of the light standards interior and exterior surfaces shall be treated with water repellent or barrier coatings to prevent moisture contact with galvanized surface.

B. Aluminum poles are not acceptable.

C. Pole shaft shall conform to ASTM A595 Grade A and be 11 gage thickness, unless otherwise indicated on Drawings. Shaft shall be one-piece construction with a full length longitudinal high frequency resistance weld.

D. The anchor base shall be constructed from structural quality hot rolled carbon steel plate conforming to ASTM A36.

E. Anchor bolts shall be fabricated from commercial quality hot rolled carbon steel bar with minimum yield strength of 55,000 PSI. Bolts shall have an L bend on one end and threaded on the opposite end. Anchor bolts shall be hot dipped galvanized with a minimum length of 12 inches on the threaded end. Four properly sized bolts furnished with two hex nuts, and flat washers, shall be provided for each pole.

Contractor to obtain manufacturer required base bolt pattern prior to concrete installation.

F. A two-piece base cover shall completely seal the entire base plate and be securely fastened.

G. Each pole shall have a three-inch by five-inch handle. A nut holder shall be provided near the hand-hole and shall include a ½ inch – 13 UNC HE by Head bolt and nut for grounding. The hand-hole shall be welded in the pole shaft and shall include a steel cover with attachment screws. The hand-hole shall be located 18 inches above the base of the pole.

H. Finish of pole and accessories shall be electrostatically applied, and thermally cured polyester powder coat. Color shall be selected by Architect.

I. All structural fasteners shall be galvanized high strength carbon steel.

J. Poles shall be designed to withstand wind velocity of 80 MPH and 100 MPH gusts. Concrete base shall be a monolithic concrete pour when installed.

K. Standards shall be installed plumb and straight on concrete footings. Grout and dry pack after leveling. Concrete, grout and drypack requirements and procedures are as specified in Division 02.

a. Standards footings shall be provided with a moisture release channel to keep the interior of the standards dry and free from rain, dew or condensation. Refer to District's Standards Footing Detail. Engage a California Registered structural engineer to design the base.

L. Provide in line fuse assembly in hand-hole of each light standard with breakaway receptacle Bussmann HEY series, or OWNER approved equal. Fuse assembly shall easily disconnect power to light standard. Fuse type and rating shall be as required by each application.

M. Provide all required fixture mounting accessories.

N. Standards shall be as manufactured by Gardco, Alcastco, Lytepole, or OWNER approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install a lighting luminaire for each lighting outlet indicated and label with day of installation.

B. Luminaire voltage shall be as indicated on Drawings.

C. Install recessed and surface-mounted luminaires, with plaster frames compatible with ceiling and wall systems employed; secure luminaires mechanically to frames.

D. Align rows of suspended and surface-mounted luminaires to form straight lines at uniform elevations.

E. Recessed luminaires shall fit snugly against ceilings to prevent light leakage.

F. Luminaire installations shall comply with CBC Seismic requirements

G. Support suspended recessed luminaires in T-bar ceilings as follows: Luminaires shall be attached to ceiling grid to resist a horizontal force equal to weight of luminaires. For heavy-duty grid systems, luminaires weighing less than 56 pounds must also have two 12 gage slack safety wires from diagonal corners to the structure above; luminaires weighing more than 56 pounds shall be independently supported by not less than four taut 12 gage wires capable of supporting four times the load. For intermediate duty grid systems, luminaires shall be independently supported by not less than four taut 12 gage wires capable of supporting four times the load. Luminaire hanger wire ends shall be twisted three tight turns within a 1 ½ -inch distance. Provide positive point of attachment to T-bar ceiling with four, #8 wafer head tek screws (one at each corner), avoiding conflict with operation of the lens. Luminaire installation shall be coordinated with acoustical ceiling installation.

H. Emergency light luminaires shall be labeled “Emergency Luminaire” with one-inch high letters produced with a P-touch or similar labeling system.

I. Continuous suspended luminaires:

1. Luminaire suspension device shall allow vertical adjustment of luminaire without the use of tools. Cable shall be minimum seven strand twisted stainless steel capable of supporting minimum four times the luminaire weight. For continuous linear suspended luminaires longer than eight feet, provide not less than three suspension points.

2. Top of luminaire shall be suspended as shown on the Drawings, typically 24 inches below the ceiling and a minimum of 18 inches from the ceiling.

3. Luminaire shall utilize factory furnished or approved hardware and canopy for either hard or T-bar ceilings.

4. White Board Lights shall be suspended 24 inches from the wall unless specifically shown otherwise.

J. Surface mount luminaires shall be attached to structure. Toggle bolts are NOT permitted. Provide backing where required.

K. Low level exit signs shall be installed with the bottom of the sign not less than six inches, or more than eight inches above the floor level and shall indicate the path of

exit travel. For exit and exit-access doors, the sign shall be on the door or adjacent to the door with the closest edge of the sign within four inches of the door frame.

3.02 TESTING

A. Check and adjust luminaires for required illumination.

B. Replace defective LED strips and drivers.

C. Test and adjust lighting control equipment for proper operation.

3.03 SPARE PARTS

A. Furnish ten percent spare LED strips with a minimum of one spare strip of each type.

B. Furnish ten percent spare motion detectors of each type with a minimum of one spare detector of each type.

C. Furnish ten percent spare drivers of each type with a minimum one spare driver of each type.

3.04 HAZARDOUS WASTE DISPOSAL

A. Hazardous waste disposals shall be handled and disposed of by an approved, licensed contractor.

B. Products with PCBs are not acceptable. Hazardous waste shall be placed in appropriate containers provided by hazardous waste contractor labeled clearly with:

1. Project Name

2. Quantity of materials

3. Date materials became waste

C. Store, remove, transport and dispose of hazardous materials in accordance with state and federal regulations.

D. Provide Owner with copy of manifest and certificate of destruction.

3.05 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.06 CLEANUP

A. Remove rubbish, debris, and waste materials from all areas of work each day.

B. Clean luminaire surfaces of dirt, cement, plaster and debris. Furnish cleansers compatible with material surfaces being cleaned.

END OF SECTION

SECTION 26 5617
PARKING LOT AND SITE LED LIGHTING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Lighting fixtures, including LED lamps arrangements, drivers, wiring, and lighting controls.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 26 0500: Common Work Results for Electrical.
3. Section 26 0513: Basic Electrical Materials and Methods.
4. Section 26 0526: Grounding and Bonding.
5. Section 26 0519: Low-Voltage Wires.
6. Section 26 0533: Raceways, Boxes, Fittings and Supports.
7. Section 26 0923: Lighting Controls Systems.
8. Section 26 2416: Panel boards and Signal Terminal Cabinets.
9. Section 26 5000: Lighting.
10. Section 31 2323: Excavating and Fill for Utilities
11. Section 32 1313: Site Concrete Work.

1.02 REFERENCES

A. Publications are referenced within the text by their basic designation only. The most current version shall apply.

B. American National Standards Institute (ANSI):

1. ANSI C82.SSL1 – SSL Drivers.
2. ANSI C136.2 - American National Standard for Roadway and Area Lighting Equipment – Luminaire Voltage Classification.

3. ANSI C136.3 – American National Standard for Roadway and Area Lighting Equipment – Luminaire Attachments.

4. ANSI C136.10 – American National Standard for Roadway Lighting Equipment – Locking-Type Photocontrol Devices and Mating Receptacle Physical and Electrical Interchangeability and Testing.

5. ANSI C136.15 – American National Standard for Roadway and Area Lighting Equipment – Luminaire Field Identification.

6. ANSI C136.25 – American National Standard for Roadway and Area Lighting Equipment – Ingress Protection (Resistance to Dust, Solid Objects and Moisture) for Luminaire Enclosures.

7. ANSI C136.31 – American National Standard for Roadway Lighting Equipment – Luminaire Vibration.

C. American Society for Testing and Materials International (ASTM):

1. ASTM A36 – Standard Specification for Carbon Structural Steel.

2. ASTM A595 - Standard Specification for Steel Tubes, Low-Carbon or High-Strength Low-Alloy, Tapered for Structural Use.

3. ASTM D1654 – Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.

4. ASTM G35 – Standard Practice for Determining the Susceptibility of Stainless Steels and Related Nickel-Chromium-Iron Alloys to Stress-Corrosion Cracking in Polythionic Acids.

D. Federal Trade Commission (FTC):

1. Green Guides, 16 CFR Part 260, Guides for the Use of Environmental Marketing Claims.

E. Illuminating Engineering Society of North America (IESNA):

1. IESNA DG-13 – Guide for the Selection of Photo controls for Outdoor Lighting Applications.

2. IESNA LM-64 – Photometric Measurements of Parking Areas.

3. IESNA LM-79 – IESNA Approved Method for the Electrical and Photometric Measurements of Solid-Sate Lighting Products.

4. IESNA LM-80 – IESNA Approved Method for Measuring Lumen Maintenance of LED Light Sources.

5. IESNA TM-15 – Luminaire Classification System for Outdoor Luminaires

6. IESNA TM-21 – Projecting Long Term Lumen Maintenance of LED Light Sources.

7. IESNA RP-13 – Nomenclature and Definitions for Illuminating Engineering.

8. NEMA/ANSLG C78.377 – American National Standard for the Chromaticity of Solid-State Lighting Products.

9. NEMA WD 7 – NEMA Guide Publication: Occupancy Motion Sensors.

10. UL – 1449 – Surge Protective Devices.

F. California Building Code (CBC):

1. California Electrical Code (CEC).

G. Next Generation Lighting Industry Alliance/Department of Energy:

1. LED Luminaire Lifetime: Recommendations for Testing and Reporting – 1st Edition.

H. Underwriters Laboratories (UL):

1.03 DEFINITIONS

A. Lighting terminology used herein as defined in IESNA RP-16. See referenced documents for additional definitions.

B. Exception: The term “driver” is used herein to broadly cover both drivers and power supplies, where applicable.

C. Clarification: The term “LED light source(s)” is used herein in accordance with IES LM-80 to broadly cover LED package(s), module(s), and array(s).

D. Support Assembly: Means a pole or other support structures, brackets, cross-arms, appurtenances, base, anchorage, and foundation.

1.04 SUBMITTALS

A. List of Materials: Submit a complete list of materials proposed for this section.

B. Shop Drawings: Provide detailed and dimensioned Shop Drawings indicating kind, weight and thickness of materials, method of fitting and fastening parts together, location and number of sockets, size of LED boards and drivers, and complete details of method of fitting suspension and fastening fixtures in place. Provide wiring diagrams for lighting control equipment. Drawings shall contain sufficient information to assemble and install equipment at the Project site without further instructions.

C. Photometric calculations: Submit calculations with graphic of luminance levels of work and floor planes. Calculations shall comply with IESNA LM-64 recommendations.

D. Performance Reports:

1. Luminaire photometric reports per IESNA LM-79 including laboratory name, report number, date, luminaire catalog number, luminaire and light source specifications. Report shall contain lumen values in Backlight, Uplight, and Glare (BUG) zones per IESNA TM-15 and roadway type classifications luminous intensity, zonal lumen summary, and iso-footcandle diagrams, as well as documentation that specified standards and tests methods were followed.

E. Certifications:

1. LM 79 report at T=0 and T=6000 hours with a summary table showing the percent lumen output change and percent input power change.
2. Provide LM80 test results to demonstrate L70 life expectancy of no less than 50,000 hours after 6000 hours of test.
3. LM-80 test data for the LED(s) at three temperatures per LM-80. Provide 6000 hours test extrapolation data using and exponential decay function to show a documented life of no less than 50,000 hours, at no less than 90% efficacy. Provide the Ts value from the IESNA LM-79 and where the point fall in relation to the IESNA LM-80 extrapolated data. Interpolate between the LM 80 data for the Ts temperature.
4. Provide safety certification and file number as required for the luminaire family that must be listed, labeled or identified per the California Electrical Code (CEC), Applicable testing bodies are determined by the US Occupational Safety Health administration (OSHA), and include ETL, UL, or another Nationally Recognized Testing Laboratory (NRTL).
5. Provide report substantiating compliance with IESNA TM-21.

F. Certified Statements:

1. Submit manufacturer’s certified statement indicating that the manufacturer has been in the business of fabricating lighting fixtures for outdoor and general area illumination for a minimum of 10 years.

2. Establish compliance with the California Lighting Efficiency and Toxics Reduction Act requirements for the manufacturer to have in place a collection and recycling system of any end-of life general purpose light fixtures generated in the State of California.

3. Submit manufacturer’s certified statement indicating that the manufacturer has local service with offices no more than 50 miles from OWNER’s central offices.

4. Certification of product's compliance with the California Health and Safety Code requirements for products containing substances identified in the California Lighting Efficiency and Toxics Reduction Act. The product(s) shall not exceed the following allowed contents in parts per million (ppm):

    a. Lead content > 0.1% or 1000 ppm.

    b. Mercury Content > 0.1% or 1000 ppm.

    c. Cadmium Content > 0.01% or 100 ppm.

    d. Hexavalent Chromium > 0.1% or 1000 ppm.

    e. Polybrominated Biphenyls > 0.1% or 1000 ppm.

    f. Polybrominated Biphenyls Ether > 0.1% or 1000 ppm.

G. Installation Instructions: Submit manufacturer's written installation instructions for fixtures and accessories.

1.05 SUBSTITUTIONS

A. Luminaires that deviate from these requirements shall not be accepted without written approval from OWNER'S Design Standards Section and Maintenance and Operations Technical Unit. When deviating or substituting luminaires, the following information shall be submitted:

1. Substitution request form with clear indication of reasons and benefits to OWNER.

2. Provide substantiating evidence of benefits and pros and cons on favor of the proposed material/equipment/components substitution.

3. OWNER'S approval shall be obtained for any equipment or materials substitutions.

4. Submit a completed OWNER's LED luminaires evaluation form with supporting documentation for any and all fixtures' performance claims. The form can be found at the following electronic address: http://www.laschools.org/documents/file?file_id=310976408

B. Substitutions: Submittals must comply with contract general provisions, and provide as a minimum necessary installation details, lighting Foot-Candle level calculations in compliance with LAUSD illumination requirements indicated in OWNER's School Design Guide Section 3.7.B.

1.06 QUALITY ASSURANCE

A. Listing and Labels: Light fixtures shall be Underwriters Laboratory (UL) or Nationally Recognized Testing Laboratory (NRTL) listed, and in compliance with applicable industry standards and codes. NRTL test laboratories shall be qualified by the DOE and listed in the DOE SSL website.

B. Design of lighting fixtures, accessories, supports, and method of fixture installation shall comply with requirements for earthquake-resistant construction of the State of California.

1.07 COMMISSIONING

A. A Commissioning Services Provider (CxSP) retained by the OWNER will lead and provide Commissioning (Cx) of lighting systems and lighting controls, including submittal review, installation, testing, documentation, and training.

B. CONTRACTOR shall follow the commissioning responsibilities stated in Section 01 9113, General Commissioning Requirements.

C. CONTRACTOR shall provide all tools and personnel, and perform start-up, prefunctional and functional performance testing in the presence of the OWNER's CxSP.

1.08 WARRANTY

A. Five years on-site replacement material, fixture finish and workmanship. On-site replacement includes transportation, removal, and installation of new products. Finish warranty shall include warranty against failure or substantial deterioration such as blistering, cracking, peeling, chalking or fading.

B. Five years material replacement warranty for defective or non-starting LED source assemblies, drivers, and power supply units (PSU).

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Lighting fixtures in new construction projects:

1. General Electric – Evolve EAMM-EASM Series.

2. Cree/Betalux – STR-LWY or ARE-EDG Series.

3. McGraw Edison/Cooper Lighting Galleon Series.

4. Lithonia – DSX1 LED.

5. Signify/Gardco Pureform Series.

6. LSI - XGB3 Series.

7. Equal.

B. Light Standards:

1. Standards shall be 25 feet high, tapered galvanized steel, unless otherwise indicated on Drawings.

2. Aluminum poles are not acceptable.

3. Pole shaft shall conform to ASTM A595 Grade A and be 11 gage thickness, unless otherwise indicated on Drawings. Shaft shall be one-piece construction with a full length longitudinal high frequency resistance weld.

4. The anchor base shall be constructed from structural quality hot rolled carbon steel plate conforming to ASTM A36.

5. Anchor bolts shall be fabricated from commercial quality hot rolled carbon steel bar with minimum yield strength of 55,000 PSI. Bolts shall have an L bend on one end and threaded on the opposite end. Anchor bolts shall be hot dipped galvanized with a minimum length of 12 inches on the threaded end. Four properly sized bolts furnished with two hex nuts, and flat washers, shall be provided for each pole. CONTRACTOR to obtain manufacturer required base bolt pattern prior to concrete installation.

6. A two-piece base cover shall completely seal the entire base plate and anchorage and it shall be securely fastened.

7. Each pole shall have a three-inch by five-inch handle. A nut holder shall be provided near the handhole and shall include a ½ inch – 13 UNC HE by Head bolt and nut for grounding. The handhole shall be welded in the pole shaft and shall include a steel cover with attachment screws. The handhole shall be located 18 inches above the base of the pole.

8. Finish of pole and accessories shall be galvanized. Color shall be selected by Architect.

9. All structural fasteners shall be galvanized high strength carbon steel.

10. Poles shall be designed to withstand wind velocity of 80 MPH and 100 MPH gusts. Concrete base shall be a monolithic concrete pour when installed.

11. Standards shall be installed plumb and straight on concrete footings. Grout and dry pack after leveling. Concrete, grout and drypack requirements and procedures are as specified in Division 2.

12. Provide in line fuse assembly in hand hole of each light standard with breakaway receptacle Bussmann HEY series, or equal. Fuse assembly shall easily disconnect power to light standard. Fuse type and rating shall be as required by each application.

13. Provide all required fixture mounting accessories, including round tubular arm brackets supplied with pole.

14. Standards shall be as manufactured by Gardco, Alcastco, Lytepole, or OWNER approved equal.

2.02 EQUIPMENT

A. Fixtures shall meet the minimum performance requirements of efficiency and quality specified on Article 2.03.

B. Fixtures of same type shall be of one manufacturer and shall meet the following requirements:

1. Finish: Baked-on enamel or powder-coated.

2. Luminaire Attachments in compliance to ANSI C136.3.

3. Lens: Injection molded UV stabilized high impact acrylic in compliance to ANSI C136.31 requirements for luminaire vibration.

4. Fixture Optics: Capable of full 90-degree horizontal cutoff on all distributions, and in compliance with the chromaticity of solid-state lighting products per ANSI/NEMA/ANDLG C78.377.

5. Luminaire housing: Constructed of metal of enough thickness to meet or exceed the rated life of the luminaire LED's. Finish color as indicated in drawings. Powder-coated and rust resistant for the life of the luminaire in compliance with ASTM D1654 requirements.

6. Driver shall be replaceable and mounted within luminaire housing.

a. Screws shall be stainless steel. Captive screws shall be provided for any components that require maintenance after installation.

b. Driver surge protection in compliance to UL 1449.

c. Approved drivers: Philips, General Electric, Cree, Osram, Nichia, or approved equal.

7. No parts of the luminaire shall be constructed of polycarbonate, unless it is ultraviolet (UV) stabilized (lens discoloration shall be considered a failure under warranty).

8. Luminaire shall be “Dark Sky” compliant.

9. Luminaire shall have an option for individual LED’s optical shield for house-side light control.

    a. LEDs shall be Philips, Osram, Nichia, Illumitex, General Electric, Cree, or approved equal.

10. Luminaire door shall remain securely and safely linked to luminaire body, through a hinge design, when in the door open “down” position during inspection or maintenance.

11. Luminaire shall be capable of being operated by standard plug-in photoelectric cell, facing north, and shall not draw more than 1 watts of power in the off state. Photoelectric design shall comply with IESNA DG-13.

    a. Shorting cap shall be provided with luminaire.

12. Luminaire shall have the option for motion sensor controls and 0-10V step dimming. Motion sensors shall comply with the requirements of NEMA standard WD 7 and photocell controllability per ANSI C136.10.

13. Luminaire shall include a heat dissipating sink with no fans, pumps, or liquids.

    a. Luminaire shall be designed so that debris buildup or bird droppings do not degrade heat dissipation performance.

    b. Luminaire shall meet the requirements of ANSI C136.25 and C136.31 for resistance to dust, solid objects and moisture.

14. Luminaire shall weigh no more than 40 pounds. 80% of the luminaire material by weight shall be recyclable at the end of life.

15. Fixtures shall be UL or NRTL listed for wet locations.

16. Fixtures shall be labeled in accordance with the Federal Trade Commission Green Guides, 16 CFR Part 260, Guide for the Use of Environmental Marketing Claims.

17. Lighting fixtures shall be classified in accordance with IESNA TM-15.

C. Luminaire shall have a manufacturer’s stencil, or a permanent legible sticker, with the month and year of delivery.

2.03 PERFORMANCE REQUIREMENTS

A. Luminaire must be subject to 100,000 cycles of 2 Gs at the resonant frequency of the luminaire (between 5 and 30 Hz) applied at the center of gravity per ANSI C136.31 without damage to the luminaire.

B. Wiring cavity shall be field accessible for service or repairs.

C. Holes required for conduit entrances into speaker poles, floodlight poles or other poles, shall be drilled with the conduit nipple or coupling welded to poles. Welds shall be done using electric arc process and shall be continuous around nipple or coupling.

D. Coating shall be capable of surviving ASTM B117 salt environment for 500 hours minimum without blistering or peeling.

E. Gloss retention shall be greater than 90% for the 500 hours exposure QUV test. Results shall conform to ASTM G35, 4 hours UV-B60°/4 hours condensation 50°C.

F. Provide a minimum 6,000 hours of integral lamp operating data (not just LED data) and documented projection for 50,000 operating hours. Testing procedures and results documentation shall comply with the Department of Energy LED Luminaire Lifetime Recommendations for Testing and Reporting 1st Edition. LED(s) shall comply with the requirements set forth in UL-1449.

G. Lighting fixtures shall be rated for -20°C to +50°C.

H. Color Rendering Index shall not be less than 70.

I. Lighting fixtures shall have a minimum luminaire efficiency rating (LER) equal or greater than 75, and an Initial Lumen Efficacy (ILE) equal or greater than 70. Fixtures with lower LER and ILE shall not be accepted.

J. The acceptable Correlated Color Temperature (CCT) shall be 4500 degrees K +/- 500 degrees K.

K. Lumen Maintenance (LM) at 6000 Hrs must be greater or equal to 95%. Provide tests reports and photometric data.

L. Projected Lumen Maintenance (LM) at 50000 hrs greater or equal to 90%.

M. The Power Factor (PW) shall not be less than 0.95.

N. The Total harmonic Distortion (THD) shall be less than 18%

O. Fixtures shall operate on 120, 208, 240, 277, or 480 Volts in compliance with the requirements set forth in ANSI standard C136.15.

P. Power supply shall have a Class A sound rating in compliance with the requirements set forth in ANSI standard C136.15.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Drivers and LED boards shall be permanently labeled with the day of installation with one-inch high letters produced with a P-touch or similar permanent labeling system.

B. Installations shall comply with CBC Seismic requirements, California Electrical code and applicable ordinances and industry standards.

C. Standards shall be installed plumb and straight on concrete footings. Concrete requirements and procedures are as specified in Section 32 1313.

D. Emergency light fixtures shall be labeled “Emergency Fixture” with one-inch high letters produced with a P-touch or similar permanent labeling system.

3.02 TESTING

A. Check and adjust fixtures for required illumination.

B. Replace defective drivers and LED boards.

C. Test and adjust lighting control equipment for proper operation.

3.03 SPARE PARTS

A. Furnish ten percent spare drivers with a minimum of one spare LED board of each type.

B. Furnish five percent spare motion detectors of each type with a minimum of one spare detector of each type.

3.04 HAZARDOUS WASTE DISPOSAL

A. Hazardous waste disposals shall be handled and disposed of by licensed CONTRACTOR.

B. Store, remove, transport and dispose of hazardous materials in all accordance with state and federal regulations.

C. Provide OWNER with copy of manifest and certificate of destruction.

3.05 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.06 CLEANUP

A. Remove rubbish, debris, and waste materials from all areas of work each day.

B. Clean fixture surfaces of dirt, cement, plaster and debris. Furnish cleansers compatible with material surfaces being cleaned.

END OF SECTION

SECTION 270500 - COMMON WORK RESULTS FOR COMMUNICATIONS

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 APPLICABLE CRITERIA/REFERENCES

A. TIA-568 Generic Telecommunications Cabling for Customer Premises

B. TIA-569 Commercial Building Standards for Telecommunications Pathways and Spaces

C. TIA-606 Administration Standard for the Telecommunications Infrastructure

D. TIA-607 Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

E. TIA-758 Customer Owned Outside Plant Telecommunications Infrastructure Standard

F. BICSI TDMMBICSI - Telecommunications Distribution Methods Manual

G. BICSI OSPDRM BICSI – Outside Plant Design Reference Manual

H. BICSI ITSIM BICSI – Information Transport Systems Installation Manual

I. NFPA 70 National Electrical Code

J. IEEE C2 National Electrical Safety Code

1.3 SUMMARY

A. Section Includes:
1. Definitions
2. Communications equipment coordination and installation.
3. Quality Assurance
4. Delivery, Storage and Handling
5. Warranty
6. Occupational Health and Safety.
7. Leadership in Energy Efficient Design (LEED©).

B. Related Sections:
1. Division 27 Section "Grounding and Bonding for Communications"
2. Division 27 Section "Pathways for Communications"
3. Division 27 Section "Seismic Controls for Communications"
4. Division 27 Section “Identification for Communications”

5. Division 27 Section "Communications Equipment Room Fittings"
6. Division 27 Section "Communications Backbone Cabling"
7. Division 27 Section “Communications Horizontal Cabling"
8. Division 27 Section “Emergency Responder Radio Systems”
9. Division 27 Section "Media Communications Systems"
10. Division 27 Section "Public Address Systems"
11. Division 27 Section "Sound Systems"
12. Division 27 Section "Clock Systems"
13. Division 27 Section "Communications Outside Plant"

1.4 DEFINITIONS

A. Indicated: Refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in Specifications, and similar requirements in Contract Documents. Where terms such as "shown", "noted", "scheduled", and "specified" are used, it is to help locate the reference; no limitation on location is intended except as specifically noted.

B. Directed: Terms such as "directed", "requested", "authorized", "selected", "approved", "required", and "permitted" mean "directed by the Architect", "requested by the Architect", and similar phrases. However, no implied meaning shall be interpreted to extend the Architect's responsibility into the Contractor's area of construction supervision.

C. Approve: The term "approved", where used in conjunction with the Architect's action on the contractor's applications and requests, is limited to the duties and responsibilities of the Architect as stated in General and Supplementary Conditions. Such approval shall not release the Contractor from responsibility to fulfill Contract requirements unless otherwise provided in the Contract Documents.

D. Regulation: The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work, whether lawfully imposed by authorities having jurisdiction or not.

E. Furnish: The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations."

F. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."

G. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use."

H. Installer: An "Installer" is the Contractor engaged by the Contractor, either as an employee, subcontractor, or sub-subcontractor for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

I. Project Site: Is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other construction activities as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land upon which the Project is to be built.

J. Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.5 SUBMITTALS

A. Product Data: For sleeve seals.

B. Material Safety Data Sheets: For all hazardous materials.

1.6 COORDINATION

A. Coordinate arrangement, mounting, and support of communications equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting pathways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for communications items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

1.7 QUALITY ASSURANCE

A. Regulatory Requirements:

1. The system shall be registered under the most current applicable rulings of the Federal Communications Commission (FCC). Provide the FCC registration number with the equipment submittal. All components and installations shall bear an Underwriters' Laboratories (UL) listing.
2. Ordinances and Codes: Perform all work in accordance with applicable Federal, State and local ordinances and regulations and in accordance with the Rules, Regulations and Accepted Practices of the following Agencies:

a.	ANSI	American National Standards Institute
b.	ASTM	American Society for Testing and Materials
c.	BICSI	Building Industry Consulting Service International
d.	EIA	Electronics Industries Association
e.	FCC	Federal Communications Commission
f.	ICEA	Insulated Cable Engineers Association
g.	IEEE	Institute of Electrical and Electronics Engineers
h.	ISO	International Organization for Standardization
i.	NEC	National Electrical Code
j.	NEMA	National Electrical Manufacturer's Association
k.	NFPA	National Fire Protection Association.
l.	TIA	Telecommunications Industry Association
m.	UL	Underwriters Laboratories, Inc.
n.	VESA	Video Electronics Standards Association

3. Notify the Engineer/Communications Designer before submitting this proposal should any changes in Drawings or Specifications be required to conform to the above codes, rules or regulations. After entering into Contract, make all changes required to conform to above ordinances, rules and regulations without additional expense to the Owner.
4. The code or standard establishing the more stringent requirement shall be followed where areas of conflict occur between codes and standards or between codes and standards and specifications.
5. Barrier-Free Regulations: All materials and installations shall comply with the requirements of the State of California Handicapped Barrier-Free Regulations and with the Americans With Disabilities Act (ADA).
6. Comply with federal, state and local labor regulations and applicable union regulations.

B. Equipment Manufacturer Qualifications: The equipment shall be built and tested by a manufacturer who has regularly engaged in the production of said equipment for a minimum of five (5) years to assure one source of supply and responsibility.

C. Equipment Supplier Qualifications: The supplier of the equipment shall maintain permanent service facilities within the area of the installation. The facilities shall include a permanent source of factory-trained service technicians on 24-hour call experienced in servicing this type of equipment and shall provide warranty and routine maintenance service to afford the Owner maximum coverage. He shall also provide a central source of support to warranty immediate answers to Owner's problems resulting from misunderstanding of the operation of the equipment.

D. Equipment Installer Qualifications: The installation of the equipment shall be performed by fully qualified personnel, having had experience on the installation of this type and able to certify that they have had no less than five (5) years of continuous experience in this area and have made installation similar to this and of this size or larger.

E. Project Management Qualifications: The Contractor Project Manager shall have a minimum of five (5) years of project management experience. Upon request, contractor will provide a resume for all staff assigned to these positions.

F. Field Measurements:

1. Drawings are not intended to be scaled for roughing-in or to serve as shop drawings. Take all field measurements required for fitting the installation to the building.

G. Parts listed shall be complete, accurate part/model numbers and equipment furnished shall conform to manufacturer's specifications.

H. All materials shall be new and shall conform to applicable provisions of Underwriters Laboratories and the American Standards Association.

1.8 DELIVERY, STORAGE AND HANDLING

A. Store Communications equipment, at the vendor's location, as recommended in manufacturer's written instructions and in manufacturer's sealed protective packages until time of installation.

B. If spare parts are specified, store spare parts at the vendor’s location, as recommended in manufacturer’s written instructions and in manufacturer’s sealed protective packages. Deliver spare parts as part of the project close-out procedure.

C. Protect Communications equipment from damage and theft.

1.9 WARRANTY

A. Warranty: Refer to Communications sections for specific warranty requirements.

1.10 OCCUPATIONAL HEALTH AND SAFETY

A. Comply with 29 CFR 1910.1200 “Hazard Communication”

1. Ensure that the hazards of all chemicals used, stored, produced or imported are evaluated, and that information concerning their hazards is transmitted to employees by means of comprehensive hazard communication programs, which shall include:

a. Container labeling and other forms of warning.
b. Material safety data sheets.
c. Employee training.

1.11 LEADERSHIP IN ENERGY EFFICIENT DESIGN - U.S GREEN BUILDING COUNCIL

A. Provide material and installation in accordance with the U.S. Green Building Council’s LEED© program as practical. Coordinate with construction manager, general contractor and design firm to optimize potential LEED© points.

PART 2 - PRODUCTS

2.1 MATERIAL SAFETY DATA SHEETS

A. Provide and ensure that MSDS for all hazardous materials are readily accessible during each work shift to employees when they are in their work area.

B. Provide copies of all MSDS to other trades, contractors, general contractor, construction manager and owner as required.

2.2 LEED© CERTIFIED COMMUNICATIONS PRODUCTS

A. Where practical, provide products that are LEED© certified for certification credits. Examples include material with recycled content, Energy Star© compliant and material produced within 500 miles of the jobsite.

2.3 SLEEVES FOR PATHWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, reamed and bushed ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral water stop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

    a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
    b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.4 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.

1. Manufacturers: Subject to compliance with requirements.
2. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of pathway or cable.
3. Pressure Plates: Plastic, Carbon steel or Stainless steel. Include two for each sealing element.

4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating or Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communications equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: To Life Safety systems or piping installed at a required slope.

3.2 SLEEVE INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Communications penetrations occur when pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting with bushings on both surfaces of walls.

F. Extend sleeves installed in floors 3 inches (75 mm) above finished floor level.

G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pathway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry.

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

K. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using [**steel**] [**cast-iron**] pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between pathway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for communications installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 270500

SECTION 270526 - GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

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. Grounding conductors.
2. Grounding connectors.
3. Grounding busbars.
4. Grounding labeling.

1.3 DEFINITIONS

A. BCT: Bonding conductor for telecommunications.

B. TGB: Telecommunications grounding busbar.

C. TMGB: Telecommunications main grounding busbar.

D. Service Provider: The operator of a service that provides telecommunications transmission delivered over access provider facilities.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For communications equipment room signal reference grid. Include plans, elevations, sections, details, and attachments to other work.

1.5 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing as-built locations of grounding and bonding infrastructure, including the following:

1. BCT, TMGB, TGBs, and routing of their bonding conductors.

B. Qualification Data: For Installer, installation supervisor, and field inspector.

C. Qualification Data: For testing agency and testing agency's field supervisor.

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 01 "Operation and Maintenance Data," include the following:

a. Result of the ground-resistance test measured at the point of BCT connection.
b. Result of the bonding-resistance test at each TGB and its nearest grounding electrode.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Installation Supervision: Installation shall be under the direct supervision of ITS Technician Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
2. Field Inspector: Currently registered by BICSI as a designer RCDD to perform the on-site inspection.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

C. Comply with TIA-607.

2.2 CONDUCTORS

A. Comply with UL 486A-486B.

B. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.

1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.
2. Cable Tray Equipment Grounding Wire: No. 6 AWG.

C. Cable Tray Grounding Jumper:

1. Not smaller than No. 6 AWG and not longer than 12 inches (300 mm). If jumper is a wire, it shall have a crimped grounding lug with two holes and long barrel for two crimps. If jumper is a flexible braid, it shall have a one-hole ferrule. Attach with grounding screw or connector provided by cable tray manufacturer.
2. Not smaller than No. 10 AWG and not longer than 12 inches (300 mm). If jumper is a wire, it shall have a crimped grounding lug with one hole and standard barrel for one crimp. If jumper is a flexible braid, it shall have a one- or two-hole ferrule. Attach with grounding screw or connector provided by cable tray manufacturer.

D. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmils (14.2 sq. mm), 14 strands of No. 17 AWG conductor, and 1/4 inch (6.3 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-hole copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.3 CONNECTORS

A. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.

B. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.

1. Electroplated tinned copper, C and H shaped.

C. Signal Reference Grid Connectors: Combination of compression wire connectors, access floor grounding clamps, bronze U-bolt grounding clamps, and copper split-bolt connectors, designed for the purpose.

D. Busbar Connectors: Cast silicon bronze, solderless compression or exothermic-type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch (15.8- or 25.4-mm) centers for a two-bolt connection to the busbar.

E. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.4 GROUNDING BUSBARS

A. TMGB: Predrilled, wall-mounted, rectangular bars of hard-drawn solid copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, length as indicated on Drawings. The busbar shall be NRTL listed for use as TMGB and shall comply with TIA-607.

1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide a 4-inch (100-mm) clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

B. TGB: Predrilled rectangular bars of hard-drawn solid copper, 1/4 by 2 inches (6.3 by 50 mm) in cross section, length as indicated on Drawings. The busbar shall be for wall mounting, shall be NRTL listed as complying with UL 467, and shall comply with TIA-607.

1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide at least a 2-inch (50-mm) clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

C. Rack and Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with TIA-607. Predrilling shall be with holes for use with lugs specified in this Section.

1. Cabinet-Mounted Busbar: Terminal block, with stainless-steel or copper-plated hardware for attachment to the cabinet.
2. Rack-Mounted Horizontal Busbar: Designed for mounting in 19- or 23-inch (483- or 584-mm) equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
3. Rack-Mounted Vertical Busbar: 72 or 36 inches (1827 or 914 mm) long, with stainless-steel or copper-plated hardware for attachment to the rack.

2.5 IDENTIFICATION

A. Comply with requirements for identification products in DIVISION 27 "Identification for Communications Systems."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the ac grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of the electrical system.

B. Inspect the test results of the ac grounding system measured at the point of BCT connection.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with connection of the BCT only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Bonding shall include the ac utility power service entrance, the communications cable entrance, and the grounding electrode system. The bonding of these elements shall form a loop so that each element is connected to at least two others.

B. Comply with NECA 1.

C. Comply with TIA-607.

3.3 APPLICATION

A. Conductors: Install solid conductor for No. 8 AWG and smaller and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

1. The bonding conductors between the TGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.
2. The bonding conductors between the TMGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2 AWG minimum.

C. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Structural Steel: Welded connectors.

D. Conductor Support:

1. Secure grounding and bonding conductors at intervals of not less than 36 inches (900 mm).

E. Grounding and Bonding Conductors:

1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
2. Install without splices.
3. Support at not more than 36-inch (900-mm) intervals.
4. Install grounding and bonding conductors in 3/4-inch (21-mm) PVC conduit until conduit enters a telecommunications room. The grounding and bonding conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.

3.4 GROUNDING ELECTRODE SYSTEM

A. The BCT between the TMGB and the ac service equipment ground shall not be smaller than No. 1/0 AWG.

3.5 GROUNDING BUSBARS

A. Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 12 inches (300 mm) above finished floor unless otherwise indicated.

B. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

3.6 CONNECTIONS

A. Bond metallic equipment in a telecommunications equipment room to the grounding busbar in that room, using equipment grounding conductors not smaller than No. 6 AWG.

B. Stacking of conductors under a single bolt is not permitted when connecting to busbars.

C. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:

1. Use crimping tool and the die specific to the connector.
2. Pre-twist the conductor.
3. Apply an antioxidant compound to all bolted and compression connections.

D. Primary Protector: Bond to the TMGB with insulated bonding conductor.

E. Interconnections: Interconnect all TGBs with the TMGB with the telecommunications backbone conductor. If more than one TMGB is installed, interconnect TMGBs using the grounding equalizer conductor. The telecommunications backbone conductor and grounding equalizer conductor size shall not be less than 2 kcmils/linear foot (1 sq. mm/linear meter) of conductor length, up to a maximum size of No. 3/0 AWG unless otherwise indicated.

F. Telecommunications Enclosures and Equipment Racks: Bond metallic components of enclosures to the telecommunications bonding and grounding system. Install top-mounted or vertically mounted rack grounding busbar unless the enclosure and rack are manufactured with the busbar. Bond the equipment grounding busbar to the TGB No. 2 AWG bonding conductors.

G. Structural Steel: Where the structural steel of a steel frame building is readily accessible within the room or space, bond each TGB and TMGB to the vertical steel of the building frame.

H. Electrical Power Panelboards: Where an electrical panelboard for telecommunications equipment is located in the same room or space, bond each TGB to the ground bar of the panelboard.

I. Shielded Cable: Bond the shield of shielded cable to the TGB in communications rooms and spaces. Comply with TIA-568 and TIA-568 when grounding shielded balanced twisted-pair cables.

J. Rack- and Cabinet-Mounted Equipment: Bond powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with NFPA 70; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.

K. Access Floors: Bond all metal parts of access floors to the TGB.

L. Equipment Room Signal Reference Grid: Provide a low-impedance path between telecommunications cabinets, equipment racks, and the reference grid, using No. 6 AWG bonding conductors.

1. Install the conductors in grid pattern on 4-foot (1200-mm) centers, allowing bonding of one pedestal from each access floor tile.
2. Bond the TGB of the equipment room to the reference grid at two or more locations.
3. Bond all conduits and piping entering the equipment room to the TGB at the perimeter of the room.

M. Towers and Antennas:

1. Ground Ring: Buried at least 30 inches (760 mm) below grade and at least 24 inches (610 mm) from the base of the tower or mounting.
2. Bond each tower base and metallic frame of a dish to the ground ring, buried at least 18 inches (460 mm) below grade.

3. Bond the ground ring and antenna grounds to the equipment room TMGB or TGB, buried at least 30 inches (760 mm) below grade.
4. Bond metallic fences within 6 feet (1.8 m) of towers and antennas to the ground ring, buried at least 18 inches (460 mm) below grade.
   a. Bond tower base footings steel, the TGB in the equipment room, and antenna support guys to the roof ring.
   b. Connect roof ring to the perimeter conductors of the lightning protection system.

5. Waveguides and Coaxial Cable:

   a. Bond cable shields at the point of entry into the building to the TGB and to the cable entrance plate, using No. 2 AWG bonding conductors.
   b. Bond coaxial cable surge arrester to the ground or roof ring using bonding conductor size recommended by surge-arrester manufacturer.

3.7 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.

B. Comply with IEEE C2 grounding requirements.

C. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) extends above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, non-shrink grout.

D. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, bonding conductor. Train conductors' level or plumb around corners and fasten to manhole walls. Connect grounding conductors to cable armor and cable shields per written instructions by manufacturer of splicing and termination kits.

3.8 IDENTIFICATION

A. Labels shall be preprinted or computer-printed type.

1. Label TMGB(s) with "fs-TMGB," where "fs" is the telecommunications space identifier for the space containing the TMGB.
2. Label TGB(s) with "fs-TGB," where "fs" is the telecommunications space identifier for the space containing the TGB.

3. Label the BCT and each telecommunications backbone conductor at its attachment point: "WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench per manufacturer's written instructions.
2. Test the bonding connections of the system using an ac earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing a TMGB and a TGB and using the process recommended by BICSI TDMM. Conduct tests with the facility in operation.

    a. Measure the resistance between the busbar and the nearest available grounding electrode. The maximum acceptable value of this bonding resistance is 100 milliohms.

3. Test for ground loop currents using a digital clamp-on ammeter, with a full-scale of not more than 10 A, displaying current in increments of 0.01 A at an accuracy of plus/minus 2.0 percent.

    a. With the grounding infrastructure completed and the communications system electronics operating, measure the current in every conductor connected to the TMGB and in each TGB. Maximum acceptable ac current level is 1 A.

D. Excessive Ground Resistance: If resistance to ground at the BCT exceeds 5 ohms, notify Architect promptly and include recommendations to reduce ground resistance.

E. Grounding system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 270526

SECTION 270528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS

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. Ladder cable trays
2. Metal conduits and fittings.
3. Nonmetallic conduits and fittings.
4. Metal wireways and auxiliary gutters.
5. Nonmetallic wireways and auxiliary gutters.
6. Metallic surface pathways.
7. Nonmetallic surface pathways.
8. Tele-power poles.
9. Hooks
10. Boxes, enclosures, and cabinets.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid conduit.

C. IMC: Intermediate metal conduit.

D. RTRC: Reinforced thermosetting resin conduit.

1.4 ACTION SUBMITTALS

A. Product data for the following:

1. Surface pathways
2. Wireways and fittings.
3. Tele-power poles.
4. Boxes, enclosures, and cabinets.
5. Underground handholes and boxes.

B. Shop Drawings: For custom enclosures and cabinets and custom underground handholes and boxes. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Pathway routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of pathway groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
3. Underground ducts, piping, and structures in location of underground enclosures and handholes.

B. Qualification Data: For professional engineer.

C. Source quality-control reports.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR CABLE TRAYS

A. Cable Trays and Accessories: Identified as defined in NFPA 70 and marked for intended location, application, and grounding.

1. Source Limitations: Obtain cable trays and components from single manufacturer.

B. Sizes and Configurations: See the Cable Tray Schedule on Drawings for specific requirements for types, materials, sizes, and configurations.

C. Structural Performance: See articles for individual cable tray types for specific values for the following parameters:

1. Uniform Load Distribution: Capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.
2. Concentrated Load: A load applied at midpoint of span and centerline of tray.
3. Load and Safety Factors: Applicable to both side rails and rung capacities.

2.2 LADDER RACK / RUNWAY

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Chatsworth Products Inc.

2. Or Equal Subject to Review.

B. Description:

1. Configuration: Two I-beam side rails with transverse rungs welded to side rails.
2. Rung Spacing: 9 inches o.c.
3. Radius-Fitting Rung Spacing: 9 inches (225 mm) at center of tray's width.
4. Minimum Cable-Bearing Surface for Rungs: 7/8-inch (22-mm) width with radius edges.
5. No portion of the rungs shall protrude below the bottom plane of side rails.
6. Structural Performance of Each Rung: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200-lb (90-kg) concentrated load, when tested according to NEMA VE 1.
7. Straight Section Lengths: 10 feet (3 m) except where shorter lengths are required to facilitate tray assembly.
8. Width: 12 inches (300 mm) unless otherwise indicated on Drawings.
9. Class Designation: Comply with NEMA VE 1
10. Splicing Assemblies: Bolted type using serrated flange locknuts.
11. Hardware and Fasteners: Steel, zinc plated according to ASTM B 633.
12. Splice Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.

2.3 METAL CONDUITS AND FITTINGS

A. Description: Metal raceway of circular cross section with manufacturer-fabricated fittings.

B. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
2. Comply with TIA-569.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. ARC: Comply with ANSI C80.5 and UL 6A.

E. IMC: Comply with ANSI C80.6 and UL 1242.

F. PVC-Coated Steel Conduit: PVC-coated GRC or IMC.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch (1 mm), minimum.

G. EMT: Comply with ANSI C80.3 and UL 797.

H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
2. Fittings for EMT:

    a. Material: Steel or die cast.
    b. Type: Set screw or compression.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

I. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.4 NONMETALLIC CONDUITS AND FITTINGS

A. Description: Nonmetallic raceway of circular section with manufacturer-fabricated fittings.

B. General Requirements for Nonmetallic Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
2. Comply with TIA-569.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. Rigid HDPE: Comply with UL 651A.

E. Continuous HDPE: Comply with UL 651A.

F. RTRC: Comply with UL 2515A and NEMA TC 14.

G. Fittings: Comply with NEMA TC 3; match to conduit or tubing type and material.

H. Solvents and Adhesives: As recommended by conduit manufacturer.

2.5 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Description: Sheet metal trough of rectangular cross section fabricated to required size and shape, without holes or knockouts, and with hinged or removable covers.

B. General Requirements for Metal Wireways and Auxiliary Gutters:

1. Comply with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized per NFPA 70.
2. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
3. Comply with TIA-569.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Screw-cover type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.6 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

A. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.

B. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.

C. General Requirements for Nonmetallic Wireways and Auxiliary Gutters:

1. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
2. Comply with TIA-569.

D. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

E. Solvents and Adhesives: As recommended by conduit manufacturer.

2.7 SURFACE METAL PATHWAYS

A. Description: Galvanized steel with snap-on covers, complying with UL 5.

B. Finish: Manufacturer's standard enamel finish in color selected by Architect.

C. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with TIA-569.

2.8 SURFACE NONMETALLIC PATHWAYS:

A. Description: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC.

B. Finish: Texture and color selected by Architect from manufacturer's standard colors.

C. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.

D. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

E. Comply with TIA-569.

2.9 HOOKS

A. Description: Prefabricated sheet metal cable supports for telecommunications cable.

1. Approved for use in limited applications to support Horizontal cabling. Bundle sizes may not exceed 20 Category 6A.

B. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

C. Comply with TIA-569.

D. Galvanized or stainless steel.

E. J shape.

F. Accept 3/8” (or 10mm) threaded rod for attachment to building structure or sub-structure.

G. Holes for easy attachment to wall surfaces, beams, trusses and direct attachment to cable trays and rack systems. Can be tiered in a single column, as well as back-to-back.

H. White, red, green, yellow or blue color identifiers for content designation of segregated cables.

I. Center Hanger Connector Plate

1. Bracket that allows for back-to-back non-continuous open top cable support mounting.
2. Continuous cable division shall be fully maintained within each open top cable support.
3. Fittings shall be manufactured of galvanized steel or stainless steel.

J. Multi-tier Assembly

1. Bracket that allows for top-to-bottom non-continuous open top cable support mounting.
2. Continuous cable division shall be fully maintained within each open top cable support.
3. Fittings shall be manufactured of galvanized steel.

2.10 BOXES, ENCLOSURES, AND CABINETS

A. Description: Enclosures for communications.

B. General Requirements for Boxes, Enclosures, and Cabinets:

1. Comply with TIA-569.
2. Boxes, enclosures, and cabinets installed in wet locations shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for use in wet locations.
3. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
4. Device Box Dimensions: 4 inches square by 2-1/4 inches deep (100 mm square by 65 mm deep).
5. Gangable boxes are prohibited.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Metal Floor Boxes:

1. Material: Cast metal or sheet metal.
2. Type: Fully adjustable.
3. Shape: Rectangular.
4. Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Nonmetallic Floor Boxes: Nonadjustable, round or rectangular.

1. Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

I. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

J. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

2. Nonmetallic Enclosures:

   a. Material: Plastic.
   b. Finished inside with radio-frequency-resistant paint.

3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

K. Cabinets:

1. NEMA 250, Type 12 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 RACEWAY INSTALLATION REQUIREMENTS

A. Minimum conduit size shall be 1-1/4” for serving one outlet box. Daisy chaining of outlet boxes is unacceptable.

B. Communications ducts and conduits entering the building from the outside shall transition to galvanized rigid steel conduit or intermediate metal conduit at the building wall, and shall continue as galvanized rigid steel conduit or intermediate metal conduit until entering the BE room or TR. Maximum conduit length to meet Code shall be 50'. Notify the Project Manager if this length is exceeded.

C. Riser conduits and sleeves connecting BE rooms and TRs shall be 4". Install conduits and sleeves as close as possible to the walls, at the locations shown. Stub up floor conduits and sleeves 4" AFF. Stub wall conduits and sleeves 4" into the room, and cable trays 6" into the room.

D. When conduits are needed to bypass a large interference in a cable tray run, the cross-sectional area of the conduits shall equal or exceed the cross-sectional area of the cable tray. These bypass conduits shall have sweeps and bends as noted below and shall be braced well to allow pulling of communication cables.

E. Conduit bends and offsets shall be made with sweeps or manufactured elbows. Conduits shall not have more than the equivalent of 2 ninety-degree bends between pull points. Pull boxes shall not be used to make directional changes. Provide pull boxes in straight sections of conduit only.

F. Provide insulated bushings on both ends of conduits.

G. Provide double gang sheet metal outlet boxes 2-1/8" deep and provide double gang plaster rings.

H. Bond the entire raceway system together and connect it to the ground system.

I. Provide nylon pull strings in conduits and sleeves. Label pull strings with room number and wall (N, S, E, or W) of the outlet.

3.2 PATHWAY APPLICATION

A. Outdoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC.
3. Underground Conduit: RNC, Type EPC-40-PVC Type EPC-80-PVC, direct buried concrete encased.
4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R or Type 4.

B. Indoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT or RNC.
2. Exposed, Not Subject to Severe Physical Damage: EMT or RNC identified for such use.
3. Exposed and Subject to Severe Physical Damage: GRC. Pathway locations include the following:

    a. Loading dock.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.
    d. Gymnasiums

4. Concealed in Ceilings and Interior Walls and Partitions: EMT or innerduct.
5. Damp or Wet Locations: GRC.
6. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical-fiber-cable pathway Plenum-type, communications-cable pathway, EMT.
7. Pathways for Optical-Fiber or Communications-Cable Risers in Vertical Shafts: Riser-type, optical-fiber-cable pathway Riser-type, communications-cable pathway, EMT.
8. Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: General-use, optical-fiber-cable pathway Riser-type, optical-fiber-cable pathway Plenum-type, optical-fiber-cable pathway General-use, communications-cable pathway Riser-type, communications-cable pathway Plenum-type, communications-cable pathway, EMT.
9. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel units in institutional and commercial kitchens and damp or wet locations.

C. Minimum Pathway Size: 1-1/4 inch (25-mm) trade size for copper, aluminum cables, and optical-fiber cables.

D. Pathway Fittings: Compatible with pathways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use set-screw or compression, steel fittings. Comply with NEMA FB 2.10.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface pathways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.3 INSTALLATION

A. Comply with the following standards for installation requirements except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA/BICSI 568.
3. TIA-569.
4. NECA 101
5. NECA 102.
6. NECA 105.
7. NECA 111.

B. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

C. Comply with requirements in Section 07 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

D. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling" for sleeves and sleeve seals for communications.

E. Keep pathways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

F. Complete pathway installation before starting conductor installation.

G. Arrange stub-ups so curved portions of bends are not visible above finished slab.

H. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches (300 mm) of changes in direction. Utilize long radius ells for all optical-fiber cables.

I. Conceal rigid conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

J. Support conduit within 12 inches (300 mm) of enclosures to which attached.

K. Pathways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot (3-m) intervals.
2. Arrange pathways to cross building expansion joints at right angles with expansion fittings. Comply with requirements for expansion joints specified in this article.
3. Arrange pathways to keep a minimum of 2 inches (50 mm) of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from nonmetallic conduit and fittings to GRC and fittings before rising above floor.

L. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for pathways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

M. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.

N. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

O. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

P. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus one additional quarter-turn.

Q. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure, to assure a continuous ground path.

R. Cut conduit perpendicular to the length. For conduits of 2-inch (50-mm) trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

S. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Secure pull wire, so it cannot fall into conduit. Cap pathways designated as spare alongside pathways in use.

T. Surface Pathways:

1. Install surface pathway for surface telecommunications outlet boxes only where indicated on Drawings.
2. Install surface pathway with a minimum 2-inch (50-mm) radius control at bend points.
3. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight pathway section. Support surface pathway per manufacturer's written instructions. Tape and glue are not acceptable support methods.

U. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and nonmetallic, rigid and flexible, as follows:

1. 4-Inch (100-mm) Trade Size and Larger: Install pathways in maximum lengths of 75 feet (23 m).
2. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

V. Install pathway-sealing fittings at accessible locations per NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish like that of adjacent plates or surfaces. Install pathway-sealing fittings per NFPA 70.

W. Install devices to seal pathway interiors at accessible locations. Locate seals, so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service pathway enters a building or structure.
3. Where otherwise required by NFPA 70.

X. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.

Y. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run

length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC and EMT that is located where environmental temperature change may exceed 100 deg F (55 deg C), and that has straight-run length that exceeds 100 feet (30 m).

2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
    d. Attics: 135 deg F (75 deg C) temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected per manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

Z. Hooks:

1. Size to allow a minimum of 25 percent future capacity without exceeding design capacity limits.
2. Shall be supported by dedicated support wires. Do not use ceiling grid support wire or support rods.
3. Hook spacing shall allow no more than 6 inches (150 mm) of slack. The lowest point of the cables shall be no less than 6 inches (150 mm) adjacent to ceilings, mechanical ductwork and fittings, luminaires, power conduits, power and telecommunications outlets, and other electrical and communications equipment.
4. Space hooks no more than 5 feet (1.5 m) o.c.
5. Provide a hook at each change in direction.

AA. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

BB. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

CC. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.

DD. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

EE. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

FF. Set metal floor boxes level and flush with finished floor surface.

GG. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.4 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling."

3.5 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.6 PROTECTION

A. Protect coatings, finishes, and cabinets from damage or deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 270528

SECTION 270543 - UNDERGROUND PATHWAYS AND STRUCTURES FOR COMMUNICATION SYSTEMS

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. Metal conduit and fittings, including GRC and PVC-coated GRC.
2. Rigid nonmetallic duct.
3. Duct accessories, including rigid innerduct and fabric innerduct.
4. Precast concrete handholes.
5. Polymer concrete handholes and boxes with polymer concrete cover.
6. Utility structure accessories.

1.3 DEFINITIONS

A. Direct Buried: Duct or a duct bank that is buried in the ground, without any additional casing materials, such as concrete.

B. Duct: A single duct or multiple ducts. Duct may be either installed singly or as component of a duct bank.

C. Duct Bank:

1. Two or more ducts installed in parallel, with or without additional casing materials.
2. Multiple duct banks.

D. GRC: Galvanized rigid conduit.

E. IMC: Intermediate metal conduit.

F. RNC: Rigid nonmetallic conduit.

G. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include duct-bank materials, including spacers and miscellaneous components.
2. Include duct and conduits and their accessories, including elbows, end bells, bends, fittings, duct spacers and solvent cement.
3. Include accessories for manholes, handholes, and boxes, and other utility structures.
4. Include underground-line warning tape.

B. Shop Drawings:

1. Precast or Factory-Fabricated Underground Utility Structures:

a. Include plans, elevations, sections, details, attachments to other work, and accessories.
b. Include duct entry provisions, including location and duct size.
c. Include reinforcement details.
d. Include frame and cover design and manhole chimneys.
e. Include grounding details.
f. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
g. Include joint details.

2. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:

a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
b. Include duct entry provisions, including location and duct size.
c. Include cover design.
d. Include grounding details.
e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.5 INFORMATIONAL SUBMITTALS

A. Duct and Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures.

1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
2. Drawings shall be signed and sealed by a qualified professional engineer.

B. Product Certificates: For concrete and steel used in precast concrete handholes, as required by ASTM C 858.

C. Qualification Data: For professional engineer and testing agency responsible for testing nonconcrete handholes and boxes.

D. Source quality-control reports.

E. Field quality-control reports.

1.6 MAINTENANCE MATERIALS SUBMITTALS

A. Furnish extra materials as recommended by the manufacturer for future installations that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified per ASTM E 329 for testing indicated.

1.8 FIELD CONDITIONS

A. Interruption of Existing Communications Service: Do not interrupt communications service to facilities occupied by Owner or others unless permitted under the following conditions, and then only after arranging to provide temporary communications service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of communications service.
2. Do not proceed with interruption of communications service without Owner's written permission.

B. Ground Water: Assume ground-water level is 36 inches (900 mm) below ground surface unless a higher water table is noted on Drawings.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. GRC: Comply with ANSI C80.1 and UL 6.

B. PVC-Coated Steel Conduit: PVC-coated GRC.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch (1 mm), minimum.

C. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
2. Comply with TIA-569 and TIA-758.

2.2 RIGID NONMETALLIC DUCTS

A. Underground Plastic Utilities Duct: Type EPC-80-PVC RNC, complying with NEMA TC 2 and UL 651, with matching fittings complying with NEMA TC 3 by same manufacturer as duct.

B. Underground Plastic Utilities Duct: Type DB-120-PVC RNC, complying with NEMA TC 6 & 8 and with ASTM F-512 for direct burial, with matching fittings complying with NEMA TC 9 by same manufacturer as duct.

C. Underground Plastic Utilities Duct: Type EB-20 PVC RNC, complying with NEMA TC 6 & 8, ASTM F-512, and UL 651, with matching fittings complying with NEMA TC 9 by same manufacturer as duct.

D. General Requirements for Nonmetallic Ducts and Fittings:

1. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
2. Comply with TIA-569 and TIA-758.

E. Solvents and Adhesives: As recommended by duct manufacturer.

2.3 FLEXIBLE NONMETALLIC DUCTS

A. HDPE Duct: Type EPEC 80-HDPE complying with NEMA TC 7 and UL 651A.

1. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
2. Comply with TIA-569 and TIA-758.

2.4 DUCT ACCESSORIES

A. Fabric Innerduct: Continuous, polyester, multi -pocket fabric innerduct, with internal pull tape and tracer wire.

B. Duct Spacers: Factory-fabricated rigid PVC interlocking spacers, sized for type and size of duct with which used, and selected to provide minimum duct spacing indicated while supporting duct during concreting or backfilling.

C. Underground-Line Warning Tape: Underground-line warning tape specified in Section 270553 "Identification for Communications Systems."

2.5 PRECAST CONCRETE HANDHOLES AND BOXES

A. Description: Monolithically poured, factory-fabricated, reinforced-concrete walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.

B. Comply with ASTM C 858 for design and manufacturing processes.

C. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.

D. Frame and Cover: Weatherproof steel frame, with steel cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.

E. Frame and Cover: Weatherproof steel frame, with hinged steel access door assembly with tamper-resistant, captive, cover-securing bolts.

1. Cover Hinges: Concealed, with hold-open ratchet assembly.
2. Cover Handle: Recessed.

F. Frame and Cover: Weatherproof aluminum frame, with hinged aluminum access door assembly with tamper-resistant, captive, cover-securing bolts.

1. Cover Hinges: Concealed, with hold-open ratchet assembly.
2. Cover Handle: Recessed.

G. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

H. Cover Legend: Molded lettering, "COMMUNICATIONS."

I. Configuration: Units shall be designed for flush burial and have integral closed bottom unless otherwise indicated.

J. Extensions and Slabs: Designed to mate with bottom of enclosure and made of same material as enclosure.

1. Extension shall provide increased depth of 12 inches (300 mm).
2. Slab: Same dimensions as bottom of enclosure and arranged to provide closure.

K. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.

L. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct and duct banks, plus an additional 6 inches (150 mm) vertically and horizontally to accommodate alignment variations.

1. Knockout panels shall be located no less than 6 inches (150 mm) from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.
2. Knockout panel opening shall have cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie into concrete envelopes of duct banks.
3. Knockout panel openings shall be framed with at least two additional No. 3 steel reinforcing bars in concrete around each opening.
4. Knockout panels shall be 1-1/2 to 2 inches (38 to 50 mm) thick.

M. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.

1. Type and size shall match fittings to duct or conduit to be terminated.
2. Fittings shall align with elevations of approaching duct and be located near interior corners of handholes to facilitate racking of cable.

N. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.6 POLYMER CONCRETE HANDHOLES AND BOXES WITH POLYMER CONCRETE COVER

A. Description: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.

B. Standard: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.

C. Color: Gray.

D. Configuration: Units shall be designed for flush burial and have integral closed bottom unless otherwise indicated.

E. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.

F. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

G. Cover Legend: Molded lettering, "COMMUNICATIONS."

H. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.

I. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering duct for secure, fixed installation in enclosure wall.

J. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have factory-installed inserts for cable racks and pulling-in irons.

2.7 UTILITY STRUCTURE ACCESSORIES

A. Accessories for Utility Structures: Utility equipment and accessory items used for utility structure access and utility support, listed and labeled for intended use and application.

B. Manhole Frames, Covers, and Chimney Components: Comply with structural design loading specified for manhole.

1. Frame and Cover: Weatherproof, gray cast iron complying with ASTM A 48/A 48M, Class 30B, with milled cover-to-frame bearing surfaces; 29-inch (725-mm) diameter.

a. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
b. Special Covers: Recess in face of cover designed to accept finish material in paved areas.

2. Cover Legend: Cast in. Selected to suit system.

C. Manhole Sump Frame and Grate: ASTM A 48/A 48M, Class 30B, gray cast iron.

D. Pulling Eyes in Concrete Walls: Eyebolt with reinforcing-bar fastening insert, 2-inch-(50-mm-) diameter eye, and 1-by-4-inch (25-by-100-mm) bolt.

1. Working Load Embedded in 6-Inch (150-mm), 4000-psi (27.6-MPa) Concrete: 13,000-lbf (58-kN) minimum tension.

E. Pulling Eyes in Nonconcrete Walls: Eyebolt with reinforced fastening, 1-1/4-inch- (31-mm-) diameter eye, rated 2500-lbf (11-kN) minimum tension.

F. Pulling-In and Lifting Irons in Concrete Floors: 7/8-inch- (22-mm-) diameter, hot-dip galvanized, bent steel rod; stress relieved after forming; and fastened to reinforcing rod. Exposed triangular opening.

1. Ultimate Yield Strength: 40,000-lbf (180-kN) shear and 60,000-lbf (270-kN) tension.

G. Bolting Inserts for Concrete Utility Structure Cable Racks and Other Attachments: Flared, threaded inserts of noncorrosive, chemical-resistant, nonconductive thermoplastic material; 1/2-inch (13-mm) ID by 2-3/4 inches (69 mm) deep, flared to a minimum of 1-1/4 inches (31 mm) at base.

1. Tested Ultimate Pullout Strength: 12,000 lbf (53 kN) minimum.

H. Ground Rod Sleeve: 3-inch (75-mm), PVC duct sleeve in manhole floors 2 inches (50 mm) from the wall adjacent to, but not underneath, the duct entering the structure.

I. Expansion Anchors for Installation after Concrete Is Cast: Zinc-plated, carbon-steel-wedge type with stainless-steel expander clip, with 1/2-inch (13-mm) bolt, 5300-lbf (24-kN) rated pullout strength, and minimum 6800-lbf (30-kN) rated shear strength.

J. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F (2 deg C). Capable of withstanding temperature of 300 deg F (150 deg C) without slump and adhering to clean surfaces of plastic duct, metallic duct, duct coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.

K. Cover Hooks: Light duty, designed for lifts less than 60 lbf (270 N). Two required.

2.8 SOURCE QUALITY CONTROL

A. Test and inspect precast concrete utility structures per ASTM C 1037.

B. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of manholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of duct, duct bank, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.

B. Coordinate elevations of duct and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Architect.

C. Clear and grub vegetation to be removed and protect vegetation to remain according to Section 311000 "Site Clearing." Remove and stockpile topsoil for reapplication according to Section 311000 "Site Clearing."

3.2 UNDERGROUND DUCT APPLICATION

A. Duct for Communications: Type EPC-80-PVC RNC, in concrete-encased duct bank unless otherwise indicated.

B. Duct for Communications: Type DB-120-PVC RNC, in direct-buried duct bank unless otherwise indicated.

C. Duct for Communications: Type EPEC-80-HDPE duct in direct-bored duct bank unless otherwise indicated.

D. Underground Duct Crossing: Paved Paths, Walks and Driveways: Type EPC-40-PVC RNC, encased in reinforced concrete.

E. Stub-Ups for Communications: Concrete-encased GRC.

3.3 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Boxes for Communications:

1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-20 structural load rating.
2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20 structural load rating.
3. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 structural load rating.
4. Units Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin or High-density plastic, structurally tested per SCTE 77 with 3000-lbf (13 345-N) vertical loading.
5. Cover design load shall not exceed the design load of the handhole or box.

3.4 EARTHWORK

A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restoration: Replace area immediately after backfilling is completed.

C. Restore surface features at areas disturbed by excavation and re-establish original grades unless otherwise indicated.

D. Cut and patch existing pavement in the path of underground duct, duct bank, and utility structures per the "Cutting and Patching" Article in Section 017300 "Execution."

3.5 DUCT AND DUCT-BANK INSTALLATION

A. Where indicated on Drawings, install duct, spacers, and accessories into the duct configuration shown. Duct installation requirements in this Section also apply to duct bank.

B. Install duct and duct bank per NEMA TCB 2 and TIA-758.

C. Slope: Pitch duct and duct bank a minimum slope of 1:100 down toward manholes and handholes and away from buildings and equipment. Slope duct and duct bank from a high point in runs between two manholes, to drain in both directions.

D. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches (1200 mm), both horizontally and vertically, at other locations unless otherwise indicated.

1. Duct and duct banks shall have maximum of two 90-degree bends, or the total of all bends shall be no more 180 degrees between pull points.

E. Joints: Use solvent-cemented joints in duct and fittings and make watertight according to manufacturer's written instructions. Stagger couplings, so those of adjacent ducts do not lie in same plane.

F. Installation Adjacent to High-Temperature Steam Lines: Where duct or duct banks are installed parallel to underground steam lines, perform calculations showing the duct or duct bank will not be subject to environmental temperatures above 40 deg C. Where environmental temperatures are calculated to rise above 40 deg C, and anywhere the duct or duct bank crosses above an underground steam line, install insulation blankets listed for direct burial to isolate the duct bank from the steam line.

G. End-Bell Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 6 inches (150 mm) o.c. for 4-inch (100-mm) duct, and vary proportionately for other duct sizes.

1. Begin change from regular spacing to end-bell spacing 10 feet (3 m) from the end bell without reducing duct slope and without forming a trap in the line.
2. Expansion and Deflection Fittings: Install an expansion and deflection fitting in each duct in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight-line direct-buried duct and duct banks, with calculated expansion of more than 3/4 inch (19 mm).
3. Grout end bells into structure walls from both sides to provide watertight entrances.

H. Terminator Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use manufactured, cast-in-place duct terminators, with entrances into structure spaced approximately 6 inches (150 mm) o.c. for 4-inch (100-mm) duct and vary proportionately for other duct sizes.

1. Begin change from regular spacing to terminator spacing 10 feet (3 m) from the terminator without reducing duct slope and without forming a trap in the line.
2. Expansion and Deflection Fittings: Install an expansion and deflection fitting in each duct in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight-line duct or duct bank, with calculated expansion of more than 3/4 inch (19 mm).

I. Building Wall Penetrations: Make a transition from underground duct to GRC at least 10 feet (3 m) outside the building wall, without reducing duct slope away from the building or forming a trap in the duct. Use fittings manufactured for RNC duct-to-GRC conduit transition. Install GRC penetrations of building walls as specified in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling."

J. Sealing: Provide temporary closure at terminations of duct that has cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.

K. Innerduct: Install immediately after mandreling duct. Size and type as indicated on Drawings.

L. Pulling Cord: Install 200-lbf- (1000-N-m) test nylon cord in empty duct and innerduct.

M. Concrete-Encased Duct and Duct Bank:

1. Excavate trench bottom to provide firm and uniform support for duct or duct bank. Prepare trench bottoms as specified in Section 312000 "Earth Moving" for pipes less than 6 inches (150 mm) in nominal diameter.
2. Width: Excavate trench 12 inches (300 mm) wider than duct or duct bank on each side.
3. Width: Excavate trench 3 inches (75 mm) wider than duct or duct bank on each side.
4. Depth: Install top of duct and duct bank at least 24 inches (600 mm) below finished grade in areas not subject to deliberate traffic, and at least 30 inches (750 mm) below finished grade in deliberate traffic paths for vehicles unless otherwise indicated.
5. Support duct and duct bank on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
6. Minimum Space Between Duct: 3 inches (75 mm) between edge of duct and exterior envelope wall, 2 inches (50 mm) between ducts for like services, and 4 inches (100 mm) between power and communications ducts.
7. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 feet (6 m) of duct. Place spacers within 24 inches (600 mm) of duct ends. Stagger spacers approximately 6 inches (150 mm) between tiers. Secure spacers to earth and duct to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around duct or duct bank.
8. Elbows: Use manufactured duct elbows for stub-ups, at building entrances, and at changes of direction in duct run unless otherwise indicated. Extend concrete encasement throughout length of elbow.
9. Elbows: Use manufactured GRC elbows for stub-ups, at building entrances, and at changes of direction in duct run.

    a. Couple GRC to duct with adapters designed for this purpose and encase coupling with 3 inches (75 mm) of concrete.
    b. Stub-Ups to Outdoor Equipment: Extend concrete-encased GRC horizontally a minimum of 60 inches (1500 mm) from edge of base. Install insulated grounding bushings on terminations at equipment.

        1) Stub-ups shall be minimum 4 inches (100 mm) above finished floor and minimum 3 inches (75 mm) from conduit side to edge of slab.

    c. Stub-Ups to Indoor Equipment: Extend concrete-encased GRC horizontally a minimum of 60 inches (1500 mm) from edge of wall. Install insulated grounding bushings on terminations at equipment.

        1) Stub-ups shall be minimum 4 inches (100 mm) above finished floor and no less than 3 inches (75 mm) from conduit side to edge of wall.

10. Reinforcement: Reinforce concrete-encased duct and duct bank where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.

11. Forms: Use trench walls to form side walls of duct and duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
12. Concrete Cover: Install a minimum of 3 inches (75 mm) of concrete cover between edge of duct to exterior envelope wall, 2 inches (50 mm) between ducts, and 4 inches (100 mm) between power and communications duct.
13. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.

    a. Start at one end and finish at the other, allowing for expansion and contraction of duct as its temperature changes during and after the pour. Use expansion fittings installed per manufacturer's written recommendations or use other specific measures to prevent expansion-contraction damage.
    b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch (19-mm) reinforcing-rod dowels extending a minimum of 18 inches (450 mm) into concrete on both sides of joint near corners of envelope.

14. Pouring Concrete: Comply with requirements in "Concrete Placement" Article in Section 033000 "Cast-in-Place Concrete." Place concrete carefully during pours to prevent voids under and between ducts and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto duct. Allow concrete to flow to center of bank and rise in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.

N. Direct-Buried Duct and Duct Banks:

1. Excavate trench bottom to provide firm and uniform support for duct and duct bank. Comply with requirements in Section 312000 "Earth Moving" for preparation of trench bottoms for duct less than 6 inches (150 mm) in nominal diameter.
2. Install duct with a minimum of 3 inches (75 mm) between duct for like services and 6 inches (150 mm) between power and signal duct.
3. Width: Excavate trench 12 inches (300 mm) wider than duct or duct bank on each side.
4. Width: Excavate trench 3 inches (75 mm) wider than duct or duct bank on each side.
5. Depth: Install top of duct or duct bank at least 36 inches (900 mm) below finished grade unless otherwise indicated.
6. Set elevation of bottom of duct or duct bank below frost line.
7. Support duct on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
8. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 feet (6 m) of duct. Place spacers within 24 inches (600 mm) of duct ends. Stagger spacers approximately 6 inches (150 mm) between tiers. Secure spacers to earth and duct to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around duct or duct bank.

9. Elbows: Install manufactured duct elbows for stub-ups, at building entrances through floor, and at changes of direction in duct unless otherwise indicated. Encase elbows for stub-ups throughout length of elbow. Extend encasement minimum of 36 inches (900 mm) beyond elbow joints.
10. Install manufactured GRC elbows for stub-ups, at building entrances, and at changes of direction in duct.

    a. Couple GRC to duct with adapters designed for this purpose and encase coupling with 3 inches (75 mm) of concrete.
    b. For equipment mounted on outdoor bases, extend GRC horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

11. After installing first tier of duct, backfill and compact. Start at tie-in point and work toward end of duct run, leaving duct at end of run free to move with expansion and contraction, as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfills to 4 inches (100 mm) over duct and hand tamp. Firmly tamp backfill around duct to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 312000 "Earth Moving" for installation of backfill materials.

    a. Place minimum of 3 inches (75 mm) of sand as a bed for duct and duct bank. Place sand to a minimum of 6 inches (150 mm) above top level of duct and duct bank.
    b. Place minimum of 6 inches (150 mm) of engineered fill above concrete encasement of duct bank.

O. Underground-Line Warning Tape: Bury conducting underground-line warning tape specified in Section 270553 "Identification for Communication Systems" no less than 12 inches (300 mm) below grade. Align tape parallel to and within 3 inches (75 mm) of centerline of duct bank. Provide an additional warning tape for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 mm). Space additional tapes 12 inches (300 mm) apart, horizontally.

3.6 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

A. Precast Concrete Handhole and Manhole Installation:

1. Comply with ASTM C 891 unless otherwise indicated.
2. Install units' level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances.
3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch (25-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

B. Elevations:

1. Manhole Roof: Install with rooftop at least 15 inches (380 mm) below finished grade.
2. Manhole Frame: In paved areas and trafficways, set frames flush with finished grade. Set other manhole frames 1 inch (25 mm) above finished grade.
3. Install handholes with bottom below frost line, no less than 24 inches below grade.
4. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
5. Where indicated, cast handhole cover frame integrally with handhole structure.

C. Drainage: Install drains in bottom of manholes where indicated. Coordinate with drainage provisions indicated.

D. Waterproofing: Apply waterproofing to exterior surfaces of manholes and handholes after concrete has cured at least three days. After duct has been connected and grouted, and before backfilling, waterproof joints and connections, and touch up abrasions and scars. Waterproof exterior of manhole chimneys after mortar has cured at least three days.

E. Dampproofing: Apply dampproofing to exterior surfaces of manholes and handholes after concrete has cured at least three days. Dampproofing materials and installation are specified in Section 071113 "Bituminous Dampproofing." After duct has been connected and grouted, and before backfilling, dampproof joints and connections, and touch up abrasions and scars. Dampproof exterior of manhole chimneys after mortar has cured at least three days.

F. Hardware: Install removable hardware, including pulling eyes, cable stanchions, [**and**]cable arms, [**and insulators,**]as required for installation and support of cables and conductors and as indicated.

G. Field-Installed Bolting Anchors in Manholes and Concrete Handholes: Do not drill deeper than 3-7/8 inches (97 mm) for manholes and 2 inches (50 mm) for handholes, for field-installed anchor bolts installed. Use a minimum of two anchors for each cable stanchion.

3.7 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of duct and duct bank, and seal joint between box and extension as recommended by manufacturer.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.

D. Install handholes and boxes with bottom below frost line, a minimum of 24 inches below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.

F. Field cut openings for duct per enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

G. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring, encircling, and in contact with, enclosure, and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.

1. Concrete: 3000 psi (20 kPa), 28-day strength, complying with Section 033000 "Cast-in-Place Concrete," with a troweled finish.
2. Dimensions: 10 inches wide by 12 inches deep (250 mm wide by 300 mm deep).

3.8 GROUNDING

A. Ground underground duct, duct bank, and utility structures per Section 270526 "Grounding and Bonding for Communications Systems."

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 12-inch-(300-mm-) long mandrel equal to duct size minus 1/4 inch (6 mm). If obstructions are indicated, remove obstructions and retest.
3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 270526 "Grounding and Bonding for Communications Systems."

B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.10 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of duct until duct cleaner indicates that duct is clear of dirt and debris.

B. Clean internal surfaces of manholes, including sump.

1. Sweep floor, removing dirt and debris.
2. Remove foreign material.

END OF SECTION 270543

SECTION 270548 - SEISMIC CONTROLS FOR COMMUNICATIONS SYSTEMS

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. Restraint channel bracings.
2. Restraint cables.
3. Seismic-restraint accessories.
4. Mechanical anchor bolts.
5. Adhesive anchor bolts.

B. Related Requirements:

1. Section 270528 "Pathways for Communications Systems" for commonly used supports and installation requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.

    a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by DSA.
    b. Annotate to indicate application of each product submitted and compliance with requirements.

B. Delegated-Design Submittal: For each seismic-restraint device.

1. Include design calculations and details for selecting seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Design Calculations: Calculate static and dynamic loading caused by equipment weight, operation, and seismic forces required to select seismic restraints and for designing vibration isolation bases.

a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.

3. Seismic-Restraint Details:

a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
d. Preapproval and Evaluation Documentation: By DSA or an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints. Communications components include:

1. Uninterruptible power supplies.
2. Racks.
3. Frames.
4. Cabinets.
5. Cable tray.
6. Conduits.
7. Speakers

B. Qualification Data: For professional engineer

C. Welding certificates.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

C. Welding Qualifications: Qualify procedures and personnel per AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis. They shall bear anchorage preapproval from DSA in addition to preapproval, showing maximum seismic-restraint ratings, by ICC-ES or another agency acceptable to authorities having jurisdiction. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) that support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

E. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC: **D**
2. Assigned Seismic Use Group or Building Category as Defined in the IBC: **III**.

    a. Component Importance Factor: **1.0**.
    b. Component Response Modification Factor: **2.5**.
    c. Component Amplification Factor: **1.0**.

3. Design Spectral Response Acceleration at Short Periods (0.2 Second): **1.281**.
4. Design Spectral Response Acceleration at 1.0-Second Period: **0.777**.

2.2 RESTRAINT CHANNEL BRACINGS

A. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end, with other matching components, and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.3 RESTRAINT CABLES

A. Restraint Cables: ASTM A 492 stainless-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.4 SEISMIC-RESTRAINT ACCESSORIES

A. Hanger-Rod Stiffener: Reinforcing steel angle clamped to hanger rod.

B. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.

C. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.

D. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.

E. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.5 MECHANICAL ANCHOR BOLTS

A. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.6 ADHESIVE ANCHOR BOLTS

A. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by DSA or an agency acceptable to authorities having jurisdiction.

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points.

B. Equipment and Hanger Restraints:

1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
2. Install seismic-restraint devices using methods approved by DSA or an agency acceptable to authorities having jurisdiction providing required submittals for component.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

E. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

F. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque using a torque wrench.

6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.

C. Seismic controls will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 270548

SECTION 270553 - IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

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. Color and legend requirements for labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes.
5. Signs.
6. Cable ties.
7. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for communications identification products.

B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule:

1. Outlets: Scaled drawings indicating location and proposed designation.
2. Patch Panels: Enlarged scaled drawings showing rack row, number, and proposed designations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 70 and TIA 606.

B. Comply with ANSI Z535.4 for safety signs and labels.

C. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Equipment Identification Labels:

1. Black letters on a white field.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

B. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters of raceway or cable they identify, that stay in place by gripping action.

C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- (0.08-mm-) thick, vinyl flexible labels with acrylic pressure-sensitive adhesive.

1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating protective shields over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
2. Marker for Labels: Permanent, waterproof black ink marker recommended by tag manufacturer.
3. Marker for Labels: Machine-printed, permanent, waterproof black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil- (0.08-mm-) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Minimum Nominal Size:

a. 1-1/2 by 6 inches (37 by 150 mm) for raceway and conductors.
b. 3-1/2 by 5 inches (76 by 127 mm) for equipment.
c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

A. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameters sized to suit diameters of raceway or cable they identify, that stay in place by gripping action.

2.5 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, and ANSI Z535.4.
2. Inscriptions for Orange-Colored Tapes: "COMMUNICATIONS CABLE, OPTICAL-FIBER CABLE".

C. Tag: Type I:

1. Pigmented polyolefin, bright colored, compounded for direct-burial service.
2. Width: 3 inches (75 mm).
3. Thickness: 4 mils (0.1 mm).
4. Weight: 18.5 lb/1000 sq. ft. (9.0 kg/100 sq. m).
5. Tensile per ASTM D 882: 30 lbf (133.4 N) and 2500 psi (17.2 MPa).

D. Tag: Type II:

1. Multilayer laminate, consisting of high-density polyethylene scrim coated with pigmented polyolefin; bright colored, compounded for direct-burial service.
2. Width: 3 inches (75 mm).
3. Thickness: 12 mils (0.3 mm).
4. Weight: 36.1 lb/1000 sq. ft. (17.6 kg/100 sq. m).
5. Tensile per ASTM D 882: 400 lbf (1780 N) and 11,500 psi (79.2 MPa).

E. Tag: Type ID:

1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright colored, compounded for direct-burial service.
2. Width: 3 inches (75 mm).
3. Overall Thickness: 5 mils (0.125 mm).
4. Foil Core Thickness: 0.35 mil (0.00889 mm).

5. Weight: 28 lb/1000 sq. ft. (13.7 kg/100 sq. m).
6. Tensile per ASTM D 882: 70 lbf (311.3 N) and 4600 psi (31.7 MPa).

F. Tag: Type IID:

1. Reinforced, detectable three-layer laminate, consisting of a printed pigmented woven scrim, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright-colored, compounded for direct-burial service.
2. Width: 3 inches (75 mm).
3. Overall Thickness: 8 mils (0.2 mm).
4. Foil Core Thickness: 0.35 mil (0.00889 mm).
5. Weight: 34 lb/1000 sq. ft. (16.6 kg/100 sq. m).
6. Tensile per ASTM D 882: 300 lbf (1334 N) and 12,500 psi (86.1 MPa).

2.6 SIGNS

A. Baked-Enamel Signs:

1. Preprinted aluminum signs punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal Size: 7 by 10 inches (180 by 250 mm).

B. Metal-Backed Butyrate Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch (1-mm) galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal Size: 10 by 14 inches (250 by 360 mm).

C. Laminated-Acrylic or Melamine-Plastic Signs:

1. Engraved legend.
2. Thickness:

    a. For signs up to 20 sq. in. (129 sq. cm), minimum 1/16 inch (1.6 mm) thick.
    b. For signs larger than 20 sq. in. (129 sq. cm), 1/8 inch (3.2 mm) thick.
    c. Engraved legend with black letters on white face.
    d. Punched or drilled for mechanical fasteners with 1/4-inch (6.4-mm) grommets in corners for mounting.
    e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.7 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C) per ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black, except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C) per ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black.

C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C) per ASTM D 638: 7000 psi (48.2 MPa).
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Black.

2.8 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying communications identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of communications systems and connected items.

G. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

H. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
3. Provide label 6 inches (150 mm) from cable end.

I. Snap-Around Labels:

1. Secure tight to surface at a location with high visibility and accessibility.
2. Provide label 6 inches (150 mm) from cable end.

J. Self-Adhesive Wraparound Labels:

1. Secure tight to surface at a location with high visibility and accessibility.
2. Provide label 6 inches (150 mm) from cable end.

K. Self-Adhesive Labels:

1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.

L. Snap-Around, Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

M. Underground-Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 12 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.
2. Limit use of underground-line warning tape to direct-buried cables.

3. Install underground-line warning tape for direct-buried cables and cables in raceways.

N. Cable Ties: General purpose, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations with high visibility. Identify by system and circuit designation.

C. Accessible Fittings for Raceways and Cables within Buildings: Identify covers of each junction and pull box with self-adhesive labels containing wiring system legend.

1. System legends shall be as follows:

a. Telecommunications
b. Security
c. Audio Visual

D. Faceplates: Label individual faceplates with self-adhesive labels. Place label at top of faceplate. Each faceplate shall be labeled with its individual, sequential designation, numbered clockwise when entering room from primary egress, composed of the following, in the order listed:

1. Wiring closet designation.
2. Colon.
3. Faceplate number.

E. Equipment Room Labeling:
1. Patch Panels: Label individual rows and outlets, starting at to left and working down, with self-adhesive labels.
2. Data Outlets: Label each outlet with a self-adhesive label indicating the following, in the order listed:

a. Room number being served.
b. Color.
c. Faceplate number.

F. Horizontal Cables: Label each cable with a vinyl-wraparound label indicating the following, in the order listed:

1. Room number.
2. Color.

3. Faceplate number.

G. Locations of Underground Lines: Underground-line warning tape for copper, coaxial, hybrid copper/fiber, and optical-fiber cable.

H. Instructional Signs: Self-adhesive labels.

I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures: Self-adhesive labels.

1. Apply to exterior of door, cover, or other access.

J. Equipment Identification Labels:

1. Indoor Equipment: Self-adhesive label.
2. Outdoor Equipment: Laminated-acrylic or melamine-plastic sign.
3. Equipment to Be Labeled:

a. Communications cabinets.
b. Uninterruptible power supplies.
c. Computer room air conditioners.
d. Fire-alarm and suppression equipment.
e. Egress points.
f. Power distribution components.

END OF SECTION 270553

SECTION 271100 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS

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. Backboards.
2. Racks.
3. Cabinets.
4. Power strips.

1.3 DEFINITIONS

A. Access Provider: An operator that provides a circuit path or facility between the service provider and user. An access provider can also be a service provider.

B. RCDD: Registered communications distribution designer.

C. Service Provider: The operator of a telecommunications transmission service delivered through access provider facilities.

D. TGB: Telecommunications grounding bus bar.

E. TMGB: Telecommunications main grounding bus bar.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
3. Grounding: Indicate location of grounding bus bar and its mounting detail showing standoff insulators and wall mounting brackets.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

B. Seismic Qualification Data: Certificates, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions. Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Cabling installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings shall be under direct supervision of Technician.
2. Installation Supervision: Installation shall be under direct supervision of Technician, who shall always be present when Work of this Section is performed at Project site.
3. Field Inspector: Currently registered by BICSI as Technician to perform the on-site inspection.

PART 2 - PRODUCTS

2.1 BACKBOARDS

A. Backboards: A/C grade, 3/4 by 48 by 96 inches (19 by 1220 by 2440 mm) Plywood, fire-retardant treated, comply with requirements for plywood backing panels specified in Division 06 Section "Rough Carpentry."

2.2 SEISMIC APPROVED RACKS

A. Manufacturers: Subject to compliance with requirements.

B. General Frame Requirements:

1. Distribution Frames: Freestanding and wall-mounting, modular-steel units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
2. Module Dimension: Width compatible with EIA 310 standard, 19-inch (480-mm) panel mounting.
3. Finish: Manufacturer's standard, baked powder coat.

C. Floor-Mounted Racks:

1. 7’ high, modular-type, steel construction.
2. 12 inch and 6 inch (150 mm) wide vertical cable management, double sided with covers.
3. Baked powder coat finish, black in color.
4. Products:
   a. Chatsworth Universal Rack 2-Post

2.3 HORIZONTAL CABLE MANAGEMENT FOR RACKS AND CABINETS

1. Metal, 3.5-inch-high (89 mm) (2RU) front integral wire retaining fingers and hinged front cover.
2. Baked-polyester black powder coat finish.
3. Provide one (1) 2RU horizontal cable manager between each optical and copper patch panel.
4. Products:
   a. Chatsworth Model Number-30130-719

2.4 POWER STRIPS

A. Power Strips: Equipment rack power strips shall be 125-volt, 20-amp, 3 wire, single circuit type with 10 NEMA 5-20R single receptacle outlets on 6" centers.
1. Horizontal rack mounting for racks with IT/AV function (2 per rack).
2. Vertical mount for racks with IT/AV and AV only function (2 per rack).
3. Six, 15-A, 120-VAC, NEMA WD 6, Configuration 5-20R receptacles.
4. LED indicator lights for power and protection status.
5. LED indicator lights for reverse polarity and open outlet ground.
6. Circuit Breaker and Thermal Fusing: When protection is lost, circuit opens and cannot be reset.
7. Cord connected with 15-foot (4.5-m) line cord.
8. Peak Single-Impulse Surge Current Rating: 33 kA per phase.
9. Protection modes shall be line to neutral, line to ground, and neutral to ground. UL 1449 clamping voltage for all 3 modes shall be not more than 330 V.

2.5 UNINTERRUPTED POWER SUPPLY

A. Products:
1. APC Smart-UPS 2200VS Rackmount 2U.

2.6 GROUNDING

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems." for grounding conductors and connectors.

B. Telecommunications Main Grounding Bus Bar:

1. Connectors: Mechanical type, cast silicon bronze, solder less compression-type wire terminals, and long-barrel, two-bolt non-twisting connection to ground bus bar.
2. Main Telecommunications Ground Bus (MTGB) bar: Copper, minimum 1/4-inch-thick by 4 inches wide (6 mm thick by 100 mm wide) with two vertical 5/16-inch (8-mm) holes spaced 5/8 inches (16 mm) apart.
3. Telecommunications Ground Bus (TGB) bar: Copper, minimum 1/4-inch-thick by 2 inches wide (6 mm thick by 50 mm wide) with two vertical 5/16-inch (8-mm) holes spaced 5/8 inches (16 mm) apart.
4. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.
5. Provide a TMGB in the Main Equipment Room and a TGB in each Telecommunications Room.

C. Comply with TIA-607.

D. Comply with NECA-BICSI-607.

2.7 LABELING

A. Comply with TIA-606 and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers. Reference sheet T-601 for owner approved labeling standard

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Comply with BICSI's "Telecommunications Distribution Methods Manual" for layout of communications equipment spaces.

C. Comply with BICSI's "Information Technology Systems Installation Methods Manual" for installation of equipment in communications equipment spaces.

D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

E. Coordinate layout and installation of communications equipment in tracks and in room. Coordinate service entrance configuration with service provider.

1. Meet jointly with systems providers, equipment suppliers, and Owner to exchange information and agree on details of equipment configurations and installation interfaces.
2. Record agreements reached in meetings and distribute them to other participants.
3. Adjust configurations and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize configurations and space requirements of communications equipment.
4. Adjust configurations and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in equipment room.

F. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

G. Backboards:

1. Install from 6 inches (150 mm) to 8 feet, 6 inches (2588 mm) above finished floor. If plywood is fire rated, ensure that fire-rating stamp is visible after installation.
2. Paint all sides of backboard with two coats of paint, leaving fire rating stamp visible.
3. Comply with requirements for backboard installation in BICSI's "Information Technology Systems Installation Methods Manual" and TIA-569.

3.2 BE ROOM AND TR REQUIREMENTS

A. Provide ceiling-hung lighting with a wall switch at the door.

B. Provide power to HVAC equipment.

C. Provide dedicated 120-volt, 20 ampere circuits to duplex receptacles 48" AFF and 10' apart on the plywood backboards. Plywood backboards are by others.

D. Provide dedicated 120-volt, 30 ampere circuits to NEMA L5-30R receptacles and provide dedicated 120-volt, 20 ampere circuits to power strips on the telecom equipment racks. See Standard Detail 16740010.

E. In rooms with DAS equipment plywood backboards, provide two dedicated 120-volt, 20 ampere circuits to quad receptacles on each DAS backboard.

F. Provide one 120-volt, 20 ampere normal power circuit to a duplex receptacle on the wall near the door.

G. Coordinate all receptacle locations with Owner.

H. Provide a 1" wide x 12" long x 1/4" thick copper ground bus bar where shown. Connect it to the unit substation room ground bus bar and to the ground bus bars in the receptacle panels feeding the telecom room receptacles. Ground cables shall be No. 6 AWG green insulated, stranded, copper. The resistance to building ground shall be 1 ohm maximum.

3.3 SLEEVE AND SLEEVE SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling."

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569, Annex A, "Firestopping."

C. Comply with BICSI's "Information Technology Systems Installation Methods Manual," "Firestopping Practices" Ch.

END OF SECTION 271100

SECTION 271300 - COMMUNICATIONS BACKBONE CABLING

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. Pathways.
2. 50/125-micrometer, optical fiber cabling.
3. 8/125-micrometer, optical fiber cabling.
4. Multipair Copper
5. Cable connecting hardware, patch panels, and cross-connects.
6. Cabling identification products.

1.3 DEFINITIONS

A. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

B. EMI: Electromagnetic interference.

C. IDC: Insulation displacement connector.

D. LAN: Local area network.

E. RCDD: Registered Communications Distribution Designer.

1.4 BACKBONE CABLING DESCRIPTION

A. Backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.

B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

1.5 PERFORMANCE REQUIREMENTS

A. General Performance: Backbone cabling system shall comply with transmission standards in TIA/EIA-568, when tested according to test procedures of this standard.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
3. Cabling administration drawings and printouts.
4. Wiring diagrams to show typical wiring schematics including the following:

    a. Cross-connects.
    b. Patch panels.
    c. Patch cords.

5. Cross-connects and patch panels. Detail mounting assemblies and show elevations and physical relationship between the installed components.

C. Sustainable Design Submittals:

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

B. Source quality-control reports.

C. Field quality-control reports.

D. Maintenance Data: For splices and connectors to include in maintenance manuals.

1.8 CLOSEOUT SUBMITTALS

A. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On USB drive or DVD ROM, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings and Cabling Administration Drawings by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall always be present when Work of this Section is performed at Project site.
3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Testing Agency Qualifications: An NRTL.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569.

F. Grounding: Comply with ANSI-J-STD-607.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical loss test set.
2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in maintenance data.

1.11 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.12 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. General Requirements: Comply with TIA/EIA-569.

B. Cable Support: NRTL labeled for support of cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Lacing bars, spools, J-hooks, and D-rings.
3. Straps and other devices.

2.2 WARRANTY REQUIREMENTS

A. Backbone cabling and connectivity (termination panels, splice panels, splices, patch cables, connectors) shall be comprised of products from a single manufacturer or from authorized manufacturer partners and shall offer a minimum 20-year performance warranty.

2.3 OPTICAL FIBER CABLE

A. 50/125 Micron Multimode (OM4) Cable Elements shall conform to the following specification:
1. 50/125-micron multimode optical fiber cable with glass core and cladding (tolerances 50+/-3 micron, 125 +/-2 micron)
2. Graded refractive index profile
3. Attenuation coefficient at 850 nm of 3.5 dB/km or less
4. Attenuation coefficient at 1300 nm of 1.5 dB/km or less
5. Bandwidth distance product at 850 nm of 2000 MHz.km or more (laser) and 1500 MHz.km (overfilled launch)
6. Bandwidth distance product at 1300 nm of 500 MHz.km or more
7. Individual glass elements proof tested at 100 kpsi (100,000 lbs. per square inch)
8. Number of elements as indicated on the drawings

B. Singlemode Cable Elements (OS2) shall conform to the following specification:
1. 8.3-micron core diameter, 125 micron cladding diameter (+/- 1 micron)
2. Mode field diameter of between 8.7 and 9.3 (with +/- 0.5 micron tolerance) at 1310 nm
3. Attenuation coefficient at 1310 nm of 1.0 db/km or less
4. Attenuation coefficient at 1550 nm of 1.0 db/km or less
5. Cladding non-circularity of +/- 1%

6. Core to cladding concentricity error of or more than 0.8 micron
7. Maximum dispersion rate of 2.80 ps/nm-km at 1300 nm
8. Maximum dispersion rate of 17.00 ps/nm-km at 1550 nm
9. Individual glass elements proof tested at 100 kpsi (100,000 lbs. per square inch)
10. Number of elements as indicated on the drawings

C. External Cable: Provide Corning, or equal external optical fiber cable. The cable shall be recommended by the manufacturer for use as an external cable suitable for installation in an underground duct. Optical fibers shall be contained within loose buffer tubes utilizing water blocking tapes or compounds surrounding these tubes. The cable will be an all-dielectric construction, with a central strength member.

2.4 MULTIPAIR COPPER

A. Solid copper conductors covered with an extruded solid insulating compound. Insulated conductors shall be twisted into pairs which are then stranded or oscillated to form a cylindrical core. For special high frequency applications, the cable core shall be separated into compartments. Cable shall be completed by the application of a suitable core wrapping material, a corrugated copper or plastic-coated aluminum shield, and an overall extruded jacket. Telecommunications contractor shall verify distances between splice points prior to ordering cable in specific cut lengths. Gauge of conductor shall determine the range of numbers of pairs specified; 22 gauge (6 to 1200 pairs), Copper conductors shall conform to the following:

1. Belden Cat-5E Multiconductor

    a. Or Equal Subject to Review

2.5 OPTICAL FIBER CABLE HARDWARE

A. Rack Mounted Optical Fiber Patch Panel. Provide Corning CCH optical fiber hardware and patch panel system or Equal Subject to Review, conforming to the following specification:
1. Each panel shall be suitable for installation in EIA 19" mounting frame.
2. Provide strain relief for each cable at the rear of the patch panel.
3. Allow for labeling of each individual connector.
4. Allow any individual cable to be terminated or otherwise handled without disturbing other cables.
5. Each panel shall provide fiber handling for fiber elements, including 36" fiber reserve (service loop) inside the patch panel with or bends sharper than 2" bend radius.
6. Provide blanking adapter plates to cover all unused spaces as necessary.

2.6 OPTICAL FIBER CONNECTORS

A. Multimode Optical Fiber Connectors. Provide LC multimode optical fiber connectors, conforming to the following:
1. Small form factor, fitting in the same size opening as an RJ-45 connector.

2. Duplex, handling one pair (two elements) per connector.
3. Aqua in color.
4. Compatible with both 900 micron buffered strands and 250 micron loose tube strands.
5. Maximum insertion loss, of mated pair, less than 0.5 dB at acceptance.
6. Minimum return loss of greater than or equal to 20 dB.
7. Durability better than 500 matings, with a maximum increase in insertion loss of not more than 0.2 dB.
8. Meets ANSI/TIA/EIA 568-B and ISO 11801 standards.

B. Singlemode Optical Fiber Connectors. Provide singlemode LC optical fiber connectors, conforming to the following specification.
1. Small form factor, fitting in the same size opening as an RJ-45 connector.
2. Duplex, handling one pair (two elements) per connector.
3. Blue in color.
4. Compatible with both 900 micron buffered strands and 250micron loose tube strands.
5. Maximum insertion loss, of mated pair, less than 0.5 dB at acceptance.
6. Minimum return loss of greater than or equal to 40 (50 for LC) dB.
7. Durability better than 500 matings, with a maximum increase in insertion loss of not more than 0.2 dB.
8. Meets ANSI/TIA/EIA 568-B and ISO 11801 standards.

2.7 BUILDING PROTECTOR ASSEMBLIES

A. Building Protector Assemblies
1. Provide self-contained 5 pin unit supplied with a field connected to protector socket blocks to terminate and accept protector modules for 25 pairs of outside cable. Building protector assembly shall have interconnecting hardware for connection to interior cabling at full capacity. Provide manufacturer’s instructions for building protector assembly installation.

B. Protector Modules
1. Provide in accordance with UL 497 solid state type 5 pin rated for the application. Provide gas tube protection modules in accordance with RUS Bull 345-83 and shall be heavy duty, A>10kA, B>400, C>65A where A is the maximum single impulse discharge current, B is the impulse life and C is the AC discharge current in accordance with NEMA C62.61. The gas modules shall shunt high voltage to ground, fail short, and be equipped with an external spark gap and heat coils in accordance with UL 497. Provide the number of surge protection modules equal to the number of pairs of exterior cable of the building protector assembly.

2.8 PATCH CORDS

A. A. Provide quantity of high-performance copper patch cords to match 75% of work area connectors installed. These shall be sourced from the same manufacturer as the connectors provided as a part of this project. Each cord shall meet or exceed the performance specifications in this document when installed as part of the end-to-end cabling system described in this specification.

1. 20% of the patch cords shall be 3 feet in length and blue in color
2. 60% of the patch cords shall be 7 feet in length and blue in color
3. 20 % of the patch cords shall be 11 feet in length and blue in color
4. Lengths and color of patch cords to be coordinated with District prior to purchasing.
5. Provide Systimax GigaSPEED XL GS8E patch cords or equivalent from Siemon Company, Panduit, Belden or Legrand.

B. Optical Fiber. Provide one optical fiber patch cord per optical fiber pair installed. These shall be sourced from the same manufacturer as the optical fiber connectors provided as a part of this project. Each cord shall meet or exceed the optical fiber performance specifications in this document.
1. 20% of the patch cords shall be 3 feet in length and orange/aqua/yellow in color
2. 60% of the patch cords shall be 7 feet in length and orange/aqua/yellow in color
3. 20% of the patch cords shall be 11 feet in length and orange/aqua/yellow in color

C. The patch cords are to be passed to the client on completion of the project. Each cord is to have a manufacturer's certificate of conformance and shall be in its original, unopened packaging.

2.9 GROUNDING

A. Comply with ANSI-J-STD-607.

2.10 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606 and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.11 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test cables on reels according to TIA/EIA-568.

C. Factory test multimode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568.

D. Cable will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for raceways and boxes specified in Section 260533 "Raceway and Boxes for Electrical Systems."

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 INSTALLATION OF PATHWAYS

A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569.

B. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Section 271100 "Communications Equipment Room Fittings." Drawings indicate general arrangement of pathways and fittings.

C. Comply with TIA/EIA-569 for pull-box sizing and length of conduit and number of bends between pull points.

D. Comply with requirements in Section 260533 "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.

E. Install manufactured conduit sweeps and long-radius elbows whenever possible.

F. Pathway Installation in Communications Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard when entering room from overhead.
4. Extend conduits 3 inches (76 mm) above finished floor.

5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

G. Backboards: Install backboards with 96-inch (2440-mm) dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

3.4 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
10. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.
11. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. Optical Fiber Cable Installation:

1. Comply with TIA/EIA-568-B.3.
2. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 6 feet (1800 mm) long not less than 12 inches (300 mm) in diameter below each feed point.

F. Group connecting hardware for cables into separate logical fields.

G. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569 recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (610 mm).

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.5 FIRESTOPPING

A. Comply with TIA/EIA-569, Annex A, "Firestopping."

B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.6 GROUNDING

A. Install grounding per BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with ANSI-J-STD-607.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.7 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606.

1. Administration Class: 3.
2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Comply with requirements in Section 099123 "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

C. Paint and label colors for equipment identification shall comply with TIA/EIA-606 for Class 3 level of administration.

D. Comply with requirements in Section 271500 "Communications Horizontal Cabling" for cable and asset management software.

E. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

F. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

G. Cable and Wire Identification:

1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

    a. Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device with name and number of particular device as shown.
    b. Label each unit and field within distribution racks and frames.

5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

H. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA 606, for the following:

1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Visually inspect optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments and inspect cabling connections for compliance with TIA/EIA-568.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
3. General Instructions.
    a. The testing is to show beyond reasonable doubt that there are or errors, damaged or incorrectly installed components, that the installation is

correctly labeled and that all the installed components meet or exceed the criteria detailed in these specifications and applicable standards. Any test that does not show that a component is satisfactorily installed, as per these specifications, shall be repeated. If a test procedure needs to be modified to satisfactorily test some components, the modification shall be submitted for approval of the Owner's Representative, prior to the tests being conducted.

b. Following optical fiber and data cable installation, including labeling and termination at both ends, undertake and record tests to ensure that the cabling system will perform satisfactorily in service. In addition to the tests detailed in this specification, the Installer shall carry out any additional tests that the Installer deems necessary to ensure the satisfactory operation of the telephone and data systems. The costs of these additional tests shall be borne by the Installer.
c. All outlets, cables, patch panels and associated components shall be fully assembled and labeled prior to testing. Any testing performed on incomplete systems shall be redone on completion of the work.
d. Provide the Owners' Representative with the opportunity to witness all testing. On reasonable request, the installer shall demonstrate that the test procedure competently identifies the fault conditions being tested for.
e. Complete and record all of the tests identified in these specifications.
f. Notify the Owners' Representative ten working days before the date of commencement of the cable tests. Provide details in writing, on that advance date, of proposed tests, the test schedule, equipment to be used, its certification and calibration and the names and qualifications of test personnel.
g. The Owner and Owners Representative shall be invited, to the first instance of each type of test conducted. In the event of a number of tests being conducted by the Installer prior to this first inspection, the Owner's Representative reserves the right to reject these tests as non-compliant and to require them to be repeated at the Installer's cost.
h. Personnel shall be competent in and qualified by experience or training for comprehensive TDR and OTDR operation and troubleshooting, for both copper and optical fiber testing.
i. Include the cost of obtaining, calibrating and maintaining test equipment and the cost of carrying out and recording the tests detailed in this specification, including labor costs, in the bid sum. Or extra costs will be entertained.
j. Ensure that all test equipment is in calibration before delivery to site and throughout the testing period. The Installer shall be responsible for ensuring that any necessary tests and rework to maintain equipment's calibration status is carried out. Any tests performed on uncalibrated test equipment shall be repeated at the Installer's cost.
k. The test documentation shall be available for inspection by the Owners' Representative during the installation period and copies shall be passed to the Owners' Representative within five working days of completion of tests on cables in each area. The Installer shall retain a copy to aid preparation of as-built information.
l. Failures detected during the testing shall be noted on the test results schedule, rectified and re-tested. On the fault being rectified, this shall also be noted. These notes shall not be deleted or obliterated.

m. Rectification of all damaged cables shall include replacing damaged cables with new cables in complete runs, replacing damaged connectors or remaking poor terminations. In-line cable joints, splices or distribution points will not be acceptable except where specified in this document. All damaged cables shall be removed from site.
n. If on submittal of the As-Built documentation there are any missing test results or incorrectly named files, the test shall be repeated at the Installer's expense.

D. Optical Fiber Cabling
1. Test each Optical Fiber Cable and its associated connectors. Carry out the following tests on every element of every optical fiber cable:
a. Length
b. End-to-End Attenuation
c. Connector Loss
d. Splice Loss
e. Power Loss
2. The tester shall have the following parameters:
a. Optical Time Domain Reflectometer (OTDR) shall be used to test every optical fiber cabling
b. OTDR shall be used to test optical in both directions and take the average. Provide a launch lead and far end drop off lead.
c. Multimode optical fibers shall be tested at 850nm and 1300 nm. Singlemode optical fibers shall be tested at 1310nm and 1550nm
3. Test each optical fiber cable element and its associated connectors. Carry out the following test on every element of every optical fiber cable:
a. Visually check optical connectors using microscope (minimal magnification x200) to ensure that or physical damage has occurred during the installation process. There are to be or scratches on the core of the fiber or pits on the core or cladding. If any defect cannot be rectified with polishing, the connector is to be replaced.
b. Carry out OTDR tests on all elements at 1300nm wavelength for multimode cable runs and at 1310 nm for singlemode. These tests shall be carried out from both ends using a near end launch lead and a far end drop lead.
c. The number of samples (averages) for each OTDR test shall be such that the noise amplitude is significantly less than the smallest loss of any component under test. This may vary for different cable runs, for shorter runs and fusion splices etc.; it may be necessary to run many samples.
d. Record the length and loss of each mated connector pair on the test results schedule for all elements.
e. Verify the labeling of the cable and connectors is correct.
f. If an element has an excessive attenuation coefficient, a sudden step in attenuation coefficient (greater than 0.2 dB) or back scatter, losses due to micro bending or macro bending or has any other fault then the fault on that element shall be rectified.
g. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted like Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
h. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

i. End-to-end cabling will be considered defective if it does not pass tests and inspections.
j. Prepare test and inspection reports.
k. The following table lists the pass/fail criteria for all connectors and fusion splices under test. Any component that does not pass these figures shall be re-worked or replaced.

Element Type	Maximum attenuation across mated connector pair (dB) – outward test	Maximum attenuation across mated connector pair (dB) – return test	Maximum Attenuation across fusion splice – averaged over both directions(dB)	Minimum Return Loss (dB) – outward test	Minimum Return Loss (dB) – return test
MM	**0.7**	**N/A**	**0.1**	**N/A**	**N/A**
SM	**0.5**	**0.5**	**0.1**	**36dB**	**36dB**

l. The attenuation of each multimode connector shall be measured in one direction (outward). The attenuation of each singlemode connector shall be measured in both directions.
m. Each fusion splice shall be tested in both directions for both multimode and singlemode elements. The measurements for each direction shall be averaged for the final attenuation figure for each fusion splice.
n. The return loss must be measured in both directions for singlemode connectors. The return loss shall be greater or equal to the value shown in the table above.
o. Any failures shall be recorded (including value of excessively lossy terminations) and the results obtained after rectification of the fault shall be recorded.
p. Graphical printouts shall be taken of OTDR tests for each element. These printouts shall be stapled or otherwise attached to 11" x 8.5" size sheets. They shall be printed at an appropriate scale, such as 0.5 dB per division for the attenuation axis. Provide digital copies of the OTDR traces to the owner on completion of the testing. Provide a copy of the emulation software and the appropriate license to the client.

END OF SECTION 271300

SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING

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. UTP cabling.
2. Multiuser telecommunications outlet assemblies.
3. Cable connecting hardware, patch panels, and cross-connects.
4. Telecommunications outlet/connectors.
5. Cabling system identification products.
6. Cable management system.

1.3 DEFINITIONS

A. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.

B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

C. EMI: Electromagnetic interference.

D. IDC: Insulation displacement connector.

E. LAN: Local area network.

F. MUTOA: Multiuser telecommunications outlet assembly, a grouping in one location of several telecommunications outlet/connectors.

G. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.

H. RCDD: Registered Communications Distribution Designer.

I. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate layout and installation of telecommunications cabling with Owner's telecommunications and LAN equipment and service suppliers.

B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.5 ACTION SUBMITTALS

A. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
3. Cabling administration drawings and printouts.
4. Wiring diagrams to show typical wiring schematics, including the following:

    a. Cross-connects.
    b. Patch panels.
    c. Patch cords.

5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

B. Source quality-control reports.

C. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For splices and connectors to include in maintenance manuals.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Patch-Panel Units: One of each type.
2. Connecting Blocks: One of each type.
3. Device Plates: One of each type.
4. Multiuser Telecommunications Outlet Assemblies: One of each type.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings and Cabling Administration Drawings, Cabling Administration Drawings, and field-testing program development by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall always be present when Work of this Section is performed at Project site.
3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each pair of UTP cable for open and short circuits.

PART 2 - PRODUCTS

2.1 HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called a "permanent link," a term that is used in the testing protocols.

1. TIA/EIA-568 requires that a minimum of two telecommunications outlet/connectors be installed for each work area.
2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
3. Bridged taps and splices shall not be installed in the horizontal cabling.

B. A work area is approximately 100 sq. ft. (9.3 sq. m) and includes the components that extend from the telecommunications outlet/connectors to the station equipment.

C. The maximum allowable horizontal cable length is 295 feet (90 m). This maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) to the workstation equipment or in the horizontal cross-connect.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568 when tested per test procedures of this standard.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Grounding: Comply with J-STD-607.

2.3 WARRANTY REQUIREMENTS

A. Horizontal cabling and connectivity (outlets, mounting plates and termination panels) shall be comprised of products from a single manufacturer or from authorized manufacturer partners and shall offer a minimum 20-year performance warranty.

2.4 UTP CABLE

A. Provide Belden 10GX Small Diameter Cable, or Equal Subject to Review from Commscope, Siemon Company or Panduit. Category 6A UTP cable for Voice and Data use. Each cable shall have four pairs of unshielded twisted-pair solid copper conductors. The cable shall be plenum-rated (CMP). Each cable shall meet or exceed the performance specifications in this document when installed as part of the end to end cabling system described in this specification.

B. The high-performance copper cabling system shall meet or exceed the performance specifications for a Category 6A system as detailed in EIA/TIA 568. This covers all Category 6A components installed as a part of the installation.

C. Jacks shall be BLUE in color for typical conditions. Multiple colors may be used to identify zones, rooms or function. Contractor shall coordinate final color with District IT prior to installation.

D. Description: 100-ohm, four-pair UTP.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568 for performance specifications.
3. Comply with TIA/EIA-568, Category 6 and 6A.

4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
   a. Communications Plenum Rated: Type CMP or MPP, complying with NFPA 262.

2.5 UTP CABLE HARDWARE

A. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

B. Connecting Blocks: 110-style IDC for Category 6 for 25-pair. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

C. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.

D. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.

   1. Number of Jacks per Field: One for each four-pair UTP cable indicated conductor group of indicated cables, plus spares and blank positions adequate to suit specified expansion criteria.

E. Provide Belden 10GX Angled Patch Panel, or Equal Subject to Review from Commscope, Siemon Company or Panduit conforming to the following specification:
   1. Suitable for mounting in standard EIA 19" racks.
   2. Configured with 48 modular jacks housed in each 2U (3.5") of usable rack space.
   3. Provide strain relief for each cable terminated on the connector at the rear of the patch panel.
   4. Allow for labeling of each individual connector.
   5. Allow any individual cable to be terminated or otherwise handled without disturbing other cables.

F. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.
   1. Provide Belden 10GX Category 6A or Equal Subject to Review from Commscope, Siemon Company or Panduit eight-position modular RJ45 jacks. Each connector shall meet or exceed the channel performance specifications in this document when installed as part of the end to end cabling system described in this specification. The pin outs for the jack shall conform to the T568B wiring scheme.
   2. Colors of work area connector colors shall be coordinated with District IT prior to procurement.

2.6 WORK AREA FACEPLATES

A. Wall-mounted Faceplate. Provide Belden KeyConnect or Equal Subject to Review from Commscope, Siemon Company or Panduit wall-mounted flush modular faceplate to

house work area jacks, capable of housing a minimum of four jacks. The faceplate shall fit over a standard NEMA electrical 2-gang outlet box fitted with a single gang plaster ring cover.

B. Color of faceplace shall be coordinated with Architect prior to procurement.

C. Blanking Inserts. Provide blanking inserts, matching faceplates, in enough quantities to cover all unused openings in every faceplate.

D. Stainless Steel Wallphone Faceplate. Provide a stainless steel wall-mounted flush modular faceplate to house a single work area jack. The faceplate shall fit over a standard NEMA electrical 2-gangoutlet box fitted with a single gang plaster ring cover. The faceplate shall be capable of having a wall-mounted telephone fitted directly over it.

E. Furniture Faceplate. Provide flush-mounted modular faceplate to house work area jacks. The faceplate shall fit over a modular raceway.

F. 106-Type Faceplate. Provide duplex mounting strips to house four work area jacks in a standard NEMA duplex electrical mounting fitted in a raceway, poke-through unit or flush floorbox.

G. Stainless Steel Faceplate. Provide decorative stainless-steel faceplate covers for locations where decorative wall outlets are required. Provide stainless-steel covers wherever stainless-steel electrical receptacles are provided.

H. Floorbox Faceplate. Provide an internal blank bracket to house combinations of work area connectors in a flush-mounted floorbox. The bracket shall be provided by the manufacturer of the flush floorbox and shall be designed to fit in the floorbox installed as a part of this project.

2.7 PATCH CORDS

A. Provide quantity of high-performance copper patch cords to match 75% of work area connectors installed. These shall be sourced from the same manufacturer as the connectors provided as a part of this project. Each cord shall meet or exceed the performance specifications in this document when installed as part of the end-to-end cabling system described in this specification.
   1. 20% of the patch cords shall be 3 feet in length and blue in color
   2. 60% of the patch cords shall be 7 feet in length and blue in color
   3. 20 % of the patch cords shall be 11 feet in length and blue in color
   4. Lengths and color of patch cords to be coordinated with District prior to procurement.

B. The patch cords are to be passed to the client on completion of the project. Each cord is to have a manufacturer’s certificate of conformance and shall be in its original, unopened packaging.

2.8 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Comply with J-STD-607.

2.9 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606 and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

B. Provide labels for connectors, cables, outlets, termination frames, patch panels, cabinets and racks.

C. The lettering on each label shall be as large as is practicable. All labels shall be machine-produced. Hand-written labels will not be acceptable.

D. A standard relative orientation shall be adopted for all labels unless otherwise specified.

E. Labels shall be robust, durable, shall resist abrasion and shall be UV inhibiting, permanent and indelible. Labels shall be proof to 140 degrees Fahrenheit.

F. All labels shall be readily visible and shall be fixed so that they remain in a visible position wherever practical.

G. Labels shall carry the full complement of characters to designate the unique identification for the item that they identify.

H. Outlet & Jack Labeling
   1. Outlet and patch panel labeling shall adhere to the following labeling convention
      a. IDFX-PPY-ZZ (TR–Patch Panel - Port)
         Example: IDF4-PPC-29 (Closet 4, Patch Panel C, Port 29)
      b. Closet number can be left off if only one closet per floor.
   2. Patch Panel Labeling
      a. The labeling of cable shall remain the same as this number on the wiring closet end.
      b. The labeling system shall be as follows:
      c. IDFX-PPY-ZZ (TR–Patch Panel - Port)
   3. Label samples to be provided and confirmed by District IT prior to procurement.

2.10 SOURCE QUALITY CONTROL

A. Factory test UTP cables per TIA/EIA-568.

B. Cable will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

A. Install cables in pathways and cable trays except within consoles, cabinets, desks, and counters. Conceal pathways and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements in Section 270528 "Pathways for Communications Systems."

B. Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures:

1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
2. Install lacing bars and distribution spools.
3. Install conductors parallel with or at right angles to sides and back of enclosure.

3.3 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. MUTOA shall not be used as a cross-connect point.
5. Consolidation points may be used only for making a direct connection to telecommunications outlet/connectors:

a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
b. Locate consolidation points for UTP at least 49 feet (15 m) from communications equipment room.

6. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
7. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

8. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
9. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
10. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
11. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
12. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.
13. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568.
2. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 60 inches (1524 mm) apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 6 feet (1800 mm) long not less than 12 inches (300 mm) in diameter below each feed point.

F. Group connecting hardware for cables into separate logical fields.

G. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569 for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (610 mm).

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).
c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.5 GROUNDING

A. Install grounding per BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with J-STD-607.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect

grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606.

1. Administration Class: 3.
2. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.

B. Using cable management system software specified in Part 2, develop Cabling Administration Drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable and label cable, jacks, connectors, and terminals to which it connects with same designation. At completion, cable and asset management software shall reflect as-built conditions.

C. Comply with requirements in Section 099123 "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

D. Paint and label colors for equipment identification shall comply with TIA/EIA-606 for Class 3 level of administration.

E. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

F. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606. Furnish electronic record of all drawings, in software and format selected by Owner.

G. Cable and Wire Identification:

1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

    a. Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet

to a building-mounted device shall be identified with name and number of devices as shown.

b. Label each unit and field within distribution racks and frames.

4. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
5. Uniquely identify and label work area cables extending from the MUTOA to the work area. These cables may not exceed the length stated on the MUTOA label.

H. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606.

1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Visually inspect UTP materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments and inspect cabling connections for compliance with TIA/EIA-568.
2. Visually confirm Category 6 & 6A, marking of outlets, cover plates, outlet/connectors, and patch panels.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
4. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

5. UTP Performance Tests:

a. Test for each outlet and MUTOA. Perform the following tests per TIA/EIA-568:

1) Wire map.
2) Length (physical vs. electrical, and length requirements).
3) Insertion loss.
4) Near-end crosstalk (NEXT) loss.
5) Power sum near-end crosstalk (PSNEXT) loss.
6) Equal-level far-end crosstalk (ELFEXT).
7) Power sum equal-level far-end crosstalk (PSELFEXT).
8) Return loss.
9) Propagation delay.
10) Delay skew.

6. Final Verification Tests: Perform verification tests for UTP systems after the complete communications cabling and workstation outlet/connectors are installed.

   a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
   b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

D. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted like Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 271500

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SECTION 273523 - EMERGENCY RESPONDER RADIO COVERAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, Standard General and Supplementary General Conditions, Division 01 Specification Sections, and other applicable Specification Sections, the Related Sections listed below, apply to this Section.

B. Related Sections:

1. Section 260513 - Medium-Voltage (601 Volt to 35KV) Cable and Accessories.
2. Section 260526 - Grounding.
3. Section 270526 - Grounding and Bonding for Communications Systems
4. Section 270528 - Pathways for Communications Systems

1.2 SUMMARY

A. Scope of Work:

1. The work under this section includes all final design, material, equipment, supplies, labor, testing, and accessories required to furnish and install a complete Emergency Responder Radio Coverage system (ERRC) as indicated on the drawings and as specified herein. These systems shall be defined as all cables, equipment, products, and etcetera, as indicated on the drawings and mentioned in these specifications.
2. **It is the intent of the Drawings and Specifications, which are presented in a "design-build" format, for the Contractor to design, provide and install a complete, fully operational and tested system. Contractor shall provide additional design as required as part of the bid.**
3. All miscellaneous system components including, but not limited to, cables, cable supports, termination equipment, punch blocks, patch panels, patch cords, device outlets, ladder runway, backboards, equipment racks, equipment cabinets, enclosures, terminal cabinets, equipment grounding, and 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. Schedule is paramount to the project's success. With this, the Contractor will have to be a team player, continually working with the team to facilitate expeditious design, procurement, and construction processes.
5. This project will be performed in a phased construction format. Each phase of construction will be completely installed, labeled and tested, to the greatest extent physically possible, before moving to the next phase.
   1. Enables 800Mhz, analog and digital Public Safety 2-way communication support within each building.

B. Project Description

1. We are seeking out more cost-efficient methods of delivering all services in various campus buildings.
2. This Section includes the requirements for an Emergency Responder Radio System for the purposes of amplifying Emergency Responder radio signals to achieve minimum signal strength in 95% of all areas on each floor of the building.
3. Final acceptance and approval are required from the local Fire Department in writing prior to contract closeout.
4. Outline:

    a. The Contractor shall develop all ERRC Design Documentation in accordance with this document.
    b. To support the deployments planned for construction, the Contractor shall provide survey and design services for each indoor building as identified. Services shall include:

        1) Pre –Installation: (Design Services)
        2) Secure approval and schedule from the Owner to conduct an on-site walk survey per approved plan.
        3) Plan and conduct on-site, building-wide, location-specific measurements of existing macro-cell signal and noise levels for wireless service providers (WSPs). Survey can be conducted during normal business hours.
        4) Using data collected, prepare an ERRC report that:

            a) Defines areas in which reinforcement will be required, to meet signal level requirements and that will not cause issues to the Owner or the AHJ.
            b) Recommended antenna placement, including a signal heat map, to reinforce first responder radios with the exterior of the building. iBwave native files shall include collected and normalized survey data, design files, and the building/signal model. Native iBwave files shall be provided to the Owner.
            c) Identifies preliminary antenna placement, including a signal heat map, based on a predictive analysis done in iBwave.

        5) Submit initial draft of report for the Owner to review, provide written response to Owner review comments, and update report to incorporate Owner comments
        6) System Coverage Drawings:
            a) Provide heat map drawings of areas within the scope of this work.

        7) Additional Requirements:

            a) Supplier shall provide all items, instrumentation, materials, equipment, vehicles and personnel to conduct the survey and inspections.
            b) Supplier shall comply with all applicable federal, state, and local codes, regulations, and ordinances, including, but not limited to, OSHA regulations.

        8) Revit Documentation

a) Once the iBwave design is completed, some venues will require conversion of the iBwave to AutoCAD shop level drawings for owner review/approval and installation cost estimation efforts. If requested, the Contractor shall be responsible for:
b) Converting the iBwave design to Revit.
c) Providing detail in Revit of cable routes, mounting details, and related items.

1.3 DEFINITIONS

A. Bi-Directional Amplifier BDA: Device used to amplify band-selective or multi-band RF signals in the uplink, to the base station for enhanced signals and improved coverage.

B. Emergency Responder Radio Coverage System: A two-way radio communication system installed to assure the effective operation of radio communications systems for fire, emergency medical services or law enforcement agencies within a building or structure. A system used by firefighters, police, and other emergency services personnel.

C. Delivered Audio Quality Definitions (DAQ): This is a universal standard often cited in system designs and specifications.

1. DAQ 1: Unusable, speech present but unreadable.
2. DAQ 2: Understandable with considerable effort. Frequent repetition due to noise/distortion.
3. DAQ 3: Speech understandable with slight effort. Occasional repetition required due to noise/distortion.
4. DAQ 3.5: Speech understandable with repetition only rarely required. Some noise/distortion
5. DAQ 4: Speech easily understood. Occasional noise/distortion.
6. DAQ 4.5: Speech easily understood. Infrequent noise/distortion.
7. DAQ 5: Speech easily understood.

D. FCC: Federal Communications Commission

E. OET 65 Standards: FCC's Bulletin 65 provides Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.

F. Public Safety/First Responder: Public Safety or First Responder agencies which are charged with the responsibility of responding to emergency situations. These include, but are not limited to law enforcement departments, fire departments, and emergency medical companies.

1.4 QUALITY ASSURANCE

A. Codes, regulations and standards referenced in the Section are:

1. NFPA 1 – The National Fire Code
2. NFPA 70 – The National Electrical Code
3. NFPA 101, Life Safety Code, the California Basic Building Code, and Local Code and Building Authority requirements.

4. NFPA 72-07 National Fire Alarm Code
5. FCC 47 CFR Private Land Mobile Radio
6. 90.219-2007 Services-Use of Signal Boosters
7. ICC International Fire Code, Code and Commentary
8. California Fire Code
9. ADA "Americans with Disabilities Act"
10. FCC's OET 65 Standards "Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields".
11. FCC Rules Part 22, Part 90 and Part 101.

B. Qualifications: Contractor shall have minimum of 3-years full-time experience executing work of similar scope and complexity.

C. Certifications:

1. Contractor shall provide manufacturer certification that their personnel have been trained on components being installed.
2. Manufacture(s) of active components shall maintain a formal authorized and certified value- added reseller program, which consists of routine quality audits of participating value-added resellers. List of authorized value-added resellers shall be published.
3. Contractor shall be an authorized and certified value-added reseller for proposed active components.
4. Contractor shall provide certification that their personnel have been trained in RF design and analysis software

D. The design shall utilize radio interface modules to filter and combine frequencies and optical modules to convert RF to an optical format (and vice-versa). The optical signal shall then be routed via single-mode fiber to remote modules located throughout each building, usually installed in communication/telco/telecom closets. Where possible, a passive infrastructure solution is preferred in the cable/antenna system.

1.5 WARRANTY

A. Warranty period service shall include all parts, labor, travel and trip charges.

B. Manufacturer Warranty:

1. Passive devices (splitters, couplers, and antennas): minimum 1-year limited warranty from date of system acceptance.
2. Cable and Connectors: 20-year limited warranty from date of system acceptance.
3. Warranty shall include 1-year of customer service from date of acceptance.

C. Contractor Warranty:

1. Contractor shall warranty system performance, as approved, for 1-year.
2. Warranty shall include first annual system test and maintenance.
3. Response time shall be on-site within 48 hours of notification.

D. Provide a complete warranty for parts and labor for a minimum of one year from the date of Substantial Completion. Provide add alternates for 2- and 5-year warranties.

PART 2 - PRODUCTS

2.1 GENERAL PERFORMANCE REQUIREMENTS

A. Compatibility: The equipment, including but not limited to repeaters, transmitters, receivers, signal boosters, cabling, fiber distributed antenna system, etc., shall not interfere with the existing communication systems utilized by the Public Safety and First Responder agencies.

B. Power Supplies: At least two (2) independent and reliable power supplies shall be provided, one primary and one secondary. The primary power source shall be supplied from a dedicated 20 ampere branch circuit and comply with 4.4.1.4 of NFPA 72. The secondary power source shall be a dedicated battery, capable of operating the in-building radio system for at least 12 hours of 100% system operation. The battery system shall automatically charge in the presence of external power input. The battery system shall be contained in one NEMA 4 or 4X type enclosures. Monitoring the integrity of power supplies shall be in accordance with 4.4.7.3 of NFPA 72.

C. Manufacturers

1. System

   a. CommScope/Andrew
   b. Corning
   c. Times Microwave
   d. Tessco
   e. CCI (Communication Components Inc.)
   f. Solid Technologies
   g. Owner approved equal

2. Cable:

   a. Material Characteristics:

      1) Jacket: Halogenated, Fire-Retardant
      2) Mechanical Characteristics:
      3) Maximum Diameter Over Jacket: ≤ 0.627 in
      4) Minimum Bending Radius: 5 in
      5) One Time Minimum Bending Radius: 2 in

3. Other Characteristics:

   a. When installed outdoors, cable shall be outdoor installation rated.
   b. When installed in a plenum, cable shall be plenum rated.

4. RF Amplification, Filtering, and Distribution Equipment Shall have FCC Certification.
5. Shall be wall or rack mounted.

6. Active equipment shall be of modular design and allow for digital filtering.
7. Operating Temperature Range: -10°F to +120°F, 85% humidity.
8. Shall include monitoring, diagnostics, and notification for degraded operation or system failure.
9. Power: 120 VAC, 60 Hz.

D. Survivability

1. Physical Protection: All wiring and fiber optics shall be installed in conduit. Refer to electrical specifications "Conduit and Fittings" for type, sizing and installation standards.
2. Fire Performance: All main risers or trunks of the antenna system shall be installed with resistance to attack from a fire using one of the following methods:

    a. A 2-hour fire rated cable or cable system.
    b. Routing the cable through a 2-hour fire rated enclosure(s) or shaft(s).
    c. A system configured in a looped design, routed through 1-hour fire rated enclosure(s) or shaft(s). The circuit shall be capable of transmitting and receiving a signal during a single open or non-simultaneous single ground fault on a circuit conductor.
    d. Performance alternative approved by the authority having jurisdiction.

3. Cabinet: The signal booster and all associated RF filters shall be housed in a single, NEMA 4 certified, painted steel weather tight box. The cabinet shall be large enough to dissipate internal heat without venting the inside of the cabinet to the outside atmosphere. Operating temperatures: –22 degrees F to +120 degrees F (–30 degrees C to +50 degrees C) minimum temperature range, including microprocessors. Equipment installed on the roof of structures shall be rated for the expected extreme temperatures associated with rooftop installations.
4. Passive Equipment: Passband shall be 700-900 MHz, IP rating of 2 GHz.
5. Cable: Passband shall be 700-900 MHz Cable shall be rated for fire plenum and riser rating.
6. Constructed of plenum rated components when installed in a plenum.
7. WHITE, ultraviolet light resistant.
8. Capable of operation from -20°F to +140°F at 100% humidity.

2.2 SYSTEM COMPONENTS

A. Signal Strength

1. Downlink: A minimum signal strength of -95 dBm shall be provided throughout the coverage area.
2. Uplink: Minimum signal strength of -95 dBm received at the local Fire Department Radio System from the coverage area.
3. A donor antenna must maintain isolation from the distributed antenna system. The donor antenna signal level shall be a minimum of 15 dB above the distributed antenna system under all operating conditions.

B. Permissible Systems

1. Buildings and structures shall be equipped with an FCC Certificated Class B Bi-Directional UHF Amplifier(s) as needed.
2. The distributed antenna system may utilize a radiating cable, fixed antennas or a combination of both.

C. Supported Frequencies: The radio system shall support frequencies in the 700 and 800 MHz public safety bands as utilized by the local Fire Department.

D. Reject Filters: Notch filter sections shall be incorporated to minimize adjacent channel cellular and SMR (Nextel) degradation of the signal booster performance. The minimum downlink band adjacent band rejection shall be 35 dB or greater at 865 MHz and 870 MHz.

E. Band Migration Capability: The signal booster shall include re-tunable or replaceable filters to accommodate rapid and economic passband changes in the event of mandatory FCC changes within the NPSPAC band. The use of non-adjustable and non-replaceable RF input and output filters is prohibited.

F. Output Level Control: An automatic output leveling circuit shall be included for both passbands with a minimum dynamic range of 60 dB, less any gain reduction setting, to maintain FCC out of band and spurious emission compliance.

G. Degraded Performance in Emergencies: The system shall be designed to allow degraded performance in adverse conditions, such as abnormally high temperatures resulting from nearby fires, extreme voltage fluctuations or other abnormal conditions that may occur during an emergency. Circuits that intentionally disable the signal booster in such situations (i.e. under/over voltage, over/under current, over/under temperature, etc.) will not be implemented as the standard mode for public safety applications.

H. Mode of Operation: The system shall be normally powered on and shall continuously provide passing of frequencies within the Public Safety and First Responder bands.

I. All in-building radio systems shall be compatible with both analog and digital communications simultaneously at the time of installation.

2.3 SYSTEM MONITORING

A. The distributed antenna system shall include a connection to the fire alarm system to monitor the integrity of the circuit of the signal booster(s) and power supplies and annunciate this malfunction on the fire alarm system shall comply with 4.4.7.1 of NFPA 72.

B. A sign shall be located at the fire alarm panel with the name and telephone number of the local Fire Department indicating that they shall be notified of any failures that extend past the 2-hour time limit

PART 3 - EXECUTION

3.1 GENERAL

A. Contractor shall design, install, commission, and test system, in accordance with all manufacturer's instructions and recommendations.

B. Contractor shall supply all personal and equipment necessary for testing.

3.2 SURVEY

A. Confirm coordination of equipment locations shown on drawings for space, power, and pathway.

B. Confirm suitability of provided power and telecommunications grounding system. Note issues to Owner before beginning installation.

C. Review antenna styles and mounting locations with Owner and A/E for aesthetic concerns and approval.

D. After complete façade installation and internal framing is complete, conduct RF survey and pre-installation testing to validate coverage areas, proposed antenna locations, and document prevailing signals. Survey a minimum of 20 diverse locations per floor. Walk tests are acceptable. Include survey results.

3.3 INSTALLATION

A. Obtain approval of all antenna locations with A/E and Owner prior to installation.

B. Mount equipment securely to provided backboard or rack at coordinated locations.

C. Antennas shall be securely attached, independent of other trades, unless previously approved.

D. Cables shall be secured using cable colored Velcro cable wraps suitable for the installation environment.

E. Maintain clearances:

1. Head end enclosure: minimum 12 inches from telecommunications equipment.
2. Antennas, omnidirectional: minimum 36 inches from communications cable, wireless access points and LED lighting fixtures

F. Install equipment to provide coverage per design requirements and as confirmed in Survey phase.

G. Cables shall be routed as follows:

1. Coordinated with all ceiling and above ceiling systems.
2. Accessible ceiling: above ceiling, concealed from view.
3. Inaccessible ceiling: above ceiling in conduit

4. Open ceiling: as high as practical, above lighting plane.
5. Mechanical spaces: routed to avoid damage, maintenance space, and environmental extremes.
6. Electrical spaces: do not route cables in electrical rooms.
7. Run parallel and perpendicular to building walls and structure. Do not take direct route.

H. Antennas may be installed exposed on the underside of ceilings at approved locations. Do not install antennas in wood ceilings.

I. Ceiling tiles stained or damaged by contractor shall be replaced by contractor at no cost to owner.

J. Label all devices:

1. Labeling shall be machine made, no hand labeling is acceptable.
2. Minimum devices label text height is 0.25 inch.
3. Show labels on as-built drawings.
4. "XXXX" in the scheme below is a sequential 4-digit number starting at 0001.
5. Cable: ERRC-C-XXXX.
6. Antenna: ERRC-A-XXXX.
7. Couplers and taps: ERRC-S-XXXX.
8. Active Equipment: ERRC-E-XXXX.

3.4 ACCEPTANCE TESTING

A. Final testing shall not be performed until after the building is fully enclosed (roof, doors, windows, interior walls and ceilings are in place).

B. Notify the Owner two (2) weeks in advance of testing.

C. All licenses, system documentation, and test plans shall be up to date.

D. Record all equipment settings before test and after adjustments.

E. Conduct testing for system RF performance

F. Test, measure, and record the percent of coverage and signal strength and signal quality at all test points per service provider.

G. A failure of any test parameter shall cause the test area to be considered a fail. A maximum of (2) non-adjacent areas will be allowed to fail the test. If (3) or more areas fail the test, to be more statistically accurate, the floor should be divided into (40) equal areas and the rest should be redone. In such event, a maximum of (4) non-adjacent areas will be allowed to fail the test. After the (40) area test, if the system continues to fail, the Contractor shall have the system altered to meet the minimum coverage requirement.

H. Conduct testing in coordination with the Owner, AHJ requirements and the Fire Department as required.

I. Modify or add equipment, cables, and antennas required to achieve the required performance. This shall be at no additional cost to Owner.

3.5 TRAINING

A. Provide written materials for all training sessions.

B. Provide (1) 4-hour training session for system operation and testing accommodating up to (4) attendees.

C. Provide (1) 4-hour training session for system maintenance and configuration accommodating up to (4) attendees.

END OF SECTION 273523

SECTION 275116 – INTERNET PROTOCOL PUBLIC ADDRESS (IPPA) SYSTEMS

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

1. The Contractor shall furnish and install all equipment including, but not limited to, outlet boxes, wiring, speakers, and all other necessary equipment to provide a complete operating system as indicated with the contract documents. Provide all necessary wall plates, specialty boxes, etc., not provided by others.
2. The Owner currently operates a Bogen Nyquist IP based public address system.
3. The intent of this specification is to provide public address announcement, class change bells, and emergency notifications to the new Phase 3 facilities. Communications between the new buildings shall be distributed over the network via IEEE Ethernet enhancing school safety and reducing maintenance, operational, and installation cost.
4. Under this specification, the system shall provide a complete IPPA Communication System for the Administrative, Classroom, Cafeteria, Library, Common, and Recreational areas.
5. The Communication System shall provide IPPA distribution of intercom, overhead paging, emergency paging, class change time tones, emergency tones and program material.

1.3 REFERENCES

A. A. Materials and workmanship shall conform to the latest issue of all industry standards, publications or regulations referenced in this Section and with the following references as applicable.

1. NFPA 70, NEC Latest edition, Article 300-22(c) UL2043 - National Electrical Code
2. NFPA 72, Chapter 24: Mass Notification
3. NFPA 90A - Latest edition, Section 2-3.10.1(a), Exception 2
4. EIA Standard SE-101-A: Amplifiers for Sound Equipment
5. EIA Standard SE-103: Speakers for Sound Equipment
6. EIA Standard SE-104: Engineering Specifications for Amplifiers for Sound Equipment
7. American National Standards Institute (ANSI)
8. National Association of Broadcasters (NAB)
9. Audio Engineering Society (AES/EBU)
10. Underwriters Laboratories (UL): UL1480 (UUMW) UL Control #7P97 Air Handling Spaces, ANSIIUL263

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Power, signal, and control wiring.

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, required clearances, method of field assembly, components, and location and size of each field connection.
3. Rack arrangements.
4. Calculations: For sizing backup battery.
5. Wiring Diagrams: For power, signal, and control wiring.

a. Identify terminals to facilitate installation, operation, and maintenance.
b. Single-line diagram showing interconnection of components.
c. Cabling diagram showing cable routing.

C. Delegated-Design Submittal: For supports and seismic restraints for control consoles, equipment cabinets and racks, and components indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of supports and seismic restraints for control consoles, equipment cabinets and racks, and components.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings are shown and coordinated with each other, using input from installers of the items involved.

B. Qualification Data: For Installer.

C. Seismic Qualification Certificates: For control consoles, equipment cabinets and racks, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Include qualification data for testing agency.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For public address systems to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Personnel certified by NICET as Audio Systems Level I Technician.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Bogen Nyquist (no equal)

B. Source Limitations: Obtain public address system from single source from single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

2.2 FUNCTIONAL DESCRIPTION OF SYSTEM

A. System Functions:
1. Selectively connect any zone to any available signal channel.
2. "All-call" feature shall be implemented via the existing VoIP telephone system.
3. VoIP adapter shall allow paging by dialing an extension from any local telephone instrument and speaking into the telephone.
4. Produce a program-signal tone that is amplified and sounded over all speakers, overriding signals currently being distributed.
5. Reproduce high-quality sound that is always free of noise and distortion at all loudspeakers during equipment operation including standby mode with inputs off; output free of nonuniform coverage of amplified sound.

2.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports and seismic restraints for control consoles, equipment cabinets and racks, and components, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Seismic Performance: Supports and seismic restraints for control consoles, equipment cabinets and racks, and components shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.4 SYSTEM DESCRIPTION

A. Compatibility of Components: Coordinate component features to form an integrated system. Match components and interconnections for optimum performance of specified functions.

B. Equipment: Comply with UL 813. Equipment shall be modular, using solid-state components, and fully rated for continuous duty unless otherwise indicated. Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz.

C. Equipment Mounting: Where rack, cabinet, or console mounting is indicated, equipment shall be designed to mount in a 19-inch (483-mm) housing complying with EIA/ECA-310-E.

D. Weather-Resistant Equipment: Listed and labeled by a qualified testing agency for duty outdoors or in damp locations.

2.5 IP SPEAKER INDOOR

A. Speaker
1. To be Confirmed by District.

2.6 IP Clock

A. Bogen
1. To be Confirmed by District.

2.7 BACKBOX COMBO FOR SPEAKERS

A. Backbox
1. To be Confirmed per Speaker.

2.8 IP OUTDOOR PAGING SPEAKER/HORN

A. Speaker/Horn
   1. To be Confirmed by District

2.9 ANGLED BACKBOX

A. Backbox
   1. To be Confirmed by Speaker

2.10 VOICE OVER IP TELEPHONE INTEGRATION

A. All admin access path ports shall be integrated via H.323, SIP, or FXO Port type protocol. This integration shall be seamless and easy to meet all standards as set forth in H.323, SIP, or FXO Port type interfacing. The VoIP Phone System Call Manager shall be used to manage these ports for control and management thus reducing adds, moves and change cost.

B. It shall be possible without the cost of additional hardware/software to incorporate a WAN/LAN district wide paging system by means of the built in VoIP district Paging Adapter. This adapter shall give the district the ability to page each school independently, as a group of schools, or all schools where a Class Connection IP system is installed.

2.11 FIRE ALARM INTEGRATION

A. Paging system will integrate with Fire Alarm to provide tones and voice evacuation services.

B. Details of integration to be determined.

C. Allocate 30 Hours of programming and integration time for integration with Fire Alarm

2.12 DISTRIBUTION

A. For a shared network the requirements shall be a VLAN capable 10/100 Ethernet switched with Gig fiber backbone. The recommended installation shall be to create a port based, fully enabled multicasting VLAN on the network and install the VCRCA Network Intercom Extender on that VLAN.

B. For a dedicated network the requirements shall be a 10/100 Ethernet switched fiber backbone. The VCRCA Network Intercom Extender shall plug into the Ethernet switch and fiber backbone via plug-in Gig Ethernet interface modules. There shall also be an alternative installation where the VCRCA Network Intercom Extender plugs into the Ethernet switch and a fiber backbone via media converters connected from Ethernet switch ports.

2.13 CONDUCTORS AND CABLES

A. All wiring shall be listed for the intended purpose. All cabling shall be Category 6 from the telecom room to the classroom and or zone origination point. All classrooms shall be homerun to each local telecom room that serves that area. There shall be no cabling required from the between telecom rooms as this is accomplished through the shared or dedicated network devices and infrastructure. All interior wiring shall be in accordance with new construction guidelines suggested by the manufacturer; including the speakers and the call-in switches.

2.14 PATHWAYS

A. Conduit and Boxes:

1. Outlet boxes shall be not less than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Wiring Method: Install cables in pathways and cable trays except within consoles, cabinets, desks, and counters. Conceal pathway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for pathways and boxes specified in Section 270528 "Pathways for Communications Systems."

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.2 INSTALLATION OF PATHWAYS

A. Comply with requirements in Section 270528 "Pathways for Communications Systems." for installation of conduits and wireways.

B. Install manufactured conduit sweeps and long-radius elbows whenever possible.

3.3 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Cable Installation Requirements:

1. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at outlets and terminals.
2. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Cables may not be spliced.
3. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
4. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
5. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
6. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend speaker cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceiling by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or be in contact with pipes, ducts, or other potentially damaging items.

D. Separation of Wires: Separate speaker-microphone, line-level, speaker-level, and power wiring runs. Install in separate pathways or, where exposed or in same enclosure, separate conductors at least 12 inches (300 mm) apart for speaker microphones and adjacent parallel power and telephone wiring. Separate other communication equipment conductors as recommended by equipment manufacturer.

3.4 INSTALLATION

A. Coordinate layout and installation of system components and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

B. Match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.

C. Identification of Conductors and Cables: Color-code conductors and apply wire and cable marking tape to designate wires and cables so they identify media in coordination with system wiring diagrams.

D. Equipment Cabinets and Racks:

1. Group items of same function together, either vertically or side by side, and arrange controls symmetrically. Mount monitor panel above the amplifiers.
2. Arrange all inputs, outputs, interconnections, and test points so they are accessible at rear of rack for maintenance and testing, with each item removable from rack without disturbing other items or connections.
3. Blank Panels: Cover empty space in equipment racks so entire front of rack is occupied by panels.

E. Wall-Mounted Outlets: Flush mounted.

F. Floor-Mounted Outlets: Conceal in floor and install cable nozzles through outlet covers. Secure outlet covers in place. Trim with carpet in carpeted areas.

G. Conductor Sizing: Unless otherwise indicated, size speaker circuit conductors from racks to loudspeaker outlets not smaller than No. 18 AWG and conductors from microphone receptacles to amplifiers not smaller than No. 22 AWG.

H. Weatherproof Equipment: For units that are mounted outdoors, in damp locations, or where exposed to weather, install consistent with requirements of weatherproof rating.

I. Speaker-Line Matching Transformer Connections: Make initial connections using tap settings as required for installation.

J. Connect wiring according to Section 271500 "Communications Horizontal Cabling."

3.5 GROUNDING

A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Schedule tests with at least seven days' advance notice of test performance.

2. After installing public address system and after electrical circuitry has been energized, test for compliance with requirements.
3. Operational Test: Perform tests that include originating program and page messages at microphone outlets, preamplifier program inputs, and other inputs. Verify proper routing and volume levels and that system is free of noise and distortion.
4. Signal-to-Noise Ratio Test: Measure signal-to-noise ratio of complete system at normal gain settings as follows:

    a. Disconnect microphone at connector or jack closest to it and replace it in the circuit with a signal generator using a 1000-Hz signal. Replace all other microphones at corresponding connectors with dummy loads, each equal in impedance to microphone it replaces. Measure signal-to-noise ratio.
    b. Repeat test for each separately controlled zone of loudspeakers.
    c. Minimum acceptance ratio is 50 dB.

5. Distortion Test: Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 50, 200, 400, 1000, 3000, 8000, and 12,000 Hz into each preamplifier channel. For each frequency, measure distortion in the paging and all-call amplifier outputs. Maximum acceptable distortion at any frequency is 3 percent total harmonics.
6. Acoustic Coverage Test: Feed pink noise into system using octaves centered at 500 and 4000 Hz. Use sound-level meter with octave-band filters to measure level at five locations in each zone. For spaces with seated audiences, maximum permissible variation in level is plus or minus 2 dB. In addition, the levels between locations in same zone and between locations in adjacent zones must not vary more than plus or minus 3 dB.
7. Power Output Test: Measure electrical power output of each power amplifier at normal gain settings of 50, 1000, and 12,000 Hz. Maximum variation in power output at these frequencies must not exceed plus or minus 1 dB.
8. Signal Ground Test: Measure and report ground resistance at public address equipment signal ground. Comply with testing requirements specified in Section 270526 "Grounding and Bonding for Communications Systems."

E. Inspection: Verify that units and controls are properly labeled, and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging speaker-line matching transformers.

F. Public address system will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

1. Include a record of final speaker-line matching transformer-tap settings and signal ground-resistance measurement certified by Installer.

3.7 STARTUP SERVICE

A. Perform startup service.

1. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements.
2. Complete installation and startup checks according to manufacturer's written instructions.

3.8 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.9 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain the public-address system and equipment.

END OF SECTION 275116

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SECTION 28 3100
FIRE DETECTION AND ALARM

ART 1 – GENERAL

Honeywell Fire Lite shall be used for the fire alarm system

1.01 SUMMARY

A. Section Includes:

1. Fire alarm system shall consist of fire alarm control panel or networked nodes of the same make and be CSFM (California State Fire Marshall) listed for the application.
2. Labor, equipment, materials, connections, testing, and performance of operations in the installation of fire alarm system.

B. Related Requirements:

1. Division 01 General Requirements.
2. Section 23 8000: Heating, Ventilating, and Air Conditioning Equipment.
3. Section 26 0500: Common Work Results for Electrical.
4. Section 26 0513: Basic Electrical Materials and Methods.
5. Section 26 0519: Low-Voltage Wire (600 Volt AC).
6. Section 26 0526: Grounding and Bonding.
7. Section 26 0533: Raceways, Boxes, Fittings, and Supports.
8. Section 27 5313: Clock and Program Systems.
9. Section 27 5116: Public Address and Intercommunication Systems.

1.02 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, duct detectors, multicriteria detectors, combination smoke/heat/CO Detectors, including detectors installed under other sections.
3. Alarm signaling circuits including alarm bells, horns and visual alarm units.
4. Annunciators.
5. Power supplies and batteries.
6. Interconnection with Central and Autonomous Public Address systems, telephone network system, Clock System-Classroom or Program schedule

change, HVAC system where applicable, kitchen fire suppression system, Theatrical and House Lighting, and other systems required by code.

B. System controls shall be UL listed for power limited applications in accordance with California Electrical Code.

C. System shall be listed for Internet of Things (IoT) security in compliance with UL 2900.

D. The fire alarm devices and equipment shall be listed for installation for the fire alarm control panel to which they are being connected.

E. Complete installation shall conform to the version of NFPA 72, California Fire Code, California Building Code (CBC), and California Electrical Code (CEC) as approved by DSA on stamped drawings.

F. System labels and devices programming addresses shall be based on final signage and building labeling submittals. For existing facilities contractor shall obtain from Owner Authorized Representative a copy of the current site layout and building labeling designations.

1.03 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.

1.04 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 system installed software, site specific system programming and information and tools required to re-program or modify the system.

1.05 SYSTEM FUNCTIONAL OPERATION

A. When a fire alarm condition is detected by one of the system 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. In the event of a fire alarm control panel activation, manual and automatic electronic tone or electromechanical bell class passing signals shall be disabled.

7. In the event of a fire alarm condition the Central and Autonomous Public Address System shall be overridden.

8. 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.

C. When any supervisory condition occurs such the following function shall occur:

1. System supervisory LED shall flash.

2. Local sounding device in panel shall be activated.

3. Appropriate message shall be transmitted to remote annunciators.

4. UDACT shall activate.

D. 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.

E. 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.

F. 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.

G. Activation of lamp test switch shall turn on LED indicators, LCD display, and local sounding device in panel, and then return to previous condition.

H. Fire alarm indicating appliances may be silenced or extinguished, 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. Audible indicating appliances shall be automatically silenced after no less than five nor more than ten minutes of operation. Visual indicating appliances shall be extinguished at system reset, or automatically after no less than five nor more than ten minutes of operation.

I. System's circuits including but not limited to initiation, indicating, and equipment interfacing shall be monitored for open or 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.

J. Notification appliance circuits shall be silenceable for testing purposes by authorized persons. Protected passcodes, keys, or another secure method that does not require entering into the system programming shall be used.

1.06 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 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 five minutes of alarm indication at end of this period. 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.

1.07 SUBMITTALS

A. Provide in accordance with Division 01.

B. Component Plan Submittal: Availability and listing for its application shall be verified for 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 per LAUSD symbol list.

3. 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 ten percent, indicate manufacturer listed operating voltage ranges for equipment and devices.

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 applicable devices for five 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 devises.

      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.

C. Shop Drawings: Provide Shop Drawings, in the same size as the design Drawings, include the following:

1. Provide drawing scale, elevations of system enclosures, and actual layout of the Fire Alarm Control Panel, power supply, annunciator, and main system components.

2. Site Plan indicating PIV and related fire sprinkler system devices and equipment to be monitored or supervised; such as water flow valves, and main equipment such as control panels, power supplies, annunciators, and

components such as outdoor wall-mounted horns, sprinkler bells, pull boxes, underground pull boxes , wiring routes on buildings exteriors and underground locations. In each conduit or raceway run indicate conduit sizes, and quantities and type of wires.

a. In existing facilities make a distinction between existing and new installation.

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 system components and wiring. The one line diagram shall show but not be limited to panel to panel interconnections, conductors gage 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 or building plan view drawings indicating device locations including end of line resistors “EOLR” in accordance with the legend provided.

   b. Individual point addresses for initiation and notification devices.

   c. Device “typical” wiring diagrams. These drawings shall indicate specific termination details for peripheral equipment and interface devices.

6. Provide interfacing with equipment furnished by others including voltages, and other required coordination items. Refer to 3.01-B.

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 Owner Authorized Representative (OAR). 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 with three – CD ROM electronic copies submitted along with full sized Shop Drawings.

9. Other installation and coordination drawings specifically related to this section shall be included as follows:

   a. Size A (8 ½ by 11) and size B (11 by 17) 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.

11. Samples: Provide Samples of material and equipment as required by the Architect. If Samples are requested, they shall be submitted within ten days from date of request.

D. In addition to the above requirements, provide submittals to meet any additional requirements of DSA.

E. Submittal of Equivalent Systems:

1. In addition to the submittal requirements of this section, if an equivalent system listed in Section 2.01A is submitted in lieu of the designed system shown on DSA approved drawings, the Contractor shall also submit a letter stating that the system is equivalent, and that device locations and quantities of devices are unchanged. Attached to this letter shall be a copy of the revised equipment schedule with corresponding CSFM numbers and a cut sheet for each item.

F. Modifications or additions to existing fire alarm systems shall be compatible and of the same manufacturer as the existing system. Contractor shall be solely responsible for engineering, plan check and any fees resulting from an installation that deviates from this requirement.

G. Prior to Substantial Completion submit to the Architect or Engineer of Record and to Owner Authorized Representative a complete updated set of the Shop Drawings showing changes made to the Fire Alarm System during construction. These drawings will become the System As-Built Drawing set for the Fire Alarm System Owner's Manual.

1.08 QUALITY ASSURANCE

A. Installer shall have successfully completed at least five projects of equal scope in the past five years, and have been in business of furnishing and installing fire alarm systems of this type for at least five years.

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. Materials and equipment installed shall be new.

G. Equipment in this specification shall be furnished and installed by the Authorized Factory Distributor of the equipment. Furnish a letter from the manufacturer of 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.

H. Installer shall be Underwriters Laboratory (UL) listed company under the UUJS classification, and shall certify that the installation has been made in accordance with UL requirements.

I. The fire alarm contractor shall have a NICET II Certified Technician on staff in their facility directly involved with this project to ensure technical expertise to this project and adherence with these specifications.

J. Contractor or Installer's Electricians and fire and 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.

K. System startup and testing shall be performed under the direct observation of the Project Inspector and OAR. 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.

L. At the time of installation the most current software package available shall be provided.

M. Provide at the time of Owner Acceptance of the installation, equipment, and 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. These components shall be delivered to the OAR.

N. Provide a backup copy of the most current software revision, in disk format. This copy shall be delivered to the OAR

O. A software license agreement shall be made available for the responsible Owner representative to sign at the time of training.

1.09 WARRANTY

A. The Fire Alarm Equipment Manufacturer shall provide a three year material warranty. Installer shall provide a three 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 five years after expiration of the warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Fire alarm equipment shall be standard products of the Notifier Co., Honeywell, Edwards Systems Technology, Siemens Building Technologies, Inc. Johnson Controls and Gamewell-FCI, or equal.

B. 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.

2.02 FIRE ALARM CONTROL PANEL (FACP) OR NETWORK NODES

A. Furnish Fire Alarm Control Panels as indicated on drawings.

B. Enclosures:

1. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.

2. The back box and door shall be constructed of 0.030 steel with provisions for electrical conduit connections into the sides and top.

3. The supplied door shall include a key lock and shall include glass or other transparent opening for viewing of indicators. For convenience, the door may be site configured for either right or left hand hinging.

2.03 POWER SUPPLIES

A. Remote Notification Appliance Circuit (NAC) extender power supplies shall be furnished with main printed circuit board, transformers, lockable cabinet, and batteries. Unit shall be configured to drive 4 notification appliance circuits. The remote power supplies shall be configured with a monitor module to report trouble conditions to the controlling FACP via an SLC. Triggering of NAC inputs shall be directly controlled from the FACP without the use of addressable control or relay modules.

2.04 PERIPHERAL DEVICES AND EQUIPMENT

A. Manual Stations (interior): Manual pull stations shall be addressable semi-flush, non-breakable glass type for building interiors. Station housing shall be fabricated of die-cast aluminum with reset lock and key. Provide an addressable monitor module for each manual station.

B. Smoke Detectors: Smoke Detectors shall be addressable. 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 re moving the detector head.

C. Non-Explosion Proof Automatic Addressable 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). 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 such as attics, where the ambient temperature can reach around 150^{o} degrees Fahrenheit in hot days, use detectors rated for the application. 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. Linear Heat Detectors: Linear detectors shall be Protectowire or equal. linear detectors shall be rated for 150-degree Fahrenheit installed ambient temperature and 190-degree Fahrenheit alarm temperature. Damaged detector due to excessive bending or kinking during installation shall not be accepted. Interface the Protectowire detector with the FACP system via addressable monitor module(s) located on one extreme of the detector and an end of line resistor at the other extreme. End of line resistor shall be readily accessible for testing. Provide appropriate signs indicating the existence of linear heat detectors at the entrances of areas protected with this type of fire detection. Installation shall be done in accordance with applicable codes and standards, and manufacturer's published installation recommendations.

1. Provide a system that utilizes linear heat detectors in concealed or controlled access areas. The detection wire shall be installed within 20 inches of the underside of the building roof or the above floor as recommended by the manufacturer. In shallow areas install the detection wire within the upper part of the space to be protected.

    a. One circuit of linear heat detection shall be utilized for areas not exceeding 4,000 square feet above multiple rooms.

    b. Areas divided by a fire rated wall shall be protected separately and considered an independent zone.

E. Monitor Modules:

1. Monitor modules shall connect a supervised zone of conventional initiating devices, N.O. dry contact devices, including four-wire smoke detectors, to one of SLC loops. Monitor module shall install in a four-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 or equal 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.

F. Control Modules:

1. Control modules shall be used to connect conventional indicating appliances or MR type isolation relays to one of the SLC loops. Control modules shall be installed in a standard four-inch square by 2 1/8-inch deep electrical box. Audio or visual or relay power shall be provided by a separate loop from main control panel or from supervised remote power supplies. Each module shall have its loop number, electronic address, and function label on the front cover using a p-Touch type or equal labeling system. Provide Air Products PAM-3 Relay Model 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.

G. Relay Modules:

1. Relay Module shall be Notifier FRM-1 or FMM-101 depending on requirements. Modules 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 a buffer relay that is part of the control system if controlled circuit(s) exceeds the voltage or current rating of the relay module.

3. Relays used to interface control of other systems shall be electrically supervised and shall only be wired in a fail-safe mode of function during a power failure.

4. Relay modules for HVAC units on roof shall be located in a NEMA 3R box next to unit being controlled. Provide approved weather listed vibration connection conduit and fittings to interface fire alarm system module with HVAC controls compartment. Do not penetrate the HVAC unit from the bottom. Bottom penetrations shall not be accepted.

H. Isolator Modules:

1. Isolator 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 two 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.

I. Strobes: Horns and strobes shall be products of the same manufacturer. In order to establish a standard of quality, items are specified from the products manufactured by System Sensor, acceptable manufacturers are Honeywell, Wheelock Inc., Gentex or District approved equal. Addressable or multifunction two wire indicating (Audible or Visual) appliances shall not be acceptable.

1. Strobe shall be wall mounted or ceiling mounted System Sensor or equal. Horn/strobe shall operate on two separate two wire 24 VDC polarized circuits and shall be provided with a semi-flush mounting plate. Entire unit shall be red finish. Strobe light shall have a clear Lexan lens. The word "FIRE" shall be printed on the two sides of the strobe body. Horn shall provide a minimum sound output of 100 dB at 10 feet. The strobe shall provide a selectable minimum light intensity of 15, 30, 60, 75, 90, 110, 135, 150, or 185 Candela as indicated on Drawings to meet or exceed requirements of CBC, CHAPTER 11B AND ADAAG and UL 1971. Horn/Strobes shall be mounted on manufacturer recommended outlet boxes. Weather proof horn or strobe shall be model No. P4RK or Model No. P4RHK. Provide a model No. BBS-2 back box skirt on indoor surface mounted outlet boxes.

2. Strobe indicating appliances shall be System Sensor or equal. Devices shall be UL listed and shall be wall-mounted. Entire unit shall be red finish. Strobe light shall have a clear Lexan lens. The word "FIRE" shall be printed on two sides of the strobe body. Strobes shall meet CBC, CHAPTER 11B AND ADAAG 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 CBC, CHAPTER 11B AND ADAAG and UL 1971. Strobes shall be mounted on manufacturer recommended outlet boxes. Weather proof strobe shall be model No. SRK or Model No. SRHK. Provide a model No. BBS-2 back box skirt on indoor outlet boxes.

3. Strobe synchronization modules if required shall be System Sensor 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).

J. Universal Digital Alarm Communicator Transmitter shall be Notifier Model No. UDAC-2 (CSFM 7165-0028:0243/7165-0028:0224). The UDACT is an interface for communication of digital information between a fire alarm control panel and a 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 6000 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.

2. The UDACT shall include connections for dual telephone lines (with voltage detect), per UL or NFPA or FCC requirements. It shall include the

ability for split reporting of panel events between up to three different telephone numbers.

3. It shall be completely field programmable from a built in keypad or laptop computer, and shall be capable of transmitting events in multiple formats.

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) and Earth Fault.

   d. System Off Normal.

   e. 12 and 24 Hour Test Signal.

   f. Abnormal Test Signal (per UL requirements).

   g. EIA-485 Communications Failure.

   h. Phone Line Failure.

5. The UDACT shall support independent zone or point reporting when used in the Contact ID format. This enables the central station to have exact details concerning the origin of the fire or response emergency.

6. The UDACT shall be supplied with two eight conductor, two to six foot long line cords. One end of the cords shall plug into the jacks on the UDACT. The other end of the cords shall plug into industry standard RJ-31X surface mounted telephone jacks. Install jacks in a screw cover box adjacent to the FACP if sufficient space is not available within the FACP, or adjacent fire alarm terminal cabinet. The line cords shall be installed in conduit when it is necessary to locate the jacks remotely from the FACP enclosure. The jacks shall be mounted to the rear of the box. The telephone number for each line shall be labeled on its respective jack.

K. Voice Evacuation System:

1. The Voice Evacuation Control (EVAC) Panel. The self-contained control panel shall be equipped with dual 25-watt audio amplifiers each with a single style Y (Class B) supervised 25 Vrms output circuit. The EVAC panel shall have the ability to record a minimum of two field-programmable messages of up to 60 seconds total duration with an integral microphone or an external source via an audio input jack. The messages shall be stored digitally onto a non-volatile EEPROM. The message(s) shall be individually field programmable for three, four, six, eight, or indefinite repeat while triggered by the host FACP. Any message being delivered at the time of the trigger circuit(s) reset shall not stop in mid-sentence but shall be completed to the end of the message. A tone generator shall be provided capable of emulating a field programmable lead-in or trailing alert tone or an Audible Emergency Evacuation Signal (Temporal Pattern). The EVAC panel shall be capable of electrically supervising in both active and standby conditions, the amplifier outputs, field wiring, message generator, tone generator, microphone and primary or secondary power supplies to an

internal trouble relay(s). The trouble relay(s) contacts shall be accessible via a terminal strip and be configured and connected to report internal or external trouble conditions to the host FACP via the trigger circuit or a separate monitor module. The minimum of two trigger circuits shall be individually field-configurable for triggering with a NAC circuit or a supervised dry contact. The control panel shall be equipped with LED indicator lights for Power On, System Trouble, Message Generator Trouble, Tone Generator Trouble, Microphone Trouble, Battery Trouble, Charger Trouble, Ground Fault, Output Circuit Trouble and Amplifier Supervisory. The panel shall be equipped with an internal monitor speaker for reviewing the field recorded messages. The primary power supply shall operate at 120 VAC through a dedicated 20 amp. circuit and shall be capable of charging 18 AH lead acid batteries. Provide two 12 volt batteries that will provide a secondary power source for the same or longer duration than is required by the host FACP. An auxiliary 24 volt DC power output shall be provided for use by an associated addressable control module. The EVAC control panel shall be triggered either directly by the associated FACP with a NAC circuit or by an addressable control module. Provide 3/8 inch minimum P Touch labeling on the window in front of the built in microphone indicating that "THE INTERNAL MICROPHONE IS TO BE USED FOR THE RECORDING OF ANNOUNCEMENTS ONLY. NOT FOR USE BY STAFF OR FIRE DEPARTMENT PERSONNEL."

2. Ceiling Mounted eight-inch EVAC Speakers shall be mounted in a Notifier Model CBB-8 back box or equal. The speaker assembly shall be supplied with a white 12 inch round metal grill. The 8 inch speaker shall have an impedance of 8 ohms, minimum 9.5 ounce magnet and an attached 25 volt audio line matching transformer with 1/8, 1/4, 1/2, 1, 2, 4 and 8 watt tap settings and DC blocking capacitor. Wattage shall be selectable by the use of a jumper or shunt. Audio levels shall be 75, 78, 81 87, 90 or 93 dba at ten feet. Input or output terminals that will accommodate 12 to 18 AWG wire shall be provided. Speakers orientated in the same direction shall be connected in phase with each other. Multiple speakers in areas such as Auditoriums or Gymnasiums shall be divided into two circuits in a checker board pattern and connected separately to the two audio output circuits.

3. Wall Mount four-inch EVAC Speakers shall be mounted on a manufacture recommended outlet box. When mounted on a surface mount outlet box, Provide a Model No. BBS-SP201R surface mount backbox skirt. The speaker assembly shall be supplied with a square high impact red grill. The four inch speaker shall have an attached 25 volt audio line matching transformer with 1/4, 1/2, 1 and 2 watt tap settings and a DC blocking capacitor. Wattage shall be selectable by the use of a jumper or shunt. Audio levels shall be 80, 84, 86 or 89 dba at ten feet. Input or Output terminals that will accommodate 12 to 18 AWG wire shall be provided. Speakers orientated in the same direction shall be connected in phase with each other; but when installed facing opposite directions they shall be connected out of phase.

L. Network Cables or SLC or Annunciator Data or Audio Output Cables: The construction and physical characteristics such as aqua-seal water block, wire gage, insulation and jacket types, etc. shall not be altered. Equivalent cables must be specifically approved and recommended by the manufacturer of the fire alarm system equipment. Substitutions will require review from the Architect or Engineer of Record.

M. Protective Covers

1. Provide protective covers for pull stations, smoke and heat detectors, and audible and visual devices located in areas occupied by students that can be subjected to vandalism such as gyms, restrooms, locker and shower rooms, and all hallways and corridors associated with these spaces. Installation of cover must not protrude over current ADA limitations.

PART 3 - EXECUTION

3.01 GENERAL

A. Fire alarm system shall not be used for any purpose other than fire alarm functions.

B. Fire alarm shall be interconnected but not limited to the following systems:

1. Systems required by code to be connected to the fire alarm systems shall be connected.
2. Public address system for disabling the manual and automatic bell or tone class passing signals. Manual and automatic class passing signals shall not be operable during alarm conditions.
3. Ventilation systems where required for the purpose of fan shutdown
4. Damper control or smoke management systems.
5. Water based fire sprinkler systems.
6. Chemical fire extinguisher systems.
7. Central and Autonomous PA system(s).
8. Theatrical lighting control system.
9. Elevator controls for the purpose of elevator cab Phase 1 recall and shunt trip control, circuit supervision and shunt trip power supervision.
10. Fire pump controller for required signaling and trouble supervision.

C. Fire alarm system shall not be interconnected to any of the following:

1. Sump warning systems,
2. Carbon monoxide detection systems.
3. Methane gas detection systems.
4. Elevator car alarm bell circuit.
5. Other unrelated system.

3.02 SYSTEM INSTALLATION

A. 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 26 0519: Low-Voltage Wire (600 Volt AC), for installation and color coding requirements.

B. Splices are not allowed in junction boxes. Terminations shall be in terminal cabinets or on equipment terminals.

C. 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.

D. 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.

E. 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.

F. Conductors shall be color-coded per specification section 26 0519 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.

G. 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.

H. 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.

I. 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.

J. 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.

K. Provide P-touch label of approximately one 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.

L. Provide adjacent to each annunciator a neatly typewritten copy of the Fire Alarm Operating Instructions. The instructions shall reflect the installed and programmed features of the system. Instructions that include information on non-installed or programmed features will not be acceptable. The instructions 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 appropriate anchors.

M. Provide adjacent to each annunciator a neatly drawn site map showing 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 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.

3.03 SYSTEM PROGRAMMING

A. Programming shall be performed in accordance with District requirements set forth in this section – the local authority having jurisdiction and applicable codes. If a conflict arises or a clarification is required, the contractor through the project's OAR shall contact the Districts Fire Life Systems Testing Group (FLSTG) for clarification

B. As part of the 50 percent construction completion label devices and locations in the manner indicted in the attached guidelines on a separate copy of the shop drawings. Request a meeting with OAR, Project Inspector, and representative of FLSTG to review, finalize and obtain approval of the proposed device, equipment and location descriptors that will be programmed into the system. The District may at time of substantial completion request minor changes to program descriptors if needed to conform to site conditions.

C. The following functions and features as required by the site or system configuration and installed peripheral equipment and systems shall be programmed into LAUSD fire alarm systems. The definition of programming shall include but not be limited to the use of a built in keyboard, the use of a connected PC with the appropriate software, dip or rotary switches, wiring or installable or removable jumpers as required or provided in the fire alarm equipment.

1. Signal Silence Switch Inhibit: The audible signal silence switch located on the remote fire alarm annunciator(s) or any fire alarm control panel(s) shall be programmed to not silence the audible or extinguish the visual alarm circuits during the first minute (60 seconds) of alarm activation. Activation of this switch shall silence only the audible signals. Enabling or disabling this feature shall be allowed only if approved by the local Fire

Marshal and District's Supervising Electrical Engineer, and authorized District maintenance personnel. The activation feature shall be protected by a maintenance level password.

2. Audible Notification Appliance Circuits: Audible notification appliance circuits shall be programmed to emulate the temporal code (ANSI S 3.41) from fire alarm audible appliances (horns). This coding shall originate and be controlled by a single coder residing within the FACP(s). The use of coders within remote power supplies either mounted adjacent to an FACP or at a remote location or directly by an audible notification appliance will not be permitted. Programmable audible notification appliances shall be configured to emulate a steady tone at approximately 1000 Hz. Audible notification appliance circuits shall be programmed to be silenced as described above. Notification appliance circuits throughout the site shall be activated by any alarm initiating device. Coded audible signals shall be controlled by a single synchronized FACP.

3. Visual Notification Appliance Circuits: Visual notification appliance circuits shall be programmed to provide steady non-coded power to the visual appliances (strobes). As required by code and the system configuration, a synchronization signal shall be superimposed onto the NAC by the FACP, a remote power supply or an add-on synchronization module. Visual notification appliance circuits shall be programmed to be extinguished as described above. Visual notification appliance circuits throughout the site shall be activated by any alarm initiating device.

4. System Reset Button: The system reset button located on FACPs and remote annunciators in addition to resetting the fire alarm system and silencing or extinguishing notification appliances except for the sprinkler water flow appliances shall be programmed to reset analog and addressable smoke detectors, duct detectors, beam detectors and relays, addressable control modules and addressable relay modules used to interface to other systems and equipment. Each installed system reset button shall be programmed to operate as a "single point of reset" for the complete system.

5. HVAC Shutdown: Relays and addressable relay modules used to interface to HVAC equipment dampers, and supply and exhaust fan motors shall be programmed to shut down this equipment only within the same building where the detection of smoke, heat, carbon monoxide or fire sprinkler water flow has taken place. Manual pull stations within any building shall not affect the operation of the HVAC equipment. These relays shall return to normal only after the system is reset.

6. Fire Fighter Warning: In conjunction with the above elevator recall function, an additional addressable relay module shall be programmed to operate only with the detection of smoke by a detector located in an elevator machine room or elevator hoistway to provide a warning signal to fire fighters attempting to use the phase II elevator function.

7. Smoke Detector Maintenance Alert: Addressable smoke detectors shall be programmed with the capability of initiating a maintenance alert when any one detector becomes obscured by dust or any other contaminates at approximately 10 percent below the level of obstruction that would initiate an alarm.

8. Disabling Class Passing Signals: The relay or addressable relay module shall be programmed to disable the class passing signals during any alarm condition at the site. This relay or addressable module shall return to normal only after the system is reset.

9. Disabling Audio of a Public Address System: The relay or addressable relay module shall be programmed to mute the audio output of the associated public address system during any activation of an audible notification appliance circuit or a voice evacuation announcement. This or these relays shall automatically restore to normal upon the silencing of the audible NACs and the voice evacuation announcement.

10. Release of Electro-Magnetically Held Doors: The relay or addressable relay module shall be programmed to open or close the control circuit as needed of the 24 volt DC door holder power supply. This relay(s) shall operate during any alarm condition within the same building as the door holders. The contacts shall return to normal only after system reset.

11. Illumination of House Lighting: The relay or addressable relay module shall be programmed to turn on to full brilliance the house lighting of an Auditorium, MP Room, etc. during any alarm condition at the site. This relay or addressable module shall return to normal only after the system is reset.

12. UDACT: The FACP and the associated Universal Digital Alarm Communication Transmitter shall be programmed to transmit to the central monitoring station separate indications for General Alarm, Fire Sprinkler Water Flow Alarm, System Trouble and Supervisory Conditions. These indications shall be in addition to any indications initiated by the UDACT itself.

13. Voice Evacuation Panel: The NAC originating at, or the addressable control module controlled by the associated FACP that is controlling the EVAC panel shall be programmed to emulate the above paragraph “E” Audible Notification Appliance Circuits except that it shall be non-coded. Trouble conditions at the EVAC panel shall report back to the associated FACP via the controlling NAC or addressable control module or a separate addressable monitor module. Transformer taps at the EVAC speakers shall be selected to provide the proper balance of audio volume in larger and smaller areas. The message shall be programmed in a female voice in the English language as follows: A minimum of two but no more than three cycle sounding of an approximate 1000 Hz tone in the pattern of the NFPA required temporal code followed by: “May I have your attention please. May I have your attention please”. The fire alarm has been activated in the building. The fire alarm has been activated in the

building. Please proceed to the nearest exit and leave the building." The sounding of the temporal patterned signal followed by the indicated message shall repeat indefinitely until the controlling NAC is reset.

14. Power Failure Reporting Time Delay: Main and remote NAC power supplies shall be programmed to delay the reporting of a site AC power failure for a minimum of 6 hours.

D. Device Descriptors:

1. Descriptors shall enable responding personnel to identify the location of a fire quickly and accurately, and shall indicate the status of emergency equipment or fire safety functions that might affect the safety of occupants. The minimum required information for devices intended to report smoke, fire, or fire sprinklers water flow include, but may not be limited to: Building, floor (if multiple floors exist in the building), room or space description, and device type and digital address (Smoke detector, Heat detector, Fire sprinkler water flow switch, etc.)

a. Building: The building must always be included in the descriptor, even if there is only one building one the site. Additional building(s) may be added at a later date creating the possibility of confusion by similar designated spaces, such as "Work room" or "Staff restroom" if more than one building has these similar designated spaces. The building designation in the descriptor must be what the site-based personnel call the building. The building should be provided with signage to aid fire department personnel in the identification of the building.

b. Floor: In multi-floor buildings the floor designation (1st, 2nd, etc.) must be included in the descriptor.

c. Room Description: The room or space description must be unique. Using the same designation for multiple spaces, such as "Workroom", "Counselor's Office", or "Men's restroom", etc. is not acceptable. If, during a project, the room numbers or the use of the room changes then the room or space descriptor must be changed to agree with the change. Proper signage should be provided for each space to aid fire department personnel in the identification of the room or space.

d. Device Type, Address and Compass Designations: The device type and digital address must be included with the descriptor, such as smoke detector or heat detector, etc. Some systems provide this information automatically in the descriptor. Compass designations, (N, S, E, and W) are required in spaces such as corridors where there are multiple detectors and this information would be helpful to responding fire department personnel in locating the device reporting alarm. It is not necessary to include compass designations in smaller spaces where there are multiple detectors located in close proximity to each other.

E. ACCEPTABLE ABBREVIATIONS

Rm.- Room	Bldg.- Building	Smk. - Smoke
Corr.- Corridor	Lby- Lobby	Asst. - Assistant
Eng.- English	N – North	Nrs. - Nurse
Flr.- Floor	S – South	Cnclr - Counselor
Ht.- Heat	E – East	Off. - Office
Lib.- Library	W – West	PE – Physical Education
Lkr. – Locker	Kit- Kitchen	RR- Rest Room
Stu Str – Student Store	Sci - Science	By = near
Stor Rm – Store Room	Café - Cafeteria	PM – Plant Manager
1st- First	2nd- Second	3rd- Third
Hopr Rm – Hopper Room	Det - Detector	Elev - Elevator
Prin – Principal	Blr Rm – Boiler Room	Conf – Conference
Park – Parking	Bsmt –Basement	MPR.- Multi-Purpose room

3.04 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, refer to Attachment B:

1. Activate audible circuits.
2. Actuate strobe units until the panel is reset or strobe circuit time-out.
3. Release magnetic door holders to doors to adjacent zones on the floor from which the alarm was initiated.
4. Duct type smoke detectors shall, in addition to the above functions, shut down the ventilation system or close associated control dampers as required.
5. UL listed central station shall be notified via – Universal Digital Alarm Communicator Transmitter (UDACT).

3.05 TESTING

A. A 48 hour notice shall be provided to the Project Inspector before final testing.

B. Testing of fire detection system shall be as required 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 signal-initiating devices (smoke detectors, heat detectors, pull stations etc.).
2. Operation of indicating devices (alarm horns, alarm bells and alarm strobes).
3. Operation of system features under normal operation.
4. Operation of system supervisory features.
5. Operation of 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.
18. Central and Autonomous PA systems for muting during the sounding of the audible notification appliances and voice evacuation announcements.
19. Disabling electronic tone or electromechanical bell class passing signals until system reset.

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 Project Inspector 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 NFPA 72, and submit one copy of the completed form to the Architect and Project Inspector.

3.06 SERVICE MANUALS

A. Deliver to OAR, three copies of the service manuals. Each manual shall include the following:

1. Installation manuals, programming manuals and user manual if applicable for every control panel, control panel power supply, FACP input or output or relay or control module, auxiliary power supply, UDACT, remote NAC extender power supply, door holder power supplies, installed annunciators, initiating and indicating devices and addressable monitor, relay and control modules. Catalog cut sheets are not acceptable.

2. A printed copy of the system configuration as programmed, including 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, and control or relay modules as applied in the interfacing of peripheral systems or equipment to the fire alarm system. Updated shop drawings shall include revisions made in the field via plan changes, RFIs, Field Change Directives, and any other construction change documents including interface details with ancillary systems.

8. An electronic copy (CD) of the posted site or fire alarm map in Auto-Cad and pdf formats.

9. Provide a CD ROM electronic copy of the updated system As-Built Drawings to the OAR, prepare this copy in the latest version of AutoCAD; along with the electronic copy provide a full size bond copy. Include one CD-ROM of the up-dated As-Built Drawings into each of the Service Manuals. CD and folded drawings shall be secured and inserted into the Service Manuals via a three-hole punched protective CD case and protective envelopes for the drawings.

10. Provide codes and passwords for fire alarm system at testing.

3.07 SPARE PARTS

The following new spare parts shall be furnished in unopened boxes:

1. Five percent spare pull stations including the associated monitor module (minimum one spare pull station per type).

2. Five percent spare smoke and heat detectors (minimum one spare smoke and heat detector per type).

3. Five percent spare audible devices (minimum one spare audible device per type).

4. Five percent spare strobe devices (minimum one spare strobe device per type).

3.08 SYSTEM USER AND MAINTENANCE PERSONNEL TRAINING

A. Before Substantial Completion, provide one instruction period for the Project site based Owner operators and system users. The instruction period shall be scheduled and coordinated by the OAR.

B. Training materials and required deliverables shall be submitted to the OAR.

1. Prior to beginning the operational demonstration, notify Central monitoring Station that an instructional activity is beginning; inform them that it includes setting and resetting the system in test mode. After the demonstration is completed and the system restored, notify the Central Monitoring Station that the system has been restored and it is back on line for continuous monitoring.

C. User Instruction and Training

1. Before substantial completion and with a fully functional fire alarm system installed at the site, the contractor shall provide a minimum of four hours of user training for site based staff. The date and time for this training shall be coordinated by the project OAR.

D. Instruction period training for site based staff shall consist of the following:

1. Overview:

a. Explain the fire system is “addressable” which means every device-smoke detector, heat detector, sprinkler water flow switch, manual pull station, etc. has a unique address or identity. This

makes it possible to positively identify the exact device causing an alarm, trouble or supervisory condition.

b. Explain the fire alarm control panel also controls the horns and strobes throughout the campus or building.

c. Explain that the fire alarm system is interconnected to various other systems and equipment throughout the site such as:

1) Elevators to recall them to the main floor or to an alternate floor and as an option dependent circumstances turn off the power to the elevators.

2) Heating and air conditioning equipment to turn off fans and close dampers to stop the spread of smoke throughout a building.

3) The class passing signaling system to disable the bells or tones to not accidentally signal students and staff to return to the buildings.

4) Magnetically held doors to close them to stop the spread of smoke.

5) To turn up house lighting in an occupied Auditorium or Multi-Purpose room to provide adequate egress lighting.

6) The Central and Autonomous PA systems to mute them during the sounding of the alarm signal.

d. Explain the fire system has a battery backup in case of power failure and that it will continue to function for a minimum of 24 hours after a total power failure.

e. Explain that the fire alarm system components and wiring are monitored to report a malfunction, damage or vandalism. When this occurs, a trouble indication will appear on the fire alarm annunciator and FACP and this indication will be transmitted to the central monitoring station.

f. Explain that other equipment and systems are monitored for abnormal conditions such as the fire sprinkler water being turned off. When this occurs, a supervisory condition is created. A supervisory indication will appear on the fire alarm annunciator and FACP and this indication will be transmitted to the central monitoring station.

g. Explain that the fire system in addition to notifying the occupants of a possible fire condition also transmits an alarm indication to the central monitoring station that will in turn notify and dispatch the local fire department to your site.

2. Basic:

a. Hand out the SYSTEM OPERATION instructions to attendees.

b. Point out the Fire Alarm Control Panel and have them observe the normal LED status (one green LED only should be on):

1) GREEN = Normal.

2) YELLOW = Trouble.

3) RED = ALARM.

c. Have the attendees observe the LCD display that should be indicating a SYSTEM NORMAL message.

d. Point out the Fire Alarm System Annunciator and have attendees observe the LCD display that should be indicating a SYSTEM NORMAL message.

3. Operation and Demonstration:

a. After putting the system or having someone put the system central station monitoring into the test mode demonstrate the following:

b. Activate a Manual Pull Station to demonstrate ALARM.

1) Demonstrate audible and visual notification appliances and if installed the voice evacuation signal announcement.

2) Demonstrate panel or annunciator sounder tone for ALARM.

3) Have staff SILENCE system.

4) Show LCD display and LED of alarm.

5) Demonstrate and have staff reset the manual pull station.

6) Have staff RESET fire system.

c. Activate Smoke Detector with canned smoke to demonstrate address identification:

1) Have staff SILENCE system.

2) Show LCD and display LED of ALARM.

3) Have staff RESET fire system.

d. Remove Smoke Detector to demonstrate SYSTEM TROUBLE.

1) Demonstrate panel or annunciator sounder tone for TROUBLE.

2) Have staff SILENCE system.

3) Show LCD display and LED of TROUBLE.

4) Replace the smoke detector.

5) Have staff RESET fire system.

e. Remove power to demonstrate function during power failure.

1) Have staff SILENCE system.

2) Show LCD display and LED of TROUBLE.

3) Activate Manual Pull station to demonstrate audible or visual functions in power failure mode.

4) Reset manual pull station.

5) Reset fire system.

6) If applicable, point out sprinkler riser and shut off valves.

7) Show location of a water flow switch.

8) Show location of a valve tamper switch.

9) Point out valves must always be OPEN or fully counter clock wise.

10) Point out PIV (Post Indicator Valves) if applicable.

11) Have water flow through the inspectors test valve and point out the ringing water flow bell.

12) After the horns are silenced by an assistant, show that the water flow bell is ringing continuously indicating water flow.

13) Have the assistant turn off the inspectors test valve to show that water flow alarm bell turns off.

14) Reset system.

15) Unlock and turn off a PIV or riser valve to show a supervisory condition.

16) Turn valve back on, lock the valve open and demonstrate the end of the indication of a supervisory condition.

4. Training documentation.

a. Insure fire panel is reset and indicates normal and central station monitoring is taken off of the test mode.

b. Have staff attendees sign off training sheet and provide a copy to the PROJECT INSPECTOR.

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 Project site.

END OF SECTION

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Site clearing as specified herein.

B. Related Sections:

1. Section 31 10 00, Site Clearing
2. Section 01 50 00, Temporary Facilities and Controls.

C. Principal items of Work included herein:

1. Site clearing and Grubbing.

1.2 REFERENCES

A. Demolition shall be as per 2016 California Fire Code, Title 24, Part 9, Chapter 33.

1.3 PROJECT SITE CONDITIONS

A. The Contractor shall be responsible to furnish and maintain all temporary barricades, warning lights, and other types of protection and to prevent accidental injury to the general public and personnel on the project.

B. Existing improvements and existing active utility lines to remain (whether above or below ground) within the new construction area shall be properly and adequately protected from damage during the entire construction period. The Contractor shall be responsible to restore to their original condition any of these existing items that are damaged or disturbed.

C. The Contractor shall be responsible to protect adjacent properties, roads, right of ways, utilities and other improvements above or below ground from damage in performing the work.

D. Comply with applicable sections of the storm water pollution prevention plan, including but not limited to, erosion control, soil, waste and maintenance areas. Comply with the SWPPP and LIP requirements per contract documents.

E. Salvaged Materials: Owner requires that a minimum of 50% (by weight) of all non-hazardous construction materials be recycled, composted and/or salvaged. Salvage shall conform to the following:

1. Contractor shall submit salvage plan showing how all materials are to be sorted, salvaged and recycled. Plan must include all final destinations for each type of material.
2. Salvaged items must be transported from site as they are removed, unless materials are to be reused on site.

3. Storage or sale of removed items on site will not be permitted, unless materials are to be reused on site.

4. Contractor shall provide certification for all salvaged materials. Certifications may take the form of receipts from recycling facilities, manufacturers, or any other legitimate form of certification. Certification types shall be outlined in salvage plan and approved by Owner.

PART 2 - PRODUCTS
(Not Applicable)

PART 3 - EXECUTION

3.1 EXECUTION

A. Completely remove from the site (as required for construction) existing vegetation, trees, shrubs, bushes, debris, poles, posts, houses, sheds, garages, structures, footings, foundations, piers, curbs, walls, steps, slabs, pavement, substructures, pool equipment, piping, asbestos piping, asbestos materials, pumps, valves, vaults, underground utilities, cesspools, weir boxes, irrigation lines and appurtenances, septic tanks, fences, basement walls and slabs, tanks, manure, etc., unless otherwise indicated, including any other items necessary to construct the new work under this contract.

B. Items removed shall be disposed of, off the property, in a legal manner.

C. Trees and tree stumps unless indicated to remain, shall be removed, together with the bulk of the roots, to a minimum depth of 3 feet below the existing grade or finish grade, whichever is lower, within a radius of eight feet beyond perimeter of trunk at ground line. The resulting holes created by the tree removal shall be filled with clean earth and compacted to the same density as specified in Section 31 10 00, Earthwork, for fills. Holes resulting from the tree removal shall not be backfilled until approved by the Inspector or other designated authority.

D. During demolition operations, thoroughly wet down debris to allay the dust as necessary. Remove debris from the site as it accumulates. Accumulation of debris will not be permitted.

E. Holes resulting from the removal of septic tanks, cesspools, or any other underground tanks or structures shall be backfilled in accordance with Section 31 10 00, Earthwork and/or geotechnical report.

F. Discussing existing vegetation into existing surface soils will not be permitted under any circumstances.

G. Coordinate timing of demolition of existing temporary drainage structures with construction of new permanent drainage structures.

END OF SECTION 311000

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: All required excavation, grading, preparation of subgrade for fills, proper placement of fills, including backfilling and compaction, watering, rolling, and compacting of fill material in place, and finish grading.

B. Principal items of Work included herein:

1. Excavation
2. Filling
3. Backfilling
4. Geotechnical Engineer Inspection and Testing
5. Grading
6. Miscellaneous related work necessary for a complete job.

C. Related Sections:

1. Site Clearing, Section 31 10 00.

2. Final subgrade preparation for asphalt paving, Section 32 12 16 – Asphalt Paving.

3. Aggregate base beneath asphalt paving is specified under Section 32 12 16 – Asphalt Paving.

4. Excavation and Fill, Section 31 23 00 for Utilities and Storm Drains.

5 Operations and Maintenance for Planting, Section 32 01 90.

1.2 PROJECT DATA

A. Geotechnical Reports: The existing soil conditions at the site have been investigated, and a report of findings is on file at the Architect's office for review by the Bidders during the bidding period. This information is offered as supplemental information only, and no guarantee of existing soil or other conditions is intended. .

Geotechnical / Geologic Investigation:

Title: Geotechnical Evaluation, Campus Modernization, Bennett/Kew Elementary School, 11710 South Cherry Ave., Inglewood, CA.
Report Date: June 24, 2019

Prepared by: Ninyo & Moore Geotechnical & Environmental Sciences Consultants
Project No. 209822010

B. The existing soil conditions at the site have been investigated and a report of the findings is on file at the District Office.

1.3 PERFORMANCE REQUIREMENTS

A. All grading work shall be performed in accordance with 2016 CBC, Title 24, Part 2.

B. The Grading Code of the County of Los Angeles, City of Inglewood, and any special requirements of the permit.

C. Applicable General and Special Conditions of these specifications hereinafter set forth in full or by reference.

D. A final Grading Report shall be submitted by the Geotechnical Engineer in accordance with 2016 CBC, Title 24, Part 2.

1.4 QUALITY CONTROL

A. Testing and Inspections:

1. A Geotechnical Engineer, designated by the Owner, shall be engaged to perform continuous inspection of the placing and compacting of fills and backfills within the limits of grading of this project. Work shall be done in accordance with these specifications, the requirements of California Building Code, Chapters 18A and 33, and as recommended and approved by the Geotechnical Engineer. Costs for such inspection and tests shall be paid by the Owner. The Contractor shall be responsible for notifying the Geotechnical Engineer in advance so that he may be present to perform his services as needed.

2. The Geotechnical Engineer shall also make an investigation of the fill material to establish the ability of the soil to sustain the vertical loads to be imposed on the fill by the proposed structure, and to confirm the expansion and other specified characteristics of the fill material.

3. The Geotechnical Engineer shall submit compaction reports to the Architect, Structural Engineer and the Civil Engineer at the completion of the Work, including test results and plot plans indicating the locations from which the tested samples of fill were taken. The Geotechnical Engineer shall keep the Architect and Civil Engineer informed of the progress of the grading work.

1.5 SITE CONDITIONS

A. Protection:

1. Protect adjacent property as required to prevent caving and sloughing of material onto adjacent property.

2. Utility lines and structures shown shall be protected, relocated and treated as indicated. Where utilities not shown are encountered, report it to the Architect

before proceeding with excavation. Remove inactive lines as directed, and plug the remaining ends. The Contractor shall bear the cost for all repairs to damaged utilities.

B. Environmental Requirements: Contractor must comply with all requirements of the applicable County of Los Angeles and the City of Inglewood dust control ordinances. Comply with applicable sections of the Storm Water Pollution Prevention Plan, including but not limited to erosion control, material stockpiling, vehicle parking and maintenance areas.

1. Construction operations and maintenance of equipment shall be performed only during the time period(s) and days allowed by local ordinance or government agency having jurisdiction.

2. Earthwork operations shall be scheduled to complete the Work as quickly as possible to reduce the noise, dust and air pollution impacts.

PART 2 - PRODUCTS

2.1 FILL MATERIAL

A. Additional earth material required to complete the work shall be provided by the Contractor at his expense, and included in his original contract bid for such work.

B. All earth imported products to the site shall meet or exceed United States Environmental Protection Agency (US EPA), Department of Toxic Substances (if applicable), and State of California regulations for clean fill. Proof of compliance is the responsibility of the Contractor.

C. All imported material shall be approved by the Geotechnical Engineer prior to hauling on site. Contractor shall deliver samples to testing lab, labeled with location, project name, and date.

D. Imported earth shall be of granular nature with sufficient binder to form a firm, stable, unyielding subgrade. Adobe or clay soils will not be acceptable. Earth imported shall be relatively non-expansive with an expansion index of less than 20, be clean and free from rubbish and debris and rock larger than 3 inches in maximum dimensions, not have sulfate content greater than 1,000 parts per million, and be subject to the approval of the Geotechnical Engineer. Imported fill material shall have an electrical resistivity exceeding 3,000 ohm cm. when saturated with distilled water, measured in accordance with the minimum resistivity procedure of California Test 643 or the soil resistivity box procedure shown in ASTM G57-06. Imported material to be used in areas to receive planting shall be approved by the Landscape Consultant of such quality as to support plant life.

E. Bedding and backfill material for storm drain and utility lines shall be imported clean sand with a sand equivalent of at least 30 (California Test Method #217), and shall be placed in a minimum thickness of 6 inches for bedding and backfilled to 12 inches above

the top of pipe.

2.2 SPECIAL REQUIREMENTS

A. If imported soils are used within the upper 12 inches of areas to be planted, these soils shall conform to the requirements for planting soils as specified herein. Otherwise the upper 12 inches of all areas to be planted in the future shall consist of material obtained from the upper 12 inches of existing on-site soils.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect adjacent property and existing improvements and structures as necessary to prevent undermining, caving of cuts, and miscellaneous damage.

B. Provide cribbing, sheeting, and shoring necessary to safely retain the earth banks and protect excavations and adjoining grades from caving and other damage resulting from excavating together with suitable forms of protection against bodily injury to personnel employed on the work and the general public. Be responsible for the design, installation, and maintenance of required cribbing and shoring and same shall meet the approval of the State Division of Industrial Safety and local governing agencies requirements.

C. Utility lines and structures shown shall be protected and treated as indicated. Where work not shown is encountered, report it to the Architect before proceeding with excavation. Encase active lines in sleeves where they pass through concrete; remove inactive lines as directed, and plug the remaining ends. Bear the costs for repairs to damaged or broken utilities and any damages related thereto.

D. An on-site, Pre-grading Meeting with the Architect, the General Contractor, and Geotechnical Engineer, Civil Engineer, Inspector and the Utility Line and Earthwork Subcontractor(s) is required prior to all grading related operations. The Pre-Job Conference will immediately follow the Pre-Construction Conference. Attendance is mandatory. City Inspection representatives and Utility Company representatives may also attend.

E. Protect existing improvements and adjacent properties from storm damage and flood hazard originating on this project until final acceptance by the Owner. Prevent silt run-off from the limits of work in accordance with governmental requirements.

F. A 6 foot high, temporary chain link fence and gates, (pair 26' wide, minimum) shall be erected prior to any grading operations at the construction limits perimeter. Coordinate the exact location with Architect and Inspector.

3.2 EXCAVATION

A. Strip vegetation in accordance with Section 31 10 00 - Site Clearing. This material shall be disposed off site in a legal manner. All non-hazardous materials shall be composted,

if possible. Contractor shall provide certification of composting location.

B. Over Excavate unsuitable materials per the project geotechnical report, including compressible alluvium, expansive clay, organic material, contaminated soils, or other unsuitable materials a minimum of 3-feet below the bottom of proposed foundations and 5-feet below existing grade (whichever is deeper). Any remaining dry, loose or soft materials should also be removed until a stable, unyielding condition under equipment loads is achieved. After making the recommended removals and prior to fill placement, the exposed ground surface shall be scarified to a depth of approximately 8 inches, brought to slightly above optimum moisture content, and compacted to at least 95% of the maximum dry density obtainable by the ASTM D1557-12 Standard Test Methods of Laboratory Compaction Characteristics of Soil Using Modified Effort. Surfaces on which fill is to be placed which are steeper than 5:1 (horizontal to vertical) should be benched so that the fill placement occurs on relatively level ground.

The observed on-site surface soils contain turf and organic rich top soils. These surface soils are not considered suitable for foundation, floor slab or pavement support, and cannot be placed underneath hardscape or building structures. On-site soil materials need separated and processed, be free of vegetation, shrubs, debris and rocks larger than 3-inches, prior to be placed as compacted fill in structural areas. On-site clayey soils with an expansion index greater than 20 shall not be re-used for compaction within 3-feet of proposed foundations. If these materials are located within 3 feet of the bottom of foundations, floor slabs or other concrete walks or slabs, or within 18 inches of paving base course, they shall be removed and replaced with non-expansive compacted fill soils. The over-excavated area shall extend horizontally at least the depth of overexcavation or 5-feet beyond the building perimeter. The replacement fill material may consist of on-site or imported non-expansive soil with an Expansion Index of less than 20.

C. Based on the proposed Grading Plans, a cut/fill transition will cross the building and pool pad area. Over-excavation of the building and pool pad area shall be performed to allow placement of at least 4 feet of non-expansive compacted fill beneath all foundations or slabs to 10 feet beyond the building area.

The building area is defined as outside face of any structure (i.e. wall, column, post) supporting or attached to overhead framing or roof structure, including masonry site walls over 5 feet high.

D. Excavate to the depths, lines and grades indicated. Excavate sufficiently over-size to permit installation and removal of concrete forms and other required work.

Should soil of inadequate density and bearing capability be encountered at the elevations indicated on the drawings, or where new fill is to be placed upon existing loose fill material exposed by excavation, the excavation shall be carried to the depth required to attain soil of bearing quality as determined by the Geotechnical Engineer.

E. Footing pads, if poured neatly, may be excavated to the net pad widths plus two-inches if approved by the Architect. Approval shall not be given until the completed excavation has been inspected.

F. Should footing excavations exceed required dimensions or should sloughing occur, fill such extra space with concrete at no additional cost to the contract. If unsuitable material is found at the indicated depths, immediately notify the Architect.

G. Notify the Inspector 48 hours before foundation excavations are ready for inspection.

H. The bottoms of footings shall be free of loose material, debris, and water before concrete is placed.

I. Cut banks shall be neatly trimmed to the required finish surface as the cut progresses, or the Contractor shall have the option of leaving the cuts full and finish grading by mechanical equipment which shall produce the finish surfaces as shown on the Drawings.

J. Surplus earth not needed for filling and grading shall be disposed of in a legal manner off the site.

3.3 FILLING

A. Fill material shall be placed in horizontal lifts not to exceed 8-inches in depth. Backfill placed in narrow restricted areas, such as along utility trenches, shall also be placed in 8-inch maximum thick lifts. All fill material shall be free of rocks larger than 3 inches in maximum dimensions. Each layer shall be brought to slightly over optimum moisture content and, while still moist, shall be compacted by rolling and tamping. The rolling and/or tamping of each layer shall continue until the density thereof is not less than 95% of the maximum density obtainable using the ASTM D1557-12.

B. Where fills are placed on existing slopes exceeding a slope of five horizontal to one vertical, the slopes shall be benched in accordance with the Geotechnical Engineer's requirements and local governing public agencies' requirements and compacted as herein specified before placing fill material on same so that fills shall be placed in horizontal layers as specified. Widths of benches shall be as directed by the Geotechnical Engineer.

C. Rock encountered in the excavation on this site may, at the option of the Contractor, be broken up into pieces not larger than 3 inches in maximum dimension and be incorporated in the fill material if spread as directed by the Geotechnical Engineer. Otherwise, rocks larger than 3 inches in maximum dimension shall be removed from the site. Rocks and stones larger than 1 inch in maximum dimension will not be permitted within the top 12 inches of finished grade in non-paved areas. Contractor is responsible for examining geotechnical report to determine if rock or hard digging will be encountered and make provisions in the bid for removal of such materials. No additional payment will be made for rock removal or hard digging.

D. Fill banks shall be graded full and compacted beyond the grade of the finish bank. After the banks have been filled, they shall be trimmed to the finish grades and limits shown on the Drawings. Slopes shall be inclined no steeper than 2:1 (horizontal to vertical).

E. Imported fill soils shall have an Expansion Index of less than 50 based on ASTM D4829, and an R-Value of at least 65 for pavement areas.

The top 12 inches of the pavement subgrade shall be compacted to at least 95% of maximum dry density as determined by ASTM D1557-12.

F. Retaining walls shall be backfilled with soil having an Expansive Index of 20 or less. The backfill area shall include the zone defined by a 1:1 sloping plane, back from the base of the wall. Retaining wall backfill should be compacted to at least 90% relative compaction based on ASTM D1557-12. Backfill should not be placed until walls have achieved adequate structural strength. Heavy compaction equipment which could cause distress to walls should not be used.

3.4 GRADING

A. The entire area within the limits of grading as indicated on the Drawings shall be constructed to the lines, grades, elevations, slopes, and cross sections indicated on the Drawings. When the grading has been completed, the areas shall be rolled smooth with a steel tandem roller or equal. Should any low spots develop during the rolling operation, such spots shall be filled and rerolled smooth. Slopes, banks, and drainage depressions shall present a neat, uniform appearance on completion of the work. Provide temporary access roadways as needed during construction.

B. It shall be the Contractor's full responsibility to take all measures necessary during grading to protect slope areas, both cut and fill, and adjacent properties from storm damage and flood hazard originating on this project until final acceptance by the Owner. It shall be the Contractor's responsibility to maintain completed slopes until all slopes are in satisfactory compliance with the job specifications.

3.5 COMPACTION

A. All fills shall be compacted to at least 90 percent of maximum density obtainable using the ASTM D1557-12. Areas which are scarified shall be recompacted to these same requirements. The soil within the upper 12 inches of pavement subgrade should be compacted to at least 90% relative compaction based on ASTM D1557-12.

B. Compaction by flooding is expressly prohibited.

3.6 CRIBBING AND SHORING

A. Provide cribbing, sheeting, and shoring necessary to safely retain the earth banks and protect excavations and adjoining grades from caving and other damage resulting from excavating, together with suitable forms of protection against bodily injury to personnel employed on the work and the general public.

The responsibility for the design, installation, and maintenance of required cribbing and shoring shall be entirely that of the Contractor and shall be in accordance with the current requirements of CAL-OSHA, the Industrial Accident Commission of the State of California, and all other public agencies having jurisdiction.

3.7 DUST CONTROL

A. During grading operations, water shall be applied to the surfaces in the working area at frequent intervals and in sufficient quantities to lay the dust and for proper compaction. No other method will be permitted.

3.8 GRADING TOLERANCES AND SUBGRADE PROVISIONS

A. Rough grading shall consist of grading to the finish grade elevations indicated on the grading plans, including, but not limited to, excavation, scarification, filling, compacting, importing, exporting, preparation of sub-grades, building pads, slopes, berms, ramps, etc. Rough grading shall also include grading to and providing the finished subgrade surface for all asphalt and cement concrete areas, building, ramps, gutters, etc. Rough grading shall be performed within a tolerance of 1/10 of a foot of the elevations indicated on the Drawings (including subgrade elevations) however, this is not to be construed as being permissible to leave the entire area 1/10 of a foot consistently high or low by that amount.

3.9 CLEANING

A. Upon completion of work in this Section, remove rubbish, trash, and debris resulting from operations. Remove unused equipment and implements of service, and leave entire area involved in a neat, clean, and acceptable condition.

END OF SECTION 312000

SECTION 312219 - FINISH GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide materials, labor and equipment necessary for the completion of finish grading as indicated on the Drawings and specified herein.

B. Related Sections:

1. Earthwork, Section 31 20 00.

2. Trenching, Backfill and Compacting, Section 31 23 34, for Storm Drains and Utilities.

3. Planting, Section 32 90 00

PART 2 - PRODUCTS

2.1 MATERIALS

A. Refer to Section 31 20 00 – Earthwork, for material for fill and planting areas, also Section 32 90 00.

PART 3 - EXECUTION

3.1 PREPARATION FOR FINISH GRADING

A. The entire area within the limits of grading as indicated on the Drawings shall be constructed to the lines, grades, elevations, slopes, and cross sections indicated on the Drawings. When the grading has been completed, the areas shall be rolled smooth with a steel tandem roller or equal.

Should low spots develop during the rolling operation, such spots shall be filled and re-rolled smooth. Slopes, banks, and drainage depressions shall present a neat, uniform appearance on completion of the work.

B. Fine grade to bring areas to required lines and grades. The subgrade elevation within the building area for slabs on grade (without a base course) shall be within 0.50- inch along a 10 foot straight edge.

C. Slope finish grades to drain surface water away from buildings, walks, paving, and other structures. Generally, grade with uniform slope between points where elevations are given, or between such points and existing grades. Excavate and grade swales to provide drainage away from and around buildings.

D. Areas to Receive Paving or Surfacing: Review plans and details for each area. See plans for paving and base course thickness. Review Drawings for sitework details.

E. Areas to Receive Topsoil and/or Planting: Where not otherwise indicated, areas outside of buildings shall be given uniform slopes between points for which finish grades are shown, or between such points and existing established grade, except that vertical curves or roundings shall be provided at abrupt changes in slope.

F. Rocks or cobbles larger than 1 inch in diameter shall not be placed in the upper 12-inches of planting area fill, and rocks or cobbles larger than 3/4-inch shall not appear on the finish graded surface.

G. Surplus or Imported Material:

1. Surplus material not needed for filling shall be removed from the site in a legal manner.

2. Provide additional earth material per Section 31 20 00, Earth Moving.

H. Preparation for Fills:

1. Prior to placing fills, the existing surface shall be scarified and recompacted to at least 95 percent maximum dry density per the ASTM D1557-12 procedure.

3.2 FIELD QUALITY CONTROL

A. Compaction of soils performed on this project shall be at least 90 percent of the maximum dry density per the ASTM D1557-09 procedure. New turf and planted areas shall be compacted to 85 percent. Aggregate bases shall be compacted to 95 percent.

B. All layout shall be performed by a qualified licensed civil engineer or surveyor.

END OF SECTION 312219

SECTION 31 2334 - TRENCHING, BACKFILLING, AND COMPACTING

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Excavation for underground services in project area.

B. Backfilling and compacting for utilities to point of connection.

C. Cap off and seal discontinued utility services and remove from site portions of lines within trench excavated areas.

D. Place and compact granular beds and fills over services, to rough grade elevations.

E. Dewater excavations as required.

1.2 RELATED REQUIREMENTS

A.	Section 31 10 00	Site Clearing
B.	Section 31 20 00	Earthwork
C.	Section 33 40 00	Storm Drainage
D.	Section 33 46 00	Subdrainage
E.	Geotechnical Report	

1.3 SITE COMPACTION TESTING

A. Testing of compacted fill materials will be performed by an independent testing laboratory appointed by the Owner and paid for by the Contractor. Testing will be performed so as to least encumber the performance of work.

B. Pay for costs of additional testing as required due to improper performance of work is the responsibility of the Contractor.

C. When work of this section or portions of work are completed, notify the testing laboratory to perform density tests. Do not proceed with additional portions of work until results have been verified.

D. If, during progress of work, tests indicate that compacted materials do not meet specified requirements, remove defective work, replace and retest at no cost to the Owner.

E. Ensure compacted fills are tested before proceeding with placement of surface materials.

F. Perform work in accordance with the Geotechnical Report prepared by the Geotechnical Engineer.

G. CAL-OSHA Requirements, including all applicable portions of Title 8 and the California Labor Code.

1.4 PROTECTION

A. Protect trees, shrubs and lawn, areas to receive planting, rock outcropping and other features remaining as part of final landscaping.

B. Protect bench marks and existing structures, fences, roads, sidewalks, paving and curbs against damage from vehicular or foot traffic. Install and maintain proper bridging or retaining against adjacent structures.

C. Protect excavations by shoring, bracing, sheet piling underpinning, or by other methods, to prevent cave-ins or loose dirt from falling into excavations.

D. Underpin or otherwise support adjacent structure(s) which may be damaged by excavation work. This includes service lines and pipe chases.

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PART 2 – PRODUCTS

2.1 BED AND FILL MATERIALS

A. Gravel: Angular pit run crushed natural stone; free from shale, clay, friable materials and debris; graded within the following limits:

Sieve Size	% Passing
2"	100
1"	95
3/4"	95 to 100
5/8"	75 to 100
3/8"	55 to 85
#4	35 to 60
#16	14 to 35
#40	10 to 25
#100	5 to 10

B. Controlled Density Fill: 28-day compressive strength of 1,000 psi or less.

C. Sand: Clean natural river or bank sand; free from silt, clay, loam, friable or soluble materials, and organic matter; graded within the following limits:

Sieve Size	% Passing
#4	100
#14	10 to 100
#48	5 to 90
#100	5 to 20
#200	0

D. Sub-soil: Free from roots, rock larger than 2" in size and building debris.

E. Fill Under Landscaped Areas: Free from alkali, salt, and petroleum products. Use sub-soil excavated from site only if conforming to specified requirements.

F. Pea gravel shall not be used for fill or backfill.

G. Fill Materials shall conform to the specifications above and to those specifications stated in the Geotechnical Report.

PART 3 – EXECUTION

3.1 PREPARATION AND LAYOUT

A. Establish extent of excavation by area and elevation. Designate and identify datum elevation.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

D. Set required lines and levels.

E. Maintain bench marks, monuments and other reference points.

3.2 UTILITIES

A. Before starting excavation, establish the location and extent of underground utilities occurring in the work area.

B. Notify utility companies to remove and relocate lines which are in the way of excavation.

C. Maintain, re-route or extend as required, existing utility lines to remain which pass through the work area. Pay costs for this work, except those covered by the utility companies.

D. Protect active utility services uncovered by excavation.

E. Remove abandoned utility service lines from areas of excavation. Cap, plug or seal such lines and identify at grade.

F. Accurately locate and record abandoned and active utility lines re-routed or extended, on Project As-Built Drawings.

3.3 TRENCHING

A. Excavate for cast-in-place structures and associated forms or framing, reinforced concrete pipe Ensure trenching does not interfere with normal 45degree bearing splay of any foundation or structure.

B. Excavate in accordance with lines and grades.

C. Cut trenches sufficiently wide to enable proper installation of forming and /or framing and to allow for inspection. Trim and shape trench bottoms and leave free of irregularities, lumps and projections.

D. Do not disturb soil within branch spread of existing trees or shrubs that are to remain. If it is necessary to excavate through roots, perform work by hand and cut roots with a sharp axe.

E. When complete, request the Engineer to inspect excavations. Correct unauthorized excavation as directed, at no cost to the Owner.

F. Stockpile excavated sub-soil for re-use where directed. Remove excess or unsuitable excavated sub-soil from site.

3.4 DEWATERING

A. Keep trenches dry. Provide necessary equipment including pumps, piping and temporary drains.

B. Direct surface drainage away from excavated areas.

C. Control the grading in and adjacent to excavations to prevent water running into excavated areas or onto adjacent properties or public thoroughfares.

D. Furnish and operate suitable pumps on a 24-hour basis to keep excavations free of water until structures have been placed and backfilling is completed.

3.5 BACKFILLING

A. Do not start backfilling until utilities have been inspected.

B. Ensure trenches are free of building debris, mud or soggy condition, snow, ice, and water and that ground surfaces are not in a frozen condition.

C. Backfill systematically and as early as possible to allow maximum time for natural settlement and compaction.

D. Place and compact fill materials in continuous layers not exceeding 6" loose depth. Use a method so as not to disturb or damage services.

E. Maintain optimum moisture content of fill materials so as to attain required compaction density.

F. Minimum degree of compaction shall be a percentage of maximum dry density as determined by ASTM D1557-78. Field tests shall conform to ASTM D1556-82 or ASTM D2922-81 and D3017-78.

G. Fill compaction shall be in accordance with the Geotechnical Report.

H. If sand or gravel or pea gravel is used, place to within 2 feet of sub-grade elevations, compacted to 90% of maximum dry density. Fill remainder of trenches with sub-soil compacted per paragraph above.

I. Remove surplus fill materials from site as directed by Architect/Engineer.

3.6 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Utility Piping and Conduits:
1. Bedding: Use clean sands in accordance with Greenbook requirements to a depth of at least 1 foot over the pipe.
2. Cover with general fill.
3. Fill up to subgrade elevation.
4. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

C. Over Subdrainage Piping at Foundation Perimeter and Under Slabs:
1. Drainage fill and geotextile fabric: Section 334600
2. Cover drainage fill with general fill.
3. Fill up to subgrade elevation.
4. Compact to 90 percent of maximum dry density.

END OF SECTION 31 2334

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SECTION 32 11 13 - AGGREGATE BASE

PART 1 - GENERAL

1.1 SECTION INCLUDES

Placing and compacting aggregate base.

1.2 RELATED REQUIREMENTS:

A.	Section 31 20 00	Earthwork
B.	Section 32 12 16	Hot-Mix Asphalt Paving

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced.

A. State of California, Department of Transportation (Caltrans) Standard Specifications Section 26, "Aggregate Base." Article 26-1.06, "Measurement" and Article 26-1.07, "Payment" shall not apply.

B. D57 Standard Test Method for Laboratory Compaction Characteristics of Soil using Modified Effort (56,000 ft-lb/cu. ft.)

1.4 SUBMITTALS

A. Field density tests, sampling and testing reports.

B. Copies of waybills and delivery tickets shall be submitted during the progress of the work. Before the final payment is allowed, the contractor shall file certified waybills and certified delivery tickets for all aggregates actually used.

C. Aggregate Composition Test Reports: Results of laboratory tests on proposed and materials used.

D. Compaction Density Test Reports

1.5 DEFINITIONS

A. Degree of Compaction: Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM 1557. The compaction required will be abbreviated hereinafter as a percentage of laboratory maximum density.

1.6 STOCKPILING MATERIALS

1. Separate differing materials with dividers or stockpile separately to prevent intermixing

2. Prevent contamination.

3. Protect stockpiles from erosion and deterioration of materials.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials for Aggregate Base shall conform to Caltrans Standard Specifications, Section 26-1.02A, "Class 2 Aggregate Base" – ¾ inch maximum gradation.

B. Aggregate Base.

1. Quality Requirements. - Aggregate base shall be clean and free from vegetable matter and other deleterious substances, and shall be of such nature that it can be compacted readily under watering and rolling to form a firm, stable base.

2. Aggregate base shall conform to the quality requirements as specified in Table I for classes indicated. Aggregate base shall have a maximum percentage of wear of 50 as determined by California Test 211, and a minimum Durability Index of 25 as determined by California Test 229 (see Note (c)).

Table 1						
Quality Requirements						
R- Value		Sand Equivalent			Crushed Particles %	
Calif. Test 301		Calif. Test 217			Calif. Test 205	
Operating		Indiv.	Operating	Indiv.	Operating	Indiv.
Class	Range	Test	Range	Test	Range	Test
1	-	78	50	45	(a)90	(a)87
2	-	78	30	28(d)	(b)25	(b)23
3	70	68	25	23		

a. Percent by weight.

b. Material retained on the No.4 USA Standard sieve shall consist of material of which at least 25 percent, by weight, shall be crushed particles.

3. Gradation: The percentage composition of aggregate base shall conform to the gradations as shown in Table 2 for the maximum size as specified on the plans or special provisions, when determined by California Test 202. When there is a difference in specific gravity of 0.2 or more, between the coarse and fine portion of the aggregate or blends of different aggregate, California Test 202 will be modified by California Test 905.

Table 2						
USA Std. Sieve Size	Percentage Passing Sieves					
	1-1/2" Max.		1" Max.		3/4" Max.	
	Operating Range	Indiv. Test	Operating Range	Indiv. Test	Operating Range	Indiv. Test
2"	100	100	----			
1-1/2"	90-100	88-100	100			
1"	----	---	85-100	88-100	100	100
3/4"	50- 85	48- 88	60- 90	58- 93	90-100	88-100
No.4	25- 45	23- 47	30- 50	28- 53	35- 55	33- 57
No. 30	10- 25	8- 28	10- 28	8- 30	10- 30	8- 32
No. 200	2- 9	1- 10	2- 9	1- 10	3- 9	1- 10

C. Herbicide

2.2 SOURCE QUALITY CONTROL

1. Where aggregate materials are specified using ASTM D2487 classification, testing or samples for compliance will be provided before delivery to site.
2. If tests indicate materials do not meet specified requirements, change material and retest.
3. Provide materials of each type from same source through the work.

2.3 SUBGRADE

A. Subgrade preparation shall be as specified in Section 31 2000 of these Specifications.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. When the base is constructed in more than one layer, the previously constructed layer shall be cleaned of loose and foreign matter by sweeping with power sweepers or power brooms, except that hand brooms may be used in areas where power cleaning is not practicable. Adequate drainage shall be provided during the entire period of construction to prevent water from collecting or standing on the working area. Line and grade stakes shall be provided as necessary for control. Grade stakes shall be in lines parallel to the centerline of the area under construction and suitably spaced for string lining.

3.2 PREPARATION OF UNDERLYING COURSE

A. General Requirements:

1. Before placing base course, the previously constructed underlying course shall be cleaned of foreign substances. The surface of underlying course shall meet the specified compaction and surface tolerances. Subgrade shall conform to Section 31 2000-Earthwork. Ruts or soft, yielding spots that may appear in the underlying course and areas having inadequate compaction shall be removed and replaced with suitable material or mechanically stabilized with aggregate prior to

placement of the base course. Stabilization may be accomplished by mixing base course material into the underlying course and compacting by approved methods. Properly compacted material will be considered as part of the underlying course and shall meet all requirements for the underlying course. Finished underlying course shall not be disturbed by traffic or other operations and shall be maintained in a satisfactory condition until base course is placed.

2. Vertical tolerance for aggregate base placed under asphalt concrete and Portland cement concrete pavement shall be within 0.03 feet of the elevations shown on the plans and as staked per direction from the Engineer.

B. General:

1. Fill materials are subject to approval by the Geotechnical Engineer for the particular location and method of placing and compacting.
2. Material excavated on-site may be used as fills, with prior Geotechnical Engineer inspection and approval.

C. Grade Control:

1. Underlying material shall be excavated to sufficient depth for the required base course thickness so that the finished base course with the subsequent surface course will meet the fixed grade. Finished and completed area shall conform to the lines, grades, cross section, and dimensions indicated.

3.3 INSTALLATION

A. Work for placing aggregate base course material shall comply with Caltrans Standard Specifications, Section 26, Article 26-1.04, and Spreading.

B. The finished grade of aggregate base, where not controlled by adjacent structures or features shall not exceed 0.05 foot above or below the planned grade, provided it is uniform and free from sharp breaks. The cross-section of the finished base shall be free from ridges or valleys and be within 0.05 foot above or below the theoretical section shown on the plans at any point on the cross-section. Surfaces will be tested by a 16-foot straight edge applied parallel with and at right angles to the roadway type and in a condition approved by the Engineer. Segmented or sheeps foot compactors will not be allowed.

C. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

D. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

E. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

F. Apply herbicide per manufacturer requirements.

3.4 TESTING

A. Testing will be performed by an approved independent commercial testing laboratory retained by the Contractor. Field in-place density testing shall be performed in accordance with ASTM D1557.

3.5 FIELD QUALITY CONTROL

A. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556.
B. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 (“modified proctor”).
C. If tests indicated work does not meet specified requirements, remove work, replace and retest.
D. Proof roll compacted aggregate at surfaces that will be under slabs-on-grade.

3.6 MAINTENANCE

A. The aggregate base course shall be maintained in a satisfactory condition until accepted. Maintenance shall include immediate repairs to any defects and shall be repeated as often as necessary to keep the area intact.

3.7 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile are to prevent standing surface water.
B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION 32 1123

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SECTION 32 12 16 - ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Asphaltic concrete paving as indicated on the Drawings and specified herein.

B. Principal items of Work:

1. Preparation of subgrade
2. Soil sterilization
3. Aggregate base course
4. Asphaltic surfacing materials
5. Mixing asphaltic concrete material
6. Placing asphaltic concrete pavement
7. Flood test

C. Related Sections:

1. Earth subgrade preparation for asphaltic paving: Section 31 20 00 Earthwork.

2. Sanitary Sewer and Storm Drainage Piping, Section 334100.

1.2 PERFORMANCE REQUIREMENTS

A. Establishment of Grades:

1. The Contractor shall be responsible for finished elevation grade stakes and other surveying necessary for the layout of the Work.

2. Conduct operations in such a manner that the survey stakes shall be protected as long as their need exists. Be responsible for replacement of stakes.

3. Areas having drainage gradients of 2% 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.

4. 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.

1.3 SUBMITTALS:

A. Provide the following:

1. Material Compliance Data Specifications.
2. Material Safety Data Specifications.
3. Copy of Installer's license.
4. Sterilization application data and purchase receipt.
5. Sample of aggregate for testing, if requested by engineer.
6. Data Sheets for seal coat and paint.

1.4 QUALITY CONTROL SUBMITTALS

A. Testing and Control of Materials:

1. Material shall meet the requirements specified herein. Laboratory tests of all of the materials will be required. If such tests meet the specified requirements, the laboratory test fees shall be paid by the Owner. If cost of subsequent tests fail to meet specified requirements, the costs of such tests shall be paid by the Contractor, and the Contractor shall immediately rectify the deficiency.

2. The Owner's inspector shall test the temperature of each batch of asphaltic concrete prior to placement. If asphaltic concrete temperature is not within tolerances as set forth in this Section of the Specifications the affected batch shall be rejected. Any and all costs due to the rejected asphaltic concrete shall be the responsibility of the paving contractor.

1.5 PROJECT SITE CONDITIONS

A. Protect existing installations: Such installations, which are shown on the plan or whose location could be reasonably inferred and which become damaged or broken by the operations, shall be repaired or replaced at no cost to Owner.

PART 2 - MATERIALS

2.1 MATERIALS

A. Soil Sterilization: The soils sterilant shall be in accordance with current EPA acceptable standard and the California Department of Pesticide Regulations for soils sterilant. Sterilant shall be selected as appropriate for the environment in which is it to be placed. Contractor shall be licensed with the State of California to apply sterilant.

1. Sterilant shall be commercial grade for commercial application. Contractor may obtain a list of acceptable sterilants from the District prior to bidding project.

B. Base and Aggregate Base:

1. Base and Aggregate base shall conform to the State of California, Department of

Transportation (CALTRANS) Standard Specifications, Current Edition. All base, whether called out as aggregate base or base shall be in conformance with CALTRANS Section 26 for Class 2 Aggregate Base, 3/4-inch maximum. The maximum percentage of recycled material allowable shall not exceed 50% of the total volume of aggregate used.

2. Base and Aggregate Base shall be provided by a licensed commercial materials supplier. Certifications shall be submitted with each submittal. Use of on-site asphalt materials in aggregate base or base is strictly prohibited. The use of Crushed Miscellaneous Base is strictly prohibited.

3. Base depth shall be in accordance with plans and specifications. If no depth is specified, the minimum depth shall be 4".

C. Asphalt Concrete: Shall be produced by a commercial asphalt paving plant. Mineral aggregate and asphalt concrete production shall be in compliance with the State of California, Department of Transportation (CALTRANS) Standard Specifications, Current Edition.

1. Paving asphalt shall be per CALTRANS Section 39 Hot Mix Asphalt.

2. All on site paving shall be PG-64, ½" maximum Medium Grade asphalt per CALTRANS, Section 92, unless otherwise specified by the geotechnical engineer.

D. Asphalt Sealer: Sealer shall be LAS-320 by Enviroseal Corporation, 800-775-9474, or equal. Sealer cannot be installed for a minimum of 30 to 45 days after asphalt has been completed. Contractor shall account for this in his schedule. If asphalt must be striped prior to sealer, contractor shall account for sealer application and a subsequent restripe of any striping obscured by sealer.

E. All stripes and markings shall be painted with two (2) coats of pavement parking paint, v.o.c. compliant, lead free, base acrylic copolymer TSP, TT-P-115F, Type I and TT-P-85E for parking lots (yellow and white); and regular dry waterborne traffic paint (red, yellow and blue), TT-P-1952B for curbs, fire lanes, accessible striping, etc. Paint curb red at fire lanes - refer to the Fire Access Site Plan. Asphaltic concrete seal coat shall be in place a minimum of 10 days before applying paint.

1. Apply parking stall lines as indicated on the Drawings. Parking stall lines shall be 3 inches wide and white in color. Edges shall be clean and sharp.

2. Accessible Parking Stalls: Parking Spaces for persons with disabilities to be marked according to CBC Sections 11B-208, and 11B-502.

3. Loading and unloading access aisle shall be marked by a border painted blue. Within the blue border, hatched lines a maximum of 36" on center shall be painted white to contrast with the parking surface. CBC Figures 11B-502.2, 11B-502.3, 11B-502.3.3, and 11B-503.3, Blue color shall conform to Color No. 15092 per Federal Standard 595C. Paint to be slip resistant and provide a

minimum 0.6 static coefficient of friction. Refer to drawings for width of painted lines and markings on pavement (3" minimum).

F. Application of Tack Coat

1. Apply tack coat at a rate of 0.05 to 0.15 gallon per square foot to cleaned contact surfaces of previously placed asphaltic concrete, abutting or projecting into asphaltic concrete paving and face of concrete curbs and walks. Protect exposed concrete.

G. Detectable Warning Area Tile: Terra Paving, ADA-3 Truncated Domes, 12 inch by 12 inch, or Armor-Tile, truncated vitrified polymer dome tiles, as distributed by White-Cap Construction Supply, CBC, 2022 Title 24, Part 2, Section 11B-705.1.2.5

1. Detectable warning surfaces shall comply with CBC,2022 , Title 24, Part 2, Section 11B-705.1
2. Detectable warning surfaces at transit boarding platform edges, bus stops, hazardous vehicular areas, reflecting pools, and track crossings shall be yellow and approximate FS 33538 of Federal Standard 595C. Detectable warning surfaces at other locations shall be either the aforementioned yellow or a color providing a 70 percent minimum visual contrast with that of the adjacent surface. CBC Section 11B-705.1.1.3.
3. Detectable warning surfaces shall differ from adjoining surfaces in resiliency or sound-on-cane contact. Such contact shall not be required for detectable warning surfaces at curb ramps, islands, or cut-through medians. CBC Section 11B-705.1.1.4.
4. Provide a minimum 5-year warranty per DSA Bulletin 10/31/02, revised 04/09/08.
5. Detectable warning surfaces shall be:

    a. Square grid, in-line pattern:

    b. Diameter of nominal 0.9 inch (22.9mm) at base tapering to 0.45 inch (11.4) at top.

    c. Nominal height of 0.2 (5.08 mm) inch.

    d. Nominal center to center spacing of 2.35 (59.7 mm).

    e. Color "yellow" conforming to Federal Color No. 33538 per Standard No. 595B. CBC Sections 11B-705.1.2.5 and 11B-810.5.2.

2. Provide a written five (5) year product warranty provided by the manufacturer of detectable warnings and directional surface products as equivalent to the evaluation and product approval program. Such warranty shall indicate compliance with architectural standards as published in the current edition of the California Building Standards Code, and also include durability criteria which indicates that the shape, color fastness, confirmation, sound-on-cane acoustic quality, resilience, and attachment will not degrade significantly for at least five

(5) years after initial installation. Warranty will certify that the produce will not degrade significantly, meaning that the product maintains at least 90 percent of its approved design characteristics, as determined by the enforcing agency.

H. Concrete Wheel Stops

1. Provide concrete wheel stops by San Diego Precast, or equal. Concrete shall be 4000 psi in 28 days. Provide two be galvanized dowels as anchorage, and glue wheel stop to asphalt surface. Dowels shall be hot dipped galvanized, 16-inch long, #4 reinforcing. Recess head of dowel beneath the top of the wheel stop. Wheel Stop shall be a minimum length of 6-feet.

PART 3 - EXECUTION

3.1 FINAL PREPARATION OF SUBGRADE

A. Immediately prior to placing base or aggregate base, the subgrade shall be scarified to a depth of at least 12 inches, moistened, and the entire area thoroughly compacted by rolling to obtain a smooth, hard, even surface of 95 percent compaction at bus drop off and fire lane and 90 percent compaction elsewhere to receive the base or aggregate base. The subgrade shall be finished to the required grades with due allowance being made for the thickness of base course and finished surfacing to be placed thereon.

B. Subgrade for the pavement structures shall not vary more than $\pm$ 0.04 feet from the specified grade and cross section.

C. Areas inaccessible to power rolling or areas that cannot be compacted properly with power rollers shall be compacted with vibrating compactors or other suitable mechanical means which shall produce a firm foundation for the paving structure.

3.2 SOIL STERILIZATION

A. The Contractor shall take whatever precautions are necessary to prevent contamination of adjacent soil areas with sterilant and for the protection of personnel. Sterilant shall not be applied within two feet of planting areas.

B. Certification shall be furnished to the Architect, showing the purchase receipt and rate of application of the material. Payment for soil sterilization will include full compensation for application and all materials and incidental work required.

3.3 AGGREGATE BASE OR BASE

A. The base material shall be placed upon the finished subgrade after the subgrade has been properly prepared as herein specified. The base shall be placed in accordance with CALTRANS, Section 26 and section 32 11 13 – Aggregate Base.

3.4 DEFINITIONS

A. For the purpose of compacting procedures the following definitions are used:

1. Initial or Breakdown Rolling: The first coverage of a roller on asphalt concrete after the material has been placed to line and grade.

2. Intermediate Rolling: The rolling performed immediately after the initial rolling. When completed, the pavement should meet job density requirements.

3. Compaction Rolling: Including initial and intermediate rolling.

4. Finish Rolling: The final rolling necessary to obtain the desired surface texture and eliminate roller marks. No further densification is anticipated in this operation.

5. Coverage: The number of movements of a roller required to cover the entire width being paved at least once.

6. Steel-Wheel Roller: A 2-wheel steel tandem roller weighing 8 to 10 tons.

7. Pneumatic-tired Roller: A rubber-tired roller equipped with tires a minimum 7.50 x 15 in size, capable of being ballasted up to 12 tons.

8. Vibratory Roller: A vibratory roller capable of imparting a dynamic force of at least 21,000 pounds.

9. Maximum Laboratory Density: Density achieved on a sample of a material taken from a specific location at the job site under working conditions. This density can be obtained using the California Kneading Compactor per Test Method No. Cal. 304.

B. Prior to paving, furnish manufacturer's certificates or literature demonstrating that rollers meet requirements specified above. Prior to paving, state which procedure will be used and do not change that procedure without the Engineer's approval.

3.5 PRIMARY LIFT SPREADING AND COMPACTION

A. Asphalt concrete in excess of 2 inches in thickness, shall be placed in two (2) lifts, a primary lift, and a surface course. Surface Course shall be a minimum of 1 inch thick.

B. Asphalt concrete shall be delivered to the project site at a temperature of not less than 260 degrees F nor more than 320 degrees F.

C. The depositing, distributing, and spreading of asphalt concrete shall be accomplished in a single, continuous operation by means of a self-propelled paving machine, motor grader, spreader box, rock spreader, or similar equipment.

D. Prior to spreading, a tack coat shall be applied to the vertical face of all curbs, gutters, and structures which will butt against the new pavement. A tack coat is required between courses if surface has been contaminated by dirt or oxidized by extended exposure. A

diluted SS-type emulsion shall be used for tack coat and shall meet the requirements set forth in CALTRANS, Section 39 and Section 94.

E. Certification: Provide certification that the asphalt aggregate mixture has at least 80 percent of compacted density values equal to or greater than 96 percent - and 100 percent equal to or greater than 95 percent - of a laboratory specimen prepared by the appropriate test method from a sample taken from a truck delivering mixture to the job site. Field density of compacted asphalt concrete shall be determined by:

1. A properly calibrated nuclear asphalt testing device in the field, or

2. ASTM D1188 when slabs or cores are taken for laboratory testing. Zinc stearate may be substituted for paraffin.

3. In case of dispute, the procedure described under Sub-Item E (2.) above shall be used. Combination of rollers shall be allowed under this procedure.

F. Steel-Wheel and Pneumatic: Apply a breakdown (initial) coverage with a steel-wheel roller loaded to 10 tons. Follow by intermediate rolling consisting of a minimum of 6 coverages of a pneumatic-tired roller, the tires being inflated a minimum of 60 psi cold and a maximum of 90 psi when hot. Finish rolling may consist of one coverage of an 8-ton tandem steel-wheel roller.

G. Steel Wheel: Apply a minimum of eight coverages with a steel-wheel roller loaded to 10 tons.

H. Vibratory: Compaction shall consist of at least six coverages with a vibratory roller. Rolling from the center to the edge shall be permitted, and all compaction rolling shall be accomplished before the mix temperature falls below 185 degrees F. Rolling shall commence at least one foot from edge of the mat after which the roller shall be gradually advanced to the edges. Within one foot of edge, the roller on its initial coverage shall advance to the edge in 4-inch increments. The roller shall be advanced to a supported edge first, if applicable. Rolling within one foot of an unsupported edge should be delayed to minimize possible distortion but completed at such time that proper densities are obtained after the completion of rolling. No roller shall be permitted to stand motionless on portion of the work before it has been properly compacted.

3.6 SURFACE COURSE SPREADING AND COMPACTION

A. Surface course shall be 1-inch thick.

B. At the time of delivery to the site of work, the temperature of mixture shall not be lower than 260 degrees F., or higher than 320 degrees F. Asphalt concrete shall not be placed when the atmospheric temperature is below 40 degrees F. or during unsuitable weather.

C. The asphalt concrete shall be evenly spread upon the subgrade or base to such a depth that after rolling, it shall be of the specified cross section and grade of the course being constructed.

D. The depositing, distributing, and spreading of the asphalt concrete shall be accomplished in a single, continuous operation by means of a self-propelled mechanical spreading and finishing machine designed especially for that purpose and equipped with a screed or strike-off assembly capable of being accurately regulated and adjusted to distribute a layer of the material to a definite predetermined thickness.

E. Spreading, once commenced, must be continued without interruption. No greater amount of the mixture shall be delivered in one day than can be properly distributed and rolled during that day.

F. Compaction is the same as outlined in Paragraph 3.05, except as noted below:

1. Steel-Wheel and Pneumatic: Apply a breakdown (initial) coverage with a steel-wheel roller loaded to 10 tons. Follow by intermediate rolling consisting of a minimum of four coverages of a pneumatic-tired roller, the tires being inflated a minimum of 60 psi cold and maximum of 90 psi when hot. Finish rolling may consist of one coverage of an 8-ton tandem steel-wheel roller.

2. Steel-Wheel: Apply a minimum of six coverages with a steel-wheel roller loaded to 10 tons.

3. Vibratory: Compaction shall consist of at least four coverages with a vibratory roller.

G. As soon as the layer of asphalt concrete has been placed, it shall be thoroughly compacted by rolling. Rolling shall be commenced along the lower edge of the area to be rolled and shall be continued until the edge is thoroughly compacted, after which the roller shall be gradually advanced to the crown point, both sides being rolled in a like manner. Rolling shall be continued until the layer has become thoroughly compacted throughout and is true to grade and cross-section.

H. Maintain rollers in good mechanical condition, and those that cannot be operated without jerking, or driven along a straight path, shall not be used. No leakage of petroleum products from roller shall be allowed to come in contact with the pavements being constructed, nor shall roller be permitted to stand motionless on portion of the work before it has been properly compacted.
Rolling surfaces shall be treated with water to prevent the adherence of the asphalt concrete, but the quantity used must not be such as to be detrimental to the surface being rolled.

3.7 FLOOD TESTING

A. Flood Test: Before seal coat is applied, a water flood test shall be done in the presence of the Inspector. The flooding shall be done by water tank truck. Depressions where the water ponds to a depth of more than 1/8-inch shall be filled, or the slope corrected to provide proper drainage. The edges of the fill shall be feathered and smoothed so that the joint between the fill and the original surface is invisible.

B. Seal Coat: After completing the flood test and the pavement has cured for 30 days, all

new A.C. pavement shall receive a slurry sealer applied in accordance with the manufacturer's specifications.

1. Areas to receive sealer shall be swept clean, and, before application, lightly sprayed with water, leaving it cool and damp but free of excess water.

2. Make two or more applications using a total of at least 80 square foot/gallon, min.

3. Each coat of sealer shall dry 24 hours before the succeeding coat is applied.

4. The finished surface seal, when dry and thoroughly set, shall be smooth, tough, waterproof, resilient, of uniform black color, and free from coarse textured areas, lap marks, ridges, and other surface irregularities. Should defect appear in the finished surface, apply as many additional coats of sealer as may be required to produce the specified finished surface at no additional cost. Protect from traffic during all operations and until the sealer is thoroughly set and cured and does not pick up under foot or wheeled traffic – min. of 24 hours. When cured and set, thoroughly wash off with water to remove excess residue before applying painted markings.

5. Application shall be by spray method is possible. Brush method may be used when sealer is covering existing pavement and the pavement is in poor condition. Skid-slip resistance applications using sand are not acceptable.

6. Repair any damage caused by construction traffic.

3.8 STRIPING

A. Pavement Marking Paint: Vinyl acrylic type for use on asphaltic concrete and Portland cement concrete. Pavement Marking Paint: Vinyl acrylic type for use on asphaltic concrete and Portland cement concrete. Painted lines and markings on pavement shall be 3" minimum wide and blue in color equal to Color No 15092 per Federal Standard 595B. Refer to Paragraph 2.01 D., for additional paint striping information.

B. Provide International Symbol of Accessibility for each accessible parking stall at location indicated in the Drawings. Symbol shall be 36 inches square, white on standard blue background, and ADA Accessibility Guidelines for Buildings and Facilities.

6. Parking spaces for the disabled shall be marked according to CBC Sections 11B-208, and 11B-502.

2. Refer to paragraph 2.01 D., for additional paint striping information.

C. Preparation:

1. Immediately before applying the paint, thoroughly clean the pavement surface of dust, dirt, sand, scale, water, oil, grease or other objectionable matter. Do not use solvent materials that will damage pavements as cleaning agent. Immediately

before paint, give pavement surface a final cleaning by means of a power broom. Following the power brooming, use power blower containing compressed air.

2. Provide warning devices required to protect the painting operations and the finished work.

D. Application: Immediately following other preparation of the pavement surface, apply the striping at the rate of 100 to 110 square feet, per gallon of paint. Apply lines 4 inches wide unless otherwise indicated. Apply the stripe of the indicated or specified width with clean true edges and without sharp breaks. Repaint to the applicable specification portions of the stripe damaged by any type of traffic within 24 hours after the stripe has been applied.

E. Provide temporary striping where parking must be occupied prior to installation of seal coat.

3.9 CLEANUP

A. Clean up the paved areas prior to acceptance of the work. Dirt, spoil, and debris of nature shall be removed, and the entire site shall present a clean, workmanlike appearance.

B. Damage to paint work from paving or seal-coating operations shall be corrected.

END OF SECTION 321216

SECTION 32 13 00 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Provide Portland cement concrete site work complete, including:
   1. Concrete work shown on Civil Drawings.
   2. Concrete work shown on Landscape Drawings.

1.2 RELATED REQUIREMENTS

A. Section 31 20 00 Earthwork

B. Section 32 11 13 Aggregate Base

1.3 QUALITY ASSURANCE

A. Reference and Standards
   1. Perform work in accordance with all applicable laws, codes and regulations required by City of Inglewood and County of Los Angeles and the State of California.
   2. Reference to "Standard Specifications" shall mean the current Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation, CALTRANS.
   3. Reference to the SSPWC shall mean the current Standard Specifications for Public Works Construction “The Greenbook”.
   4. The American Concrete Institute (ACI): "Manual of Concrete Practice," Parts 1, 2 and 3.

B. Stipulations
   1. Finish Surface Tolerance: 1/4-inch maximum variation in 10 feet.

1.4 TESTS

A. The owner will select a qualified testing laboratory to take samples for testing during the course of the work as considered necessary. The Owner will pay costs for such tests. Contractor shall cooperate in making tests and shall be responsible for notifying the designated laboratory in sufficient time to allow taking of samples at time of pour.

B. Should tests show that concrete is below specified strength, Contractor shall remove all such concrete.

1.5 SOILS REPORT

A. A soil investigation report has prepared for the project entitled:

Geotechnical / Geologic Investigation:

Title: Geotechnical Evaluation, Campus Modernization, Warren Lane K-6 Elementary School, 2602 West 79th Street, Inglewood, CA.
Report Date: June 19, 2019

Prepared by: Ninyo & Moore Geotechnical & Environmental Sciences Consultants
Project No. 209822009

1.6 SUBMITTALS

A. The Contractor's Testing Laboratory's certificate of compliance.

B. The Contractor shall submit:
1. Certified copies of mix designs for each concrete class specified including compressive strength test reports.
2. Certification that materials meet requirements specified.
3. Certification from vendor that samples originate from and are representative of each lot proposed for use.
4. Weight master Certificates for concrete delivered to the site and used for improvements.
5. Mill certifications for reinforcing steel.
6. Items required under Waiver of Batch Plant Inspection specified herein.
7. Items required by Form DSA-103 Testing & Inspection Sheet.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Supply ready mixed concrete throughout. Batch, mix and transport in accordance with ASTM C-94, "Specifications for Ready Mixed Concrete."

B. Mix and deliver concrete in quantities that will permit immediate use only.

C. Indiscriminate addition of water for any reason will be cause for rejection of the load.

PART 2 - PRODUCTS

2.1 FORMWORK MATERIALS

A. Forms shall be wood.
1. Plywood: APA Plyform, Grade B-B, 5/8-inch thickness minimum.
Lumber: Douglas fir, "Standard" grade or better (grade marks not required).
Plywood: 5/8-inch thickness minimum. Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete

Form", Class 1. Panels to receive specified form sealer to ensure uniform finish of exposed surfaces

B. Form Coatings: Knox-Crete, or equal.

C. Form Ties: Burke "Penta-Tie," or equal, cone and rod type with 1-inch break-back. Do not use form ties on exposed concrete of seat walls.

2.2 REINFORCING MATERIALS

A. Bar Reinforcement ASTM A615.
1. #3 and smaller: Grade 40.
2 #4 and larger: Grade 60.

2.3 CONCRETE MATERIALS

A. Portland Cement: ASTM C150, Type II.

B. Aggregate: ASTM C33.
1. Coarse Aggregate: Normal weight; 3/4 inch maximum size; clean, uncoated, crushed aggregate, free of materials which cause staining or rust spots.
2. Fine Aggregate: Clean, natural sand.

C. Water: Clear and potable, free from deleterious impurities.

D. Admixtures: Admixtures are optional, must be compatible with color pigments where required. Any proposed admixture shall comply with State Section 2603(b) 5 of Part 2, Title 24 CCR. Accelerating admixtures are not permitted.

2.4 CONCRETE MIXES

A. Concrete mixes shall be accepted and shall be in accordance with CalTrans Standard Specifications Section 90 and per Table 201-1.1.2 of the SSPWC. Unless otherwise noted, mix shall be Class "A," 3,250 psi, Type II Portland cement and 3/4-inch maximum aggregate or as specified on the plans. Maximum water cement ratio shall be 0.50. Submit alternative mix designs for pumping applications.

B. For concrete pavement, not integral with curb, Concrete Class shall be 560-C-3250, Maximum slump is 3- inches.

C. For Curb, integral curb and pavement, gutter, walk and aprons, Concrete Class shall be 520-C-2500 or 520-C-2500P[1] (where P designates to accommodate concrete placement by a concrete pump with a 4-inch line)., maximum slump is 4-inches.

D. For extruded Curb, curb & gutter, Concrete class shall be 520-C-2500, with a maximum slump of 2-inches.

E. Sewer and storm drain facilities, concrete class shall be 560-C-3250, with a maximum slump of 5-inches.

F. Pipe bedding and encasement, anchors and thrust blocks, wall support for pipes, concrete class shall be 450-C-2000, slump shall be 5-inches.

G. Reinforced structures and the pool deck, concrete class shall be 560-C-3250 or 565-C-3250 P[1], maximum slump shall be 4-inches.

H. Concrete, not otherwise specified, concrete class shall be 560-C-3250, maximum slump shall be 5-inches.

2.5 ANCILLARY MATERIALS

A. Expansion Joint Material
   1. Fiber Expansion Joint: A non-extruding resilient filler, saturated with high quality bituminous materials having preserving characteristics. W. R. Meadows or accepted equal. Conform to ASTM-D1751-83. Include Joint Sealant.

B. Curing Compound: ASTM C309, Water-base type, free of permanent color, oil or wax, or accepted equal. Curing compound shall be compatible with color pigments.

C. Combination Curing Compound Concrete Sealer: W. R. Meadows Vocomp-20, (800-342-5976) or accepted equal. Combination Curing Compound. Combination Curing Compound Concrete Sealer shall be compatible with color pigments.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Install all concrete work true to line and grade as indicated on the drawings.

3.2 PREPARATION

A. Subgrade shall be kept moist and shall not be allowed to dry out before placement of concrete. Place no material on muddy subgrade.

3.3 FORMS

A. Forms shall be constructed in accordance with ACI 347 and shall be of sufficient strength and sufficiently tight to prevent visible distortion or leakage of mortar and fines.

B. Forms for exposed surfaces shall be designed to protect intended finish. Deflection of facing material between studs shall not exceed 0.0025 of the span. Facing material and pattern of joints shall be as accepted by the Architect.

C. For vertical surface of wall footings below grade, clean-cut trench may be used in lieu of form if character of soil will permit installation without sluffing and width of concrete is increased at least 1 inch beyond indicated dimension of each face poured against earth.

D. Curb and pavement edge forms shall extend full depth of concrete. Curves shall be formed with flexible metal or wood made up of thin laminations. Curve forms shall extend one stake space straight beyond tangent point.

E. Maintain forms within the following tolerances.
   1. Top of Form: Plus or minus 1/8 inch in 10 feet and no abrupt variations; at required elevation to plus 3/8 inch.

2. Face of Form: Plus or minus 1/4 inch in 10 feet longitudinal and no abrupt variations; perpendicular to surface plus or minus 1/8 inch.

F. Forms may be reused upon cleaning and coating with parting compound to ensure separation from concrete without damage.

After concrete is placed, the following minimum times shall elapse before removal of forms.

1. Footing sides: 24 hours.
2. Mow bands, curbs and pads: 48 hours.

3.4 REINFORCEMENT

A. Concrete shall be steel reinforced unless specifically noted to be "not reinforced." If no reinforcement is shown, reinforce in same manner as that shown in similar places.

B. Fabricate and place reinforcement as indicated on the Drawings and in accordance with ACI "Detailing Manual" SP-66. No reinforcement shall be placed prior to distribution of the accepted shop drawings.

C. Secure reinforcement in position by suitable supports and by wiring at intersections with tie wire. Supports shall be of sufficient number and strength to resist crushing or displacement under full load. Metal shall not extend to surface of concrete.

D. At time of placing concrete, reinforcing shall be free of excessive rust, mill scale, or other bond reducing matter. Immediately before placing concrete, check and adjust position, support and anchorage.

3.5 MIXING AND PLACING CONCRETE

A. Conform to applicable requirements set forth in CalTrans Standard Specifications Section 90.

3.6 JOINTS AND GROOVES

A. Plane of joints shall be perpendicular to surface. Where new pavements join existing, joints shall align.

B. Install joint sealant at fiber expansion joints per manufacturer's specifications.
   1. Allow sufficient time(as recommended by manufacturer) for sealant to cure, prior to release of site to user/general public.
   2. Protect joint sealant until required curing time as expired.

C. Construction Joints: Place construction joints at the end of pours and at locations where placement operations are stopped for a period of more than one half hour, except where such pours terminate at expansion joints.
   1. Construction joints shall be keyed with formed tongue and groove.
   2. Tool concrete edge both sides of construction joint.

D. Saw Cut Joints: Begin as soon as concrete has hardened enough to support saw and operator, and to allow cutting without raveling, or deforming the surface finish. Use a concrete cutting blade. Form a smooth uniform joint 3/16" wide, to minimum 1-1/2" depth unless shown otherwise. Joints shall be cut within 48 hours of pour. Hold saw cuts 1/2" from edge of concrete.

E. Score Joints: Form in the fresh concrete using a jointer to cut the groove so that a smooth uniform impression is obtained to a 1/2" depth unless shown otherwise. All joints shall be struck before and after brooming. Tool concrete both sides of joint.

F. Expansion Joints and Edging: Provided at the location and intervals as shown on the drawings, and at all locations where concrete paving abuts buildings, curbs or other structures, and not greater than 20 feet on center. Approved joint material shall be placed with top edge below the paved surface, and shall be securely held in place to prevent movement. Joint and other edges shall be formed in the fresh concrete using an edging tool to provide a smooth uniform impression. All edges shall be struck before and after brooming.

3.7 FINISHING

A. Mow bands, paving and other exposed work.
   1. Surface Finishes
      a. Float Finish (typical preliminary finishing for slabs to receive other finishes): The surface of the slab shall be screeded and all surface water and laitance removed. Floating shall be started as soon as the screeded surface has stiffened sufficiently. Floating shall be performed by hand using a wood float and shall be the minimum necessary to produce a relatively smooth, level, even-textured surface.
      b. Medium Broom Finish: After the slab has been float finished as described above, the surface shall be uniformly directional textured by coarse stable broom to match accepted mock up to be a non-slip finish and meet the DSA requirements for concrete finishes.
      c. DSA requirements for concrete finishes: Portland cement concrete paving shall have a medium salted (medium broom) finish on all surfaces

sloped less than 6% and slip resistant (heavy broom finish) on all surfaces sloped greater than 6%. CBC Section 11B-403.1 and 11B-403.2.

3.8 CURING

A. Cure exposed concrete in accordance with CalTrans Standard Specifications Section 90.

B. Only water or curing compounds that impart no permanent color or gloss shall be used for curing concrete.

3.9 CONCRETE SEALING

A. Seal all exposed surfaces according to manufacturer's specifications.

3.10 WATERPROOFING

A. Where soil is backfilled against seat walls install waterproofing per manufacturer's specifications. Hold 2" below finish grade.

3.11 CLEANUP

A. During construction, wash off work as quickly as possible when stains or splotches are unavoidable.

B. Upon completion, clean exposed surfaces carefully. Brushing and cleaning solution, if used, must be preceded and followed with a through rinsing of clear water. No sandblasting will be allowed to clean surfaces.

C. Remove from premises; equipment, debris and surplus material needed for, or resulting from, this work. Remove all concrete waste from planting areas and legally dispose of it.

END OF SECTION 32 1300

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SECTION 32 1313

SITE CONCRETE WORK

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: On-site concrete work:

1. Portland cement concrete pavement, driveways, curbs, gutters and mowing strips.
2. Ramps and stairs on grade.
3. Footings for fence posts, bollards, flagpoles, shade structures, light standards and athletic and playground equipment.
4. Pipe encasements, thrust blocks, and equipment pads.
5. Retaining walls, planter walls and concrete benches.
6. Skateboard deterrents.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 1000 – Concrete Forming and Accessories.
3. Section 03 2000 - Concrete Reinforcement.
4. Section 03 3000 – Cast-in-Place Concrete.
5. Section 03 3800 – Post Tensioned Concrete Slab - Tennis Courts.
6. Section - 05 5100 Metal Stairs.
7. Section 07 9200 – Joint Sealants.
8. Section 10 7516 – Flagpoles.
9. Section 11 6813 – Playfield Equipment and Structures – Primary Centers and Elementary Schools.
10. Section 11 6816 – Playfield Equipment and Structures – Middle and High Schools.
11. Division 23 - HVAC.
12. Division 26 - Electrical.

13. Section 31 2200 – Grading.

14. Section 31 2316 - Excavation and Fill for Pavement.

15. Section 31 2319 – Excavation and Fill for Structures.

16. Section 31 2326 - Base Course.

17. Section 32 1216 - Asphalt Paving.

18. Section 32 1219 – Asphalt Paving for Synthetic Running Track Surfacing.

19. Section 32 1723 – Pavement Markings.

20. Section 32 1816 – Playground Protective Surfacing.

21. Section 32 3113 - Chain Link Fences and Gates.

22. Section 33 1100 - Site Water Distribution Utilities.

23. Section 33 3000 - Site Sanitary Sewer Utilities.

24. Section 33 4000 - Storm Drainage Utilities.

1.02 REFERENCES

A. Structural work, such as retaining walls, planter walls, cast-in-place benches, equipment pads, and footings for playground equipment, fences, walls, shade structures and flagpoles shall conform to the following Sections:

1. Section 03 1000 Concrete Forming.

2. Section 03 2000 Concrete Reinforcing.

3. Section 03 3000 Cast-in-Place Concrete.

B. Flatwork, such as walkways, driveways, ramps and steps on grade, swales, curbs, mow strips and utility related concrete, conform to:

1. Standard Specifications for Public Works Construction, The “Greenbook”, except reclaimed aggregates and processed miscellaneous base are not allowed.

C. Imported or exported earthwork shall conform to Section 01 4524 Environmental Import / Export Materials Testing.

D. National Ready Mixed Concrete Association (NRMCA):

1. Checklist for the Concrete Pre-Construction Conference.

1.03 QUALITY ASSURANCE

A. Source Limitations for Exposed Concrete: Obtain each color, size, type, and variety of concrete material and concrete mixture from single manufacturer with resources to provide concrete of consistent quality in appearance and physical properties. Secure material required for the duration of the project as needed to ensure consistent quality in appearance.

B. Pre-Installation Conference:

1. CONTRACTOR shall coordinate and conduct pre-installation conference in conformance to Section 01 3119 Project Meetings.

2. CONTRACTOR shall use the NRMCA "Checklist for the Concrete Pre-Construction Conference" as the meeting agenda.

C. Mockup:

1. Build 8 feet by 8 feet mockups of full-thickness sections of concrete paving using processes and techniques intended for use on permanent work, including curing procedures.

2. Build mockups to demonstrate typical joints; surface finishes and standard of workmanship.

3. Obtain ARCHITECT's approval of mockup before proceeding with work of this Section.

4. Mockup shall remain through completion of the work for use as a quality standard for finished work.

5. Remove mockup when directed by the OAR.

D. Field applied primers, paintings, sealers, sealants, caulking, leveling and patching compounds, crack/joint repair compounds adhesives and similar products shall be approved by the OWNER's Office of Environmental Health and Safety (OEHS).

E. ADA related slopes shall be measured with a twenty-four-inch digital level.

1.04 SUBMITTALS

A. Structural Work: Conform to the applicable requirements of Sections 03 1000 Concrete Forming, 03 2000 Concrete Reinforcing and 03 3000 Cast-in-Place Concrete.

B. Flatwork: Submit mix design in conformance to the Greenbook.

C. Shop Drawings: Submit drawings indicating the locations of concrete joints, including construction joints, expansion joints, isolation joints, and contraction joints.

EDIT NOTE: SELECT ONE OF THE PARAGRAPHS BELOW IF COLORED CONCRETE IS USED. DELETE IF NOT APPLICABLE TO THE PROJECT.

D. Submit concrete Sample of each specified color.

E. Submit full range of manufacturer's standard and custom range colors and products for ARCHITECT's review and selection.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store cement and aggregate materials so 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.

C. Avoid exposure of reinforcing steel bars, wire, and wire fabric to dirt, moisture or conditions harmful to reinforcing.

D. 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 by size and shape.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Structural Work: Conform to the applicable requirements of the following Sections, except as otherwise specified:

1. Section 03 1000 Concrete Forming.

2. Section 03 2000 Concrete Reinforcing.

3. Section 03 3000 Cast-in-Place Concrete.

4. Section 07 9200 Joint Sealants.

B. Flatwork: Conform to the applicable requirements of the Greenbook, Section 201, except as follows:

1. Water/cement ratio for concrete flatwork shall be 0.50 maximum.

2. Base course shall conform to Section 32 3226 Base Course.

3. Reclaimed concrete material shall not be used.

2.02 SKATEBOARD DETERRENTS

A. Manufacturer: Barrett Robinson Inc. or equal.

B. Fabricated from 6061-T6 aluminum, clear anodized.

EDIT NOTE: DELETE PRODUCTS NOT USED IN THE PROJECT.

1. Fixed Angle Series:

    a. FR0.12: For walls with 1/8" radius edge. Dimensions: 4.875" top x 1.0" face x 2.0" wide.

    b. FA90A: For walls with 1/8" radius edge. Dimensions: 4.0" top x 2.375" face x 2.0" wide.

    c. FA135: For chamfered edges, where the chamfer is 3/4” or more. Dimensions: 2" wide X 3-1/2" long X 1-1/8" tall.

    d. FA902.5: For 90 degree walls with 1/2" radius edge. Dimensions: 3.75" top x 2.375" face x 2.0" wide.

2. Fixed Radius:

    a. FR.12: For 1/8" radiused edges. Dimensions: 4.875" top x 1.0" face x 2.0" wide.

    b. FR.05: For 1/2" radiused edges. Dimensions: 3.75" top x 1.0" face x 2.0" wide.

    c. FR1.0: For 1" radiused edges. Dimensions: 4.375" top x 1.625" face x 2.0" wide.

3. Gorilla Series:

    a. Gorilla 012: Rounded edge. For square corners from 0” - 3/8” radius. Size: 1-1/8” wide x 8” deep x 1-1/8”.

    b. Gorilla 0135: Chamfered edge. For square corners from 0” - 3/8” radius. Size: 1-1/8” wide x 8” deep x 1-1/8”.

4. Two-part epoxy adhesive shall be approved by the OWNER’s Office of Environmental Health and Safety (OEHS).

5. Fastening pins as recommended by skateboard deterrent manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that gradients and elevations of base are correct. Maintain subgrade clean and in a smooth, compacted condition until the concrete is placed.

B. Maintain subgrade in a smooth, compacted condition in conformity with the required section and established grade until the concrete is placed. Earth surface shall be kept moist by frequent sprinkling up to the time of placing concrete.

3.02 CONSTRUCTION OF FORMS

A. Flatwork Forming: Set forms to the indicated alignment, grade and dimensions. Hold forms rigidly in place by a minimum of 4 stakes per form placed at intervals not to exceed two feet. Use additional stakes and braces at corners, deep sections, and radius bends, as required. Use clamps, spreaders, and braces where required to ensure rigidity in the forms.

B. Wall Formwork: Forms shall be constructed to conform to final concrete shape, lines and dimensions of members required by Drawings and Specifications. Forms shall be sufficiently tight to prevent leakage of concrete and properly braced or tied together to maintain position and shape.

3.03 STEEL REINFORCEMENT INSTALLATION

A. 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.

B. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

C. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces, and lace splices with wire.

D. Clean reinforcement of loose rust and mill scale, earth, or bond-reducing materials.

EDIT NOTE: SHOW THE LOCATION AND SPACING OF ALL JOINTS ON THE DRAWINGS. EDIT ARTICLE BELOW AS NEEDED TO MATCH THE DRAWINGS; DELETE PARAGRAPHS THAT ARE NOT APPLICABLE TO THE PROJECT.

3.04 PREPARATION FOR CONCRETE PLACEMENT

A. Surfaces to receive concrete shall be free of debris, standing water, and any other deleterious substances before start of concrete placing.

B. Do not place concrete until forms, reinforcement, pipe, conduits, outlet boxes, anchors, sleeves, bolts, and other embedded materials are securely fastened in place. Maintain a minimum of two inches clearance between said items and any part of the concrete reinforcement.

C. Adjust pull boxes, meter boxes, valve covers and manholes to proposed finish grade prior to placement of concrete. Anchor bolts shall be accurately set and maintained in position by templates while being embedded in concrete.

D. Clean thoroughly the surfaces of metalwork to be in contact with concrete, remove dirt, grease, loose scale and rust, grout, mortar, and other foreign substances before the concrete is placed.

E. Moisten subbase to provide a uniform dampened condition at time concrete is placed.

3.05 CONCRETE PLACEMENT

A. Place, compact, screed, float and trowel concrete as indicated in Section 03 3000 Cast-in-Place Concrete.

B. Finish: After straightedging, when most of the water sheen has disappeared and just before the concrete hardens, finish the surface with a wood or magnesium float or darby to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. Produce a scored surface by brooming with a fiber-bristle brush in a direction transverse to that of the traffic, followed by edging.

1. Provide medium broom finish on surfaces up to six percent slope by striating surface 1/32 to 3/64 inch deep with a soft bristle broom across concrete surface to provide a uniform fine line texture.

2. Provide heavy broom finish on surfaces over six percent by striating surface 1/16 inch to 1/8 inch deep with a stiff-bristled broom.

3.06 JOINTS

A. Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated. Align curb, gutter, and sidewalk joints.

B. Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour.

1. Continue steel reinforcement across construction joints unless otherwise indicated on the Drawings.

2. Provide tie bars at sides of paving strips where indicated on the Drawings

3. Butt Joints: Use bonding agent or epoxy-bonding adhesive at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.

5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated on the Drawings.

D. Expansion Joints:

1. Provide premolded joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together. Extend expansion joint fillers full-width and depth of joint, and 1/4" below finished surface where joint filler is indicated. If no joint sealer is indicated place top of premolded joint filler flush with top of concrete or curb.

2. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints to a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Remove grooving-tool marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

F. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Remove edging-tool marks on concrete surfaces.

G. Where concrete is to be cast against old concrete, (greater than 60 days of age), the surface of the old concrete shall be thoroughly cleaned and roughened by sand-blasting, exposing the aggregate. The hardened surface shall be cleaned of latent foreign material and washed clean, prior to the application of an epoxy bonding agent.

3.07 STAIRS AND RAMPS

A. Install support post sleeves into the perimeter concrete curbing during the installation process of the curbing. Sleeves shall be three-inch diameter, schedule 40 PVC with a cap solvent welded to the bottom of the sleeve. Drill a half-inch weep hole on the bottom of the cap. Sleeve and cap shall be Nibco products or approved equal. Sleeves shall be embedded into concrete a minimum of nine inches and spaced at a maximum of four feet, or as indicated on the Drawings. Fill sleeve with non-shrink grout Quickcrete #1585-01 when setting posts. Provide control joints into the concrete on both sides for each post.

B. Finish step nosings with a safety step edger/groover with a 1/2 inch radius and four grooves spaced equally 3/4 inch on center and a bit depth between 1/4 to 3/8 inch. Paint with contrasting color.

3.08 CURB AND GUTTER CONCRETE PLACEMENT AND FINISHING

A. Formed Curb and Gutter: Place concrete to the required section in a single lift. Consolidate concrete using approved mechanical vibrators. Finish curve shaped gutters with a standard curb mule or concrete slipformed curb paving equipment.

B. Concrete Finishing: Float and finish exposed surfaces with a smooth wood float until true to grade and section and uniform in texture. Brush floated surfaces with a fine-hair brush using longitudinal strokes. Round the edges of the gutter and top of the curb with an edging tool to a radius of 1/2 inch. Immediately after removing the front curb form, rub the face of the curb with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. Brush the front curb surface, while still wet, in the same manner as the gutter and curb top. Finish the top surface of gutter to grade with a wood float.

C. Surface and Thickness Tolerances: Finished surfaces shall not vary more than 1/4 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

EDIT NOTE: REFER TO STANDARD TECHNICAL DRAWINGS A-460 AND A-461 FOR SYNTHETIC SURFACING RUNNING TRACK CURBS/BANDS.

3.09 TRACK AND FIELD CONCRETE WORK

A. Provide a Conformance Survey for concrete curbs, bands, drains, edge of paving dimensions and elevations in accordance with Section 32 1219 Asphalt Paving for Synthetic Running Track Surfacing.

B. Corrective Measures: Determine If the planarity, cross slopes, elevations or general specifications have not been met submit corrective measures for the ARCHITECT's and OWNER's review and approval. Once the corrective measures have been completed the track surfacing contractor shall submit a notification accepting the concrete work.

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 321816.13 - PLAYGROUND PROTECTIVE SURFACING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Poured-in-Place Surfacing – PlayBound™ Poured-in-Place

1.2 REFERENCES

A. ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.

B. ASTM D624 Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.

C. ASTM D2047 Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.

D. ASTM D2859 Standard Test Method for Flammability of Finished Textile Floor Covering Materials.

E. ASTM E303 Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester.

F. ASTM F1292 Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment.

G. ASTM F1951 Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment.

1.3 SYSTEM DESCRIPTION

A. A. Performance Requirements: Provide a 2-layer rubber-urethane playground surfacing system which has been designed, manufactured and installed to meet the following criteria:
   1. Shock Attenuation (ASTM F1292):
      a. Gmax: Less than 200.
      b. Head Injury Criteria: Less than 1000.
   2. Flammability (ASTM D2859): Pass.
   3. Tensile Strength (ASTM D412): 60 psi (413 kPa).
   4. Tear Resistance (ASTM D624): 140%.
   5. Water Permeability: 0.4 gal/yd2/second.
   6. Accessibility: Comply with requirements of ASTM F1951.

1.4 QUALITY ASSURANCE

A. Qualifications: Utilize an installer approved and trained by the manufacturer of the playground surfacing system, having experience with other projects of the scope and scale of the work described in this section.

B. Certifications: Certification by manufacturer that installer is an approved applicator of the playground surfacing system.

C. International Play Equipment Manufacturers Association (IPEMA) certified.

1.5 DELIVERY, STORAGE, & HANDLING

A. General: Comply with Division 1 Product Requirement Section.

B. Delivery: Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at a minimum temperature of 40 degrees F (4 degrees C) and a maximum temperature of 90 degrees F (32 degrees C).

1.6 PROJECT SITE CONDITIONS

A. Environmental Requirements: Install surfacing system when minimum ambient temperature is 40 degrees F (1 degree C) and maximum ambient temperature is 90 degrees F (32 degrees C). Do not install in steady or heavy rain.

1.7 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer’s Warranty: Submit, for Owner’s acceptance, manufacturer’s standard warranty document executed by authorized company official. Manufacturer’s warranty is in addition to, and not a limitation of, other rights Owner may have under contract documents.

C. Proper drainage is critical to the longevity of the PlayBound Poured-in-Place surfacing system. Inadequate drainage will cause premature breakdown of the poured system in affected areas; and void the warranty Manufacturers and products listed in SpecAgent and Masterworks Paragraph Builder are neither recommended nor endorsed by the AIA or AVITRU. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications. For definitions of terms and requirements for Contractor's product selection, see Section 016000 "Product Requirements."

PART 2 - EXECUTION

2.1 POURED-IN-PLACE PLAYGROUND SURFACING SYSTEM

A. Manufacturer: Surface America, Inc.
1. 1. Contact: PO Box 157, Williamsville, NY 14231; Telephone: (800) 999-0555, (716) 632-8413; Fax: (716) 632-8324; E-mail: info@surfaceamerica.com; website: http://www.surfaceamerica.com.

B. B. Proprietary Products/Systems. Poured-in-place playground surfacing system, including the following:
1. PlayBound Poured-In-Place Primer:
a. Material: Urethane.
2. PlayBound Poured-in-Place Basemat:
a. Material: Blend of 100% recycled SBR (styrene butadiene rubber) and urethane.
b. The type of playground equipment determines the required basemat thickness, and the basemat thickness may be different at various locations on the playground site. Depending on ASTM F1292 requirements for critical fall height (4’, 5’, 6’, 7’, 8’, 9’, 10’, 12’ or 13’ (1219, 1524, 1829, 2134, 2438, 2743, 3048, 3657 or 3962 mm), select basemat thickness from options provided in subparagraph below (1 1/4 ", 2”, 2 1/2", 2 1/2", 3”, 3 1/2", 4", 4 1/2”, 5" or 6" (32, 51, 63, 63, 76, 89, 102, 114, 127 or 152 mm, respectively). Specify project requirements below and coordinate with working drawings.
c. Thickness: [1 1/4" (31.75 mm) for 4’ critical fall height] [2" (51 mm) for 5’ critical fall height] [2 1/2” (64 mm) for 6’ and 7’ critical fall heights] [3" (76 mm) for 8’ critical fall height] [3 1/2" (89 mm) for 9’ critical fall height] [4" (102 mm) for 10’ critical fall height] [5" (127 mm) for 12’ critical fall height] [6" (152 mm) for 13’ critical fall height].
d. Formulation Components: Blend of strand and granular material.
3. PlayBound Poured-In-Place Top Surface:
a. Material: Blend of Virgin EPDM (ethylene propylene diene monomer) rubber or TPV Granule and aromatic or aliphatic urethane binder.
b. Thickness: Nominal 1/2" (12.7 mm), minimum 3/8" (9.5 mm), maximum 5/8" (15.9 mm).
c. Color: [Standard] [Terra Cotta Red] [Primary Red] [Orange (indoor only)] [Gold] [Beige] [Yellow] [Bright Green] [Hunter Green] [Teal] [Sky Blue] [Royal Blue] [Purple] [Pearl] [Eggshell] [Brown] [Light Gray] [Dark Gray] [Black] [Custom color – specify requirements].
d. Aliphatic urethane (Extreme-10) is recommended for certain colors (blue, teal, purple, pearl, eggshell and grays) because aromatic binder (Super-7) “yellows” slightly upon exposure to ultraviolet rays. Most of this thin layer of urethane wears off with foot traffic and weathering typically within two to six months. *This characteristic applies industry-wide.*
e. Dry Static Coefficient of Friction (ASTM D2047): 1.0.
f. Wet Static Coefficient of Friction (ASTM D2047): 0.9.
g. Dry Skid Resistance (ASTM E303): 89.
h. Wet Skid Resistance (ASTM E303): 57.

2.2 PRODUCT SUBSTITUTIONS

A. Substitutions: No substitutions permitted

2.3 MIXES

A. Required mix proportions by weight:
   1. Basemat: 16+% urethane (as ratio: 14% urethane divided by 86% rubber). 14% urethane, 86% rubber (based on entire rubber & urethane mix).
   2. Top Surface: 22% urethane (ratio: 18% urethane divided by 82% rubber). 18% urethane, 82% rubber (based on entire rubber & urethane mix).

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Comply with the instructions and recommendations of the playground surfacing manufacturer.

3.2 EXAMINATION

A. Substrate preparation must be in accordance with surfacing manufacturer's specification. New asphalt must be fully cured – up to 30 days. New concrete must be fully cured – up to 7 days.

B. Proper drainage is critical to the longevity of the PlayBound Poured-in-Place surfacing system. Inadequate drainage will cause premature breakdown of the poured system in affected areas; and void the warranty.

3.3 PREPARATION

A. Surface Preparation: Using a brush or short nap roller, apply primer to the substrate perimeter and any adjacent vertical barriers such as playground equipment support legs, curbs or slabs that will contact the surfacing system at the rate of 300 ft2/gal (7.5 m2/L).

3.4 INSTALLATION

A. Do not proceed with playground surfacing installation until all applicable site work, including substrate preparation, fencing, playground equipment installation and other relevant work, has been completed.

B. Basemat Installation:
   1. Using screeds and hand trowels, install the basemat at a consistent density of 29 pounds, 1 ounce per cubic foot (466 kg/m3) to the specified thickness.
   2. Allow basemat to cure for sufficient time so that indentations are not left in the basemat from applicator foot traffic or equipment.
   3. Do not allow foot traffic or use of the basemat surface until it is sufficiently cured.

C. Primer Application: Using a brush or short nap roller, apply primer to the basemat perimeter and any adjacent vertical barriers such as playground equipment support legs, curbs or slabs that will contact the surfacing system at the rate of 300 ft2/gal (7.5 m2/L).

D. Top Surface Installation:
   1. Using a hand trowel, install top surface at a consistent density of 58 pounds, 9 ounces per cubic foot (938 kg/m3) to a nominal thickness of 1/2" (12.7 mm).
   2. Allow top surface to cure for a minimum of 48 hours.
   3. At the end of the minimum curing period, verify that the top surface is sufficiently dry and firm to allow foot traffic and use without damage to the surface.
   4. Do not allow foot traffic or use of the surface until it is sufficiently cured.

3.5 PROTECTION

A. Protect the installed playground surface from damage resulting from subsequent construction activity on the site.

END OF SECTION 321816.13

SECTION 323113 - CHAIN LINK FENCES AND GATES

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. Chain-link fences.
2. Swing gates.

1.3 ACCESSIBILITY REQUIREMENTS

A. Fences, Gates, and Hardware:

1. Gates that are part of the accessible route shall meet all the requirements of an accessible door in compliance with CBC Section 11B-404.
2. The lever of lever actuated latches or locks for an accessible gate shall be curved with a return to within 1/2” of the (face of) gate to prevent catching on the clothing or persons. California Referenced Standards code. T-24 Part 12, Section 12-10-202, Item (F).
3. Swing doors and gate surfaces within 10” of the finish floor or ground shall have a smooth surface on the push side extending the full width of the door or gate. Parts creating horizontal or vertical joints in these surfaces shall be within 1/16” of the same plane as the other and be free of sharp or abrasive edges. Cavities created by added kick plates shall be capped. CBC Section 11B-404.2.10.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

a. Fence and gate posts, rails, and fittings.
b. Chain-link fabric, reinforcements, and attachments.
c. Gates and hardware.

B. Shop Drawings: For each type of fence and gate assembly.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include accessories, hardware, gate operation, and operational clearances.

C. Delegated-Design Submittal: For structural performance of chain-link fence and gate frameworks, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For factory-authorized service representative.

B. Product Certificates: For each type of chain-link fence and gate.

C. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For gate operators to include in emergency, operation, and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Emergency Access Requirements: According to requirements of authorities having jurisdiction for gates with automatic gate operators serving as a required means of access.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design chain-link fence and gate frameworks.

B. Structural Performance: Chain-link fence and gate frameworks shall withstand the design wind loads and stresses for fence height(s) and under exposure conditions indicated according to ASCE/SEI 7.

a. Minimum Post Size: Determine according to ASTM F 1043 for post spacing not to exceed 10 feet for Material Group IA, ASTM F 1043, Schedule 40 steel pipe.

b. Minimum Post Size and Maximum Spacing: Determine according to CLFMI WLG 2445, based on mesh size and pattern specified.

2.2 CHAIN-LINK FENCE FABRIC (Black Extruded Vinyl Coated, Core Material Galv Steel)

A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:

1. Fabric Height: As indicated on Drawings.
2. Steel Wire for Fabric: Wire diameter of 0.192 inch. (Black Vinyl Coated)

a. Mesh Size: 1 inch.
b. Zinc-Coated Fabric: ASTM A 392, Type II, Class 1, 1.2 oz./sq. ft. with zinc coating applied before weaving.

3. Selvage: Knuckled at both selvages.

2.3 FENCE FRAMEWORK

A. Posts and Rails: ASTM F 1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 or ASTM F 1083 based on the following:

1. Fence Height: As indicated on Drawings.
2. Heavy-Industrial-Strength Material: Group IA, round steel pipe, Schedule 40.

3. Horizontal Framework Members: Intermediate, top, and bottom rails according to ASTM F 1043.
4. Brace Rails: ASTM F 1043.
5. Metallic Coating for Steel Framework:

a. Type A: Not less than minimum 2.0-oz./sq. ft. average zinc coating according to ASTM A 123 or 4.0-oz./sq. ft. zinc coating according to ASTM A 653.

2.4 SWING GATES

A. General: ASTM F 900 for gate posts and swing gate types.

1. Gate Leaf Width: As indicated.
2. Framework Member Sizes and Strength: Based on gate fabric height as indicated.

B. Pipe and Tubing:

1. Zinc-Coated Steel: ASTM F 1043 and ASTM F 1083; protective coating and finish to match fence framework.
2. Gate Posts: Round tubular steel.
3. Gate Frames and Bracing: Round tubular steel.

C. Frame Corner Construction: Shop-welded or assembled with corner fittings.

D. Hardware:

1. Hinges: 360-degree inward and outward swing.
2. Latch: Permitting operation from both sides of gate with provision for padlocking accessible from both sides of gate.
3. Closer: Manufacturer's standard.

2.5 FITTINGS

A. Provide fittings according to ASTM F 626.

B. Post Caps: Provide for each post.

1. Provide line post caps with loop to receive tension wire or top rail.

C. Rail and Brace Ends: For each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:

1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches long.
2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom rails to posts.

E. Tension and Brace Bands: Pressed steel.

F. Tension Bars: Steel, length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.

G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.

H. Tie Wires, Clips, and Fasteners: According to ASTM F 626.

1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, according to the following:

a. Hot-Dip Galvanized Steel: 0.148-inch diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.

I. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. of zinc.

2.6 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements that affect performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CHAIN-LINK FENCE INSTALLATION

A. Install chain-link fencing according to ASTM F 567 and more stringent requirements specified.

B. Post Setting: Set posts with mechanical anchors at indicated spacing into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with mechanical devices.

C. Terminal Posts: Install terminal end, corner, and gate posts according to ASTM F 567.

D. Line Posts: Space line posts uniformly at 96 inches o.c.

E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.

1. Locate horizontal braces at midheight of fabric 72 inches or higher, on fences with top rail, and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

F. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

G. Intermediate and Bottom Rails: Secure to posts with fittings.

H. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 1-inch bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

I. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts, with tension bands spaced not more than 15 inches o.c.

J. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric according to ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.

1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.

K. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side.

3.3 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation.

3.4 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

END OF SECTION 323113

SECTION 329300 - PLANTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Plant materials.
2. Fertilizers.
3. Weed-control barriers.
4. Mulches.
5. Herbicides and pesticides.
6. Tree-stabilization materials.
7. Tree grates.

B. Related Requirements:

1. Section 328400 "Planting Irrigation" for complete irrigation systems.

1.02 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.03 ACTION SUBMITTALS

A. Product Data:

1. Plant materials.
2. Fertilizers.
3. Weed-control barriers.
4. Mulches.
5. Herbicides and pesticides.
6. Tree-stabilization materials.
7. Tree grates.

B. Product Data Submittals: For each product.

1. Plant Materials: Include quantities, sizes, quality, and verified sources for plant materials.

C. Samples for Verification: Actual sample of finished products for each of the following:

1. Organic Mulch: 1-pint volume of each organic mulch required; typical of the lot of material to be furnished, in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Provide an accurate representation of color, texture, and organic makeup.
2. Mineral Mulch: 2 lb of each mineral mulch required; typical of the lot of material to be furnished, in sealed plastic bags labeled with source of mulch. Provide accurate indication of color, texture, and makeup.
3. Weed-Control Barrier: 12 by 12 inches.
4. Proprietary Root-Ball-Stabilization Device: One unit.

5. Root Barrier: Width of panel by 12 inches.

1.04 INFORMATIONAL SUBMITTALS

A. Field Quality-Control Reports: Percolation tests for tree pits. Include the following:

1. Date of test.
2. Time when water was added to tree pit to start percolation test.
3. Time with photo documentation showing increments of testing with water level in tree pit.
4. Identification of tester.

B. Qualification Statements: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

C. Product Certificates: For each type of manufactured product, from manufacturer, and complying with manufacturer's certified analysis of standard products.

D. Pesticides and Herbicides: Product label and manufacturer's written application instructions specific to Project.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.

1. Professional Membership: Member in good standing of either the National Association of Landscape Professionals or AmericanHort.
2. Experience: Five years' experience in landscape installation in addition to requirements in Section 014000 "Quality Requirements."
3. Installer's Field Supervision: Maintain an experienced full-time supervisor on Project site when work is in progress.
4. Personnel Certification: Installer's field supervisor certified in one of the following categories from the National Association of Landscape Professionals:

    a. Landscape Industry Certified Technician - Exterior.
    b. Landscape Industry Certified Interior.
    c. Landscape Industry Certified Horticultural Technician.

5. Pesticide Applicator: State licensed, commercial.

B. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries,

and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Architect of sources of planting materials seven days in advance of delivery to site.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, or walkways and pavements; or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

D. Handle planting stock by root ball.

E. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

F. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Do not remove container-grown stock from containers before time of planting.
2. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.08 FIELD CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum

results may be obtained. Apply products during favorable weather conditions in accordance with manufacturer's written instructions and warranty requirements.

1.09 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.
b. Structural failures, including plantings falling or blowing over.
c. Faulty performance of tree stabilization and tree grates.
d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Periods: From date of Substantial Completion.

a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
b. Ground Covers, Biennials, Perennials, and Other Plants: Six months.

3. Include the following remedial actions as a minimum:

a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.

PART 2 - PRODUCTS

2.01 PLANT MATERIALS

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders; with tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); with crossing trunks; with cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots are unacceptable.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root

ball, which begins at root flare in accordance with ANSI Z60.1.

D. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for plant.

2.02 FERTILIZERS

A. Granular Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition:

a. 0.75 lb/1000 sq. ft.3 percent of actual nitrogen, 4 percent phosphorous, and 3 percent potassium, by weight.
b. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

B. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb of ectomycorrhizal fungi, 33 percent hydrogel, and maximum of 5.5 percent inert material.

2.03 WEED-CONTROL BARRIERS

A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. minimum, composed of fibers inert to biological degradation and naturally resistant to chemicals, alkalis, and acids, formed into a stable network so that fibers retain their relative position.

B. Composite Fabric: Woven, needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric, 4.8 oz./sq. yd..

2.04 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Shredded hardwood.
2. Size Range: 3 inches maximum, 1/2 inch minimum.
3. Color: Natural.

B. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through a 1-inch sieve; soluble-salt content of 2 to 5 dS/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

2.05 HERBICIDES AND PESTICIDES

A. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below

the mulch layer.

B. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

C. Pesticides: Registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended in writing by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

2.06 TREE-STABILIZATION MATERIALS

A. Trunk-Stabilization Materials:

1. Upright and Guy Stakes: Rough-sawn, sound, new softwood with specified wood pressure-preservative treatment, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.
2. Wood Deadmen: Timbers measuring 8 inches in diameter and 48 inches long, treated with specified wood pressure-preservative treatment.
3. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or turnbuckles.
4. Guys and Tie Wires: ASTM A641/A641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch in diameter.
5. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.
6. Guy Cables: Five-strand, 3/16-inch-diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 3 inches long, with two 3/8-inch galvanized eyebolts.
7. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.

2.07 TREE GRATES

A. Shape and Size: As indicated on Drawings.

B. Finish: As fabricated.

1. Color: Low-gloss black.

2.08 MISCELLANEOUS PRODUCTS

A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix in accordance with manufacturer's written instructions.

B. Planter Filter Fabric: Woven geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
3. Suspend planting operations during periods of excessive soil moisture until moisture content reaches acceptable levels to attain required results.
4. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove soil and contamination as directed by Architect and replace with new planting soil.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

3.03 PLANTING AREA ESTABLISHMENT

A. General: Prepare planting area for soil placement and mix planting soil in accordance with Section 329113 "Soil Preparation."

B. Placing Planting Soil: Place and mix planting soil in-place over exposed subgrade.

C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

D. Application of Mycorrhizal Fungi: At time directed by Architect, broadcast dry product uniformly over prepared soil at application rate in accordance with manufacturer's written instructions.

3.04 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits.

1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
2. Excavate approximately three times as wide as ball diameter for container-

grown stock.

3. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
4. Do not excavate deeper than depth of root ball, measured from the root flare to the bottom of root ball.
5. If area under the plant was initially dug too deep, add soil to raise it to correct level and thoroughly tamp the added soil to prevent settling.
6. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
7. Maintain supervision of excavations during working hours.
8. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
9. If drain tile is indicated on Drawings or required under planting areas, excavate to top of porous backfill over tile.

B. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Drill 6-inch-diameter holes, 24 inches apart, into free-draining strata or to depth of 10 ft., whichever is less, and backfill with free-draining material.

C. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

D. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.05 TREE, SHRUB, AND VINE PLANTING

A. Inspection: At time of planting, verify that root flare is visible at top of root ball in accordance with ANSI Z60.1. If root flare is not visible, remove soil in a level manner from root ball to where the top-most root emerges from the trunk. After soil removal to expose root flare, verify that root ball still meets size requirements.

B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.

1. Carefully remove root ball from container without damaging root ball or plant.
2. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
3. Distribute granular fertilizer around each planting pit when pit is approximately one-half filled. Do not place in bottom of the hole.
4. Continue backfilling process. Water again after placing and tamping final layer of soil.

D. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of root ball.

3.06 TREE, SHRUB, AND VINE PRUNING

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Do not apply pruning paint to wounds.

3.07 INSTALLATION OF TREE-STABILIZATION MATERIALS

A. Trunk Stabilization by Upright Staking and Tying: Install trunk stabilization as follows unless otherwise indicated:

1. Upright Staking and Tying:

a. Stake trees of 2- through 5-inch caliper. Stake trees of less than 2-inch caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend to the dimension indicated on Drawings above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.

2. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

B. Trunk Stabilization by Staking and Guying: Install trunk stabilization as follows unless otherwise indicated on Drawings. Stake and guy trees more than 14 ft. in height and more than 3 inches in caliper unless otherwise indicated.

1. Site-Fabricated, Staking-and-Guying Method: Install no fewer than three guys spaced equally around tree.

a. Securely attach guys to stakes 30 inches long, driven to grade. Adjust spacing to avoid penetrating root balls or root masses. Provide turnbuckle for each guy wire and tighten securely.
b. Support trees with bands of flexible ties at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
c. Attach flags to each guy wire, 30 inches above finish grade.

3.08 INSTALLATION OF ROOT BARRIER

A. Install root barrier where trees are planted within 60 inches of paving or other hardscape elements, such as walls, curbs, and walkways, unless otherwise indicated on Drawings.

B. Align root barrier vertically, and run it linearly along and adjacent to paving or other hardscape elements to be protected from invasive roots.

C. Install root barrier continuously for distance of 60 inches in each direction from tree

trunk, for total distance of 10 ft. per tree. If trees are spaced closer, use single continuous piece of root barrier.

1. Position top of root barrier flush with finish grade.
2. Overlap root barrier minimum of 12 inches at joints.
3. Do not distort or bend root barrier during construction activities.
4. Do not install root barrier surrounding the root ball of tree.

3.09 GROUND COVER AND PLANT PLANTING

A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on Drawings in even rows with triangular spacing.

B. Dig holes large enough to allow spreading of roots.

C. For rooted cutting plants supplied in flats, plant each in a manner that minimally disturbs the root system but to depth not less than two nodes.

D. Work soil around roots to eliminate air pockets and leave slight saucer indentation around plants to hold water.

E. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

F. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.10 INSTALLATION OF MULCHES

A. Mulch backfilled surfaces of planting areas and other areas indicated.

1. Trees and Treelike Shrubs in Turf Areas: Apply organic mulch ring of 3-inch average thickness, with 24-inch radius around trunks or stems. Do not create a mulch cone or place mulch within 3 inches of trunks or stems.
2. Organic Mulch in Planting Areas: Apply 3-inch average thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.

3.11 INSTALLATION OF TREE GRATES

A. Tree Grates: Install in accordance with manufacturer's written instructions. Set grate segments flush with adjoining surfaces. Shim from supporting substrate with soil-resistant plastic. Maintain 3-inch-minimum growth radius around base of tree; break away portions of casting, if necessary, in accordance with manufacturer's written instructions.

3.12 APPLICATION OF HERBICIDES AND PESTICIDES

A. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas in accordance with manufacturer's written instructions. Do not apply to seeded areas.

B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written

instructions.

C. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and in accordance with manufacturer's written instructions. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

3.13 PLANT MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.

B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.14 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Perform tree pit percolation tests.
2. Tree pit construction will be considered defective if it does not pass percolation tests and inspections.
3. Do not proceed with planting in tree pits until satisfactory percolation is demonstrated.

B. Prepare test and inspection reports.

3.15 REPAIR AND REPLACEMENT

A. Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Architect.

1. Submit details of proposed pruning and repairs.
2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Remove and replace trees that are more than 25 percent dead or in unhealthy condition before end of corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.

1. Provide new trees of same size as those being replaced for each tree of 6 inches or smaller in caliper size.

2. Species of Replacement Trees: Same species being replaced.

3.16 CLEANING AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

END OF SECTION

SECTION 329113 - SOIL PREPARATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes planting soils specified by composition of the mixes.

B. Related Requirements:

1. Section 311000 "Site Clearing" for topsoil stripping and stockpiling.
2. Section 329300 "Plants" for placing planting soil for plantings.

1.02 DEFINITIONS

A. AAPFCO: Association of American Plant Food Control Officials.

B. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.

C. CEC: Cation exchange capacity.

D. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.

E. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.

F. Imported Soil: Soil that is transported to Project site for use.

G. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.

H. NAPT: North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.

I. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."

J. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

K. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.

L. SSSA: Soil Science Society of America.

M. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or

the top surface of a fill or backfill before planting soil is placed.

N. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

O. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.

P. USCC: U.S. Composting Council.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include recommendations for application and use.
2. Include test data substantiating that products comply with requirements.
3. Include sieve analyses for aggregate materials.
4. Material Certificates: For each type of imported soil and soil amendment and fertilizer before delivery to the site, according to the following:

a. Manufacturer's qualified testing agency's certified analysis of standard products.
b. Analysis of fertilizers, by a qualified testing agency, made according to AAPFCO methods for testing and labeling and according to AAPFCO's SUIP #25.
c. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.

B. Samples: For each bulk-supplied material, 1-quart volume of each in sealed containers labeled with content, source, and date obtained. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of composition, color, and texture.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For each testing agency.

B. Preconstruction Test Reports: For preconstruction soil analyses specified in "Preconstruction Testing" Article.

C. Field quality-control reports.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.

1. Laboratories: Subject to compliance with requirements, provide testing by the following:

a. Wallace Laboratories, 365 Coral Cir, El Segundo, CA 90245.

1.06 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction soil analyses on existing, on-site soil imported soil.

B. Preconstruction Soil Analyses: For each unamended soil type, perform testing on soil samples and furnish soil analysis and a written report containing soil-amendment and fertilizer recommendations by a qualified testing agency performing the testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.

1. Have testing agency identify and label samples and test reports according to sample collection and labeling requirements.

1.07 SOIL-SAMPLING REQUIREMENTS

A. General: Extract soil samples according to requirements in this article.

B. Sample Collection and Labeling: Have samples taken and labeled by Contractor in presence of Architect or state-certified, -licensed, or -registered soil scientist under the direction of the testing agency.

1. Number and Location of Samples: Minimum of three representative soil samples from varied locations for each soil to be used or amended for landscaping purposes.
2. Procedures and Depth of Samples: According to USDA-NRCS's "Field Book for Describing and Sampling Soils."
3. Division of Samples: Split each sample into two, equal parts. Send half to the testing agency and half to Owner for its records.
4. Labeling: Label each sample with the date, location keyed to a site plan or other location system, visible soil condition, and sampling depth.

1.08 TESTING REQUIREMENTS

A. General: Perform tests on soil samples according to requirements in this article.

B. Physical Testing:

1. Soil Texture: Soil-particle, size-distribution analysis by one of the following methods according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods":

a. Sieving Method: Report sand-gradation percentages for very coarse, coarse, medium, fine, and very fine sand; and fragment-gradation (gravel) percentages for fine, medium, and coarse fragments; according to USDA sand and fragment sizes.
b. Hydrometer Method: Report percentages of sand, silt, and clay.

2. Total Porosity: Calculate using particle density and bulk density according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
3. Water Retention: According to SSSA's "Methods of Soil Analysis - Part 1-

Physical and Mineralogical Methods."

4. Saturated Hydraulic Conductivity: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods"; at 85% compaction according to ASTM D698 (Standard Proctor).

C. Chemical Testing:

1. CEC: Analysis by sodium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."
2. Clay Mineralogy: Analysis and estimated percentage of expandable clay minerals using CEC by ammonium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 1- Physical and Mineralogical Methods."
3. Metals Hazardous to Human Health: Test for presence and quantities of RCRA metals including aluminum, arsenic, barium, copper, cadmium, chromium, cobalt, lead, lithium, and vanadium. If RCRA metals are present, include recommendations for corrective action.
4. Phytotoxicity: Test for plant-available concentrations of phytotoxic minerals including aluminum, arsenic, barium, cadmium, chlorides, chromium, cobalt, copper, lead, lithium, mercury, nickel, selenium, silver, sodium, strontium, tin, titanium, vanadium, and zinc.

D. Fertility Testing: Soil-fertility analysis according to standard laboratory protocol of SSSA NAPT WERA-103, including the following:

1. Percentage of organic matter.
2. CEC, calcium percent of CEC, and magnesium percent of CEC.
3. Soil reaction (acidity/alkalinity pH value).
4. Buffered acidity or alkalinity.
5. Nitrogen ppm.
6. Phosphorous ppm.
7. Potassium ppm.
8. Manganese ppm.
9. Manganese-availability ppm.
10. Zinc ppm.
11. Zinc availability ppm.
12. Copper ppm.
13. Sodium ppm and sodium absorption ratio.
14. Soluble-salts ppm.
15. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
16. Other deleterious materials, including their characteristics and content of each.

E. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."

F. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable plants indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.

1. Fertilizers and Soil Amendment Rates: State recommendations in weight per 1000 sq. ft. for 6-inchdepth of soil.
2. Soil Reaction: State the recommended liming rates for raising pH or sulfur for lowering pH according to the buffered acidity or buffered alkalinity in weight per 1000 sq. ft. for 6-inchdepth of soil.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Do not move or handle materials when they are wet or frozen.
4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

PART 2 - PRODUCTS

2.01 SOIL AMENDMENTS

A. Organic Soil Conditioner

1. Product shall be fully composted 100 percent recycled organic product, consisting of composted bio-solids and aged wood fiber with particles passing a ½ inch screen. Product shall be non-hazardous, and conform to U.S. EPA 40 CFR 503 criteria for class “A” product. Low sodium amendments shall be used when soil salts are high as determined by the agricultural soils test.

B. Humate

1. A commercially mined and packaged soil conditioner containing 40 percent organic matter, 40 percent Carbon, and 40 percent humic acids.

C. Agricultural Gypsum

1. A commercially processed and packaged product with a minimum 90 percent Calcium Sulfate dihydrate (CaSO42H2O) and minimum 14 percent Sulfur (S). Gypsum shall be free flowing, fine granular form with 100 percent passing a 10 mesh screen. Product shall be environmentally safe and produced specifically for agricultural or landscape use.

D. Granular Fertilizer

1. Fertilizer shall be a commercial grade product, uniform and homogenous in composition, dust free, dry, and free flowing granular or pelletized form suitable for application with approved equipment, and shall contain the following

minimum available percentages by weight of plant food:

2. Nitrogen 6.00%
3. Phosphorus 20.00%
4. Potassium 20.00%
5. Fertilizer shall be delivered to the site in original unopened containers bearing the manufacturer's guaranteed analysis. Wet or caked fertilizer is not acceptable.

E. Endomycrorrhizal Inoculum

1. Arbuscular mycorrhizal inoculum shall consist of spores, mycelium, and mycorrhizal root fragments in a granular calcined clay carrier. Eighty percent (80%) of root fragments shall not exceed one inch (1") in length. Inoculum shall not contain significant quantities of leaves, stems, seeds, coarse roots, pebbles, perlite, vermiculite or other materials of such size or in such quantity as to interfere with the proper operation of inoculum dispensing equipment.
2. Commercial inocula shall contain at least fifty (50) propagules of a suitable arbuscular mycorrhizal fungus per cc of bulk inoculum. A propagule is a spore, fragment of fungal mycelium, or piece of mycorrhizal root capable of colonizing host plant roots on the restoration site. The inoculum shall contain one (1) or more species of fungi from the genus Glomus, and may contain one (1) or more species of the genera Sclerocyctis, Gigaspora, Scutellospora, Entrophospora, or Acaulospora.
3. Arbuscular mycorrhizal inoculum shall be viable and healthy, and have sufficient time remaining in its recommended shelf life to compensate for any potential delays in planting.
4. Ectomycorrhizal Inoculum: Ectomycorrhizal inoculum shall contain Pisolithus tinctorius and one or more species of Rhizopogon and shall have no less than a live spore count of 400 propagules per milliliter of bulk inoculum. No antagonistic pathogens shall be present at significant levels.

F. Soil Penetrant

1. A commercially produced organic soil enhancer packaged in liquid form.

2.02 PRE-EMERGENT HERBICIDES

A. Pre-emergent herbicides shall be a wettable powder or granule type product, suitable for use with the groundcovers specified on the plans and suitable for use with the on-site soil.

B. Herbicides shall be selected for controlling the weeds indigenous to the site.

C. Herbicides shall comply with requirements of local and state agencies having jurisdiction over the project.

2.03 AMENDMENTS FOR BID

A. Quantity and procedure adjustments may be may be made by the landscape architect after reviewing of the Agricultural Soil Analysis report. Adjustments by the landscape architect will issued in writing and approved by the Owner's representative. The following amendments and quantities are to be used as the basis for bids:

1. Soil amendments for planting areas with gradient less than 2:1 in slope. Quantity per 1,000 square feet:
2. Soil amendments for 2:1 slopes. Quantities per 1000 square feet:

2.04 IMPORTED TOP SOIL

A. Imported soil shall be Class A topsoil as defined under Section 212-1.1.2 of the Standard Specifications. Provide soil free of subsoil, brush, objectionable weeds, seeds, rocks, organic or inorganic debris, silt, and clay, toxic substance, organic or inorganic; soil sterilants; salts; and soil removed from road bed excavations.

B. The Contractor shall furnish upon the request of the Architect a soils report made from the intended import by an approved agricultural lab. The report shall include pH, N-P-K, SAR, minerals, micro-nutrients, ECe, boron levels, soil particle size, and textural elevation. Soil imported to site and found to be unsuitable by the Owner's representative shall be removed from the site and replaced with an approved soil at the Contractor's expense. The Contractor shall pay expenses for soil testing of import materials.

PART 3 - EXECUTION

3.01 GENERAL

A. Place planting soil and fertilizers according to requirements in other Specification Sections.

B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.

C. Proceed with placement only after unsatisfactory conditions have been corrected.

3.02 PREPARATION OF UNAMENDED, ON-SITE SOIL BEFORE AMENDING

A. Excavation: Excavate soil from designated area(s) to a depth of 6 inches and stockpile until amended.

B. Unacceptable Materials: Clean soil of concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.

C. Unsuitable Materials: Clean soil to contain a maximum of 8 percent by dry weight of stones, roots, plants, sod, clay lumps, and pockets of coarse sand.

D. Screening: Pass unamended soil through a 2-inch sieve to remove large materials.

3.03 PLACING AND MIXING PLANTING SOIL OVER EXPOSED SUBGRADE

A. General: Apply and mix unamended soil with amendments on-site to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Subgrade Preparation: Till subgrade to a minimum depth of 8 inches. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply, add soil amendments, and mix approximately half the thickness of unamended soil over prepared, loosened subgrade according to "Mixing" Paragraph below. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil.

C. Mixing: Spread unamended soil to total depth of 6 inches, but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.

1. Amendments: Apply soil amendments, except compost, and fertilizer, if required, evenly on surface, and thoroughly blend them with unamended soil to produce planting soil.

a. Mix lime and sulfur with dry soil before mixing fertilizer.
b. Mix fertilizer with planting soil no more than seven days before planting.

D. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.04 PLACING MANUFACTURED PLANTING SOIL OVER EXPOSED SUBGRADE

A. General: Apply manufactured soil on-site in its final, blended condition. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Subgrade Preparation: Till subgrade to a minimum depth of 6 inches. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply approximately half the thickness of planting soil over prepared, loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil.

C. Application: Spread planting soil to total depth of 8 inches, but not less than required to meet finish grades after natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.

D. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.05 BLENDING PLANTING SOIL IN PLACE

A. General: Mix amendments with in-place, unamended soil to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Preparation: Till unamended, existing soil in planting areas to a minimum depth of of 8 inches. Remove stones larger than 2 inches in any dimension and sticks, roots,

rubbish, and other extraneous matter and legally dispose of them off Owner's property.

C. Mixing: Apply soil amendments, except compost, and fertilizer, if required, evenly on surface, and thoroughly blend them into full depth of unamended, in-place soil to produce planting soil.

1. Mix lime and sulfur with dry soil before mixing fertilizer.
2. Mix fertilizer with planting soil no more than seven days before planting.

D. Compaction: Compact blended planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D698 except where a different compaction value is indicated on Drawings.

E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.06 APPLYING COMPOST TO SURFACE OF PLANTING SOIL

A. Application: Apply compost component of planting-soil mix to surface of in-place planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Finish Grading: Grade surface to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.07 PROTECTION

A. Protection Zone: Identify protection zones according to Section 015639 "Temporary Tree and Plant Protection."

B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Vehicle traffic.
4. Foot traffic.
5. Erection of sheds or structures.
6. Impoundment of water.
7. Excavation or other digging unless otherwise indicated.

C. If planting soil or subgrade is overcompacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Architect and replace contaminated planting soil with new planting soil.

3.08 CLEANING

A. Protect areas adjacent to planting-soil preparation and placement areas from

contamination. Keep adjacent paving and construction clean and work area in an orderly condition.

B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.

1. Dispose of excess subsoil and unsuitable materials on-site where directed by Owner.

END OF SECTION

SECTION 328400 - PLANTING IRRIGATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Pressure-reducing valves.
3. Automatic control valves.
4. Transition fittings.
5. Dielectric fittings.
6. Miscellaneous piping specialties.
7. Quick couplers.
8. Drip irrigation specialties.
9. Controllers.

1.02 DEFINITIONS

A. Circuit Piping: Downstream from control valves to sprinklers, specialties, and drain valves. Piping is under pressure during flow.

B. ET Controllers: EvapoTranspiration Controllers. Irrigation controllers, which use some method of weather-based adjustment of irrigation. These adjusting methods include use of historical monthly averages of ET, broadcasting of ET measurements, or use of on-site sensors to track ET.

C. Main Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.

D. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

1.03 ACTION SUBMITTALS

A. Product Data:

1. Pipes, tubes, and fittings.
2. Encasement for piping.
3. Manual valves.
4. Pressure-reducing valves.
5. Automatic control valves.
6. Transition fittings.
7. Dielectric fittings.
8. Miscellaneous piping specialties.
9. Quick couplers.
10. Drip irrigation specialties.
11. Controllers.
12. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Wiring Diagrams: For power, signal, and control wiring.

C. Delegated Design Submittals: For irrigation systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.04 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Irrigation systems, drawn to scale, on which components are indicated and coordinated with each other, using input from Installers of the items involved. Also include adjustments necessary to avoid plantings and obstructions, such as signs and light standards.

B. Zoning Chart: Indicate each irrigation zone and its control valve.

C. Controller Timing Schedule: Indicate timing settings for each automatic controller zone.

D. Field Quality-Control Submittals:

1. Field quality-control reports.

E. Delegated design engineer qualifications.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For controllers to include in operation and maintenance manuals.

1.06 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Bubblers: Equal to 5 percent of amount installed for each type indicated, but no fewer than 4 units.
2. Emitters: Equal to 5 percent of amount installed for each type indicated, but no fewer than 5 units.
3. Drip-Tube System Tubing: Equal to 5 percent of total length installed for each type and size indicated, but not less than 100 ft..

B. Schedule of maintenance material items.

1.07 QUALITY ASSURANCE

A. Qualifications:

1. Installers: Entity that employs a Certified Irrigation Designer - Landscape qualified by the Irrigation Association.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and

application.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and entrance of dirt, debris, and moisture.

B. Store plastic piping protected from direct sunlight. Support piping to prevent sagging and bending.

1.09 FIELD CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1. Notify Construction Manager Owner no fewer than two days in advance of proposed interruption of water service.
2. Do not proceed with interruption of water service without Construction Manager's Owner's written permission.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Irrigation Zone Control: Automatic operation with controller and automatic control valves.

B. Location of Sprinklers and Specialties: Design location is approximate. Make minor adjustments necessary to avoid plantings and obstructions, such as signs and light standards. Maintain 100 percent irrigation coverage of areas indicated.

C. Minimum Working Pressures: The following are minimum pressure requirements for piping, valves, and specialties unless otherwise indicated:

1. Irrigation Main Piping: 30 psi.

2.02 PIPES, TUBES, AND FITTINGS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

B. PE Pipe with Controlled ID: ASTM D2239, PE 3408 compound; SIDR 11.5 and SIDR 15.

1. Insert Fittings for PE Pipe: ASTM D2609, nylon or propylene plastic with barbed ends. Include bands or other fasteners.

C. PVC Pipe: ASTM D1785, PVC 1120 compound, Schedules 40 and 80.

1. PVC Socket Fittings: ASTM D2466, Schedules 40 and 80.
2. PVC Threaded Fittings: ASTM D2464, Schedule 80.
3. PVC Socket Unions: Construction similar to that of MSS SP-107, except both headpiece and tailpiece shall be PVC with socket ends.

D. PVC Pipe, Pressure Rated: ASTM D2241, PVC 1120 compound, SDR 21 and SDR 26.

1. PVC Socket Fittings: ASTM D2467, Schedule 80.
2. PVC Socket Unions: Construction similar to that of MSS SP-107, except both headpiece and tailpiece shall be PVC with socket or threaded ends.

2.03 PIPING JOINING MATERIALS

A. Solvent Cements for Joining PVC Piping: ASTM D2564. Include primer in accordance with ASTM F656.

B. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.04 TRANSITION FITTINGS

A. General Requirements: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

2.05 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

2.06 SPRINKLERS

A. General Requirements: Designed for uniform coverage over entire spray area indicated at available water pressure.

2.07 BOXES FOR AUTOMATIC CONTROL VALVES

A. Drainage Backfill: Cleaned gravel or crushed stone, graded from 3/4 inch minimum to 3 inches maximum.

PART 3 - EXECUTION

3.01 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

B. Install warning tape directly above pressure piping, 12 inches below finished grades, except 6 inches below subgrade under pavement and slabs.

C. Drain Pockets: Excavate to sizes indicated. Backfill with cleaned gravel or crushed stone, graded from 3/4 to 3 inches, to 12 inches below grade. Cover gravel or crushed stone with sheet of asphalt-saturated felt and backfill remainder with

excavated material.

D. Provide minimum cover over top of underground piping according to the following:

1. Irrigation Main Piping: Minimum depth of 24" below finished grade, or not less than 18 inches below average local frost depth, whichever is deeper.
2. Circuit Piping: 12 inches.
3. Drain Piping: 12 inches.
4. Sleeves: 24 inches.

3.02 INSTALLATION OF PIPING

A. Location and Arrangement: Drawings indicate location and arrangement of piping systems. Install piping as indicated unless deviations are approved on Coordination Drawings.

B. Install piping at minimum uniform slope of 0.5 percent down toward drain valves.

C. Install piping free of sags and bends.

D. Install groups of pipes parallel to each other, spaced to permit valve servicing.

E. Install fittings for changes in direction and branch connections.

F. Install unions adjacent to valves and to final connections to other components with NPS 2 or smaller pipe connection.

G. Install flanges adjacent to valves and to final connections to other components with NPS 2-1/2 or larger pipe connection.

H. Install expansion loops in control-valve boxes for plastic piping.

I. Lay piping on solid subbase, uniformly sloped without humps or depressions.

J. Install PVC piping in dry weather when temperature is above 40 deg F. Allow joints to cure at least 24 hours at temperatures above 40 deg F before testing.

K. Install piping in sleeves under parking lots, roadways, and sidewalks.

L. Install sleeves made of Schedule 80, PVC pipe and socket fittings, and solvent-cemented joints.

M. Install transition fittings for plastic-to-metal pipe connections according to the following:

1. Underground Piping:

a. NPS 1-1/2 and Smaller: Plastic-to-metal transition fittings.
b. NPS 2 and Larger: AWWA transition couplings.

N. Install dielectric fittings for dissimilar-metal pipe connections according to the following:

1. Underground Piping:

    a. NPS 2 and Smaller: Dielectric coupling or dielectric nipple.
    b. NPS 2-1/2 and Larger: Prohibited except in control-valve box.

2. Piping in Control-Valve Boxes:

    a. NPS 2 and Smaller: Dielectric union.
    b. NPS 2-1/2 to NPS 4: Dielectric flange.
    c. NPS 5 and Larger: Dielectric flange kit.

3.03 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Copper-Tubing Brazed Joints: Construct joints in accordance with CDA's "Copper Tube Handbook," using copper-phosphorus brazing filler metal.

E. Copper-Tubing Soldered Joints: Apply ASTM B813 water-flushable flux to tube end unless otherwise indicated. Construct joints in accordance with ASTM B828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B32.

F. PE Piping Fastener Joints: Join with insert fittings and bands or fasteners in accordance with piping manufacturer's written instructions.

G. PVC Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings in accordance with the following:

1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Pressure Piping: Join schedule number, ASTM D1785, PVC pipe and PVC socket fittings in accordance with ASTM D2672. Join other-than-schedule-number PVC pipe and socket fittings in accordance with ASTM D2855.
3. PVC Nonpressure Piping: Join in accordance with ASTM D2855.

3.04 INSTALLATION OF VALVES

A. Underground Iron Gate Valves, Resilient Seat: Comply with AWWA C600 and AWWA M44. Install in valve casing with top flush with grade.

B. Pressure-Reducing Valves: Install in boxes for automatic control valves or aboveground between shutoff valves.

C. Throttling Valves: Install in underground piping in boxes for automatic control valves.

3.05 INSTALLATION OF DRIP IRRIGATION SPECIALTIES

A. Install freestanding emitters on pipe riser to mounting height indicated.

B. Install manifold emitter systems with tubing to emitters. Plug unused manifold outlets. Install emitters on off-ground supports at height indicated.

C. Install multiple-outlet emitter systems with tubing to outlets. Plug unused emitter outlets. Install outlets on off-ground supports at height indicated.

D. Install drip tubes with direct-attached emitters on ground.

E. Install drip tubes with remote discharge on ground with outlets on off-ground supports at height indicated.

F. Install off-ground supports of length required for indicated mounted height of device.

G. Install application pressure regulators and filter units in piping near device being protected, and in control-valve boxes.

H. Install air relief valves in piping, and in control-valve boxes.

3.06 INSTALLATION OF AUTOMATIC IRRIGATION CONTROL SYSTEM

A. Equipment Mounting, Interior: Install controllers on interior wall.

1. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Install control cable in same trench as irrigation piping and at least 2 inches below or beside piping. Provide conductors of size not smaller than recommended by controller manufacturer. Install cable in separate sleeve under paved areas.

3.07 CONNECTIONS

A. Comply with requirements for piping specified in Section 331415 "Site Water Distribution Piping" for water supply from exterior water service piping, water meters, protective enclosures, and backflow preventers. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment, valves, and devices to allow service and maintenance.

C. Connect wiring between controllers and automatic control valves.

3.08 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

B. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplates and signs on each automatic controller.

1. Text: In addition to identifying unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

C. Warning Tapes: Arrange for installation of continuous, underground, detectable warning tapes over underground piping during backfilling of trenches. See Section 312000 "Earth Moving" for warning tapes.

3.09 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service with Test Assistance: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
4. Irrigation system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.10 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks in accordance with manufacturer's written instructions.
2. Verify that controllers are installed and connected in accordance with the Contract Documents.
3. Verify that electrical wiring installation complies with manufacturer's submittal.

3.11 ADJUSTING

A. Adjust settings of controllers.

B. Adjust automatic control valves to provide flow rate at rated operating pressure required for each sprinkler circuit.

C. Adjust sprinklers and devices, except those intended to be mounted aboveground, so they will be flush with, or not more than 1/2 inch above, finish grade.

3.12 CLEANING

A. Flush dirt and debris from piping before installing sprinklers and other devices.

3.13 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain automatic control valves and controllers.

3.14 PIPING SCHEDULE

A. Install components having pressure rating equal to or greater than system operating pressure.

B. Piping in control-valve boxes and aboveground may be joined with flanges or unions instead of joints indicated.

C. Underground Irrigation Main Piping:

1. NPS 4 and Smaller:

a. Schedule 40 Schedule 80, PVC pipe and socket fittings, and solvent-cemented joints.
b. Schedule 80, PVC pipe; Schedule 80, threaded PVC fittings; and threaded joints.
c. SDR 21, PVC, pressure-rated pipe; Schedule 80, PVC socket fittings; and solvent-cemented joints.

D. Circuit Piping:

1. NPS 2 and Smaller:

a. SIDR 7, PE, controlled ID pipe; insert fittings for PE pipe; and fastener joints.
b. Schedule 40, PVC pipe and socket fittings; and solvent-cemented joints.
c. SDR 26, PVC, pressure-rated pipe; Schedule 40, PVC socket fittings; and solvent-cemented joints.

E. Underground Branches and Offsets at Sprinklers and Devices: Schedule 80, PVC pipe; threaded PVC fittings; and threaded joints.

1. Option: Plastic swing-joint assemblies, with offsets for flexible joints, manufactured for this application.

3.15 VALVE SCHEDULE

A. Underground, Shutoff-Duty Valves: Use the following:

1. NPS 3 and Larger: Iron gate valve, resilient seated; iron gate valve casing; and operating wrench(es).

B. Throttling-Duty Valves:

1. NPS 2 and Smaller:

a. Plastic automatic control valve.
b. Plastic ball valve.

2. NPS 2-1/2 and NPS 3:
3. Plastic automatic control valve.
4. Iron ball valve.

END OF SECTION

SECTION 33 1100 - SITE WATER SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Domestic water lines including valves, adaptors, thrust blocks, fittings, and appurtenances.

B. Connections to existing lines, meters, etc.

C. Coordinate connections with building plumbing, irrigation system, and all lines to remain in service during work.

D. Obtain and pay for all required permits where specified in the General Conditions.

E. Perform leakage tests and disinfection of new lines.

1.2 RELATED REQUIREMENTS:

A.	Section 01 40 00	Quality Requirements
B.	Section 31 20 00	Earthwork
C.	Section 31 23 34	Trenching, Backfilling, and Compaction
D.	Section 33 30 00	Sanitary Sewerage
E.	Section 33 40 00	Storm Drainage Systems
F.	Section 03 30 00	Cast-in Place Concrete

1.3 FIELD CONDITIONS

A. The lines are drawn to scale, but some appurtenances are diagrammatic, and shall be followed as closely as actual construction permits. Deviations from drawings required to make this conform to the site conditions, and to the work of others, shall be made as necessary or directed. Verify dimensions with requirements prior to starting work.

B. Accuracy of Data: The data given herein and on the drawings are based on available information, and the Contractor is responsible for verification of the accuracy of all data. The specifications and drawings are for the assistance and guidance of the Contractor. Exact locations, distances, levels, etc., will be governed by the actual conditions and the Contractor shall verify these data prior to constructing the work.

C. Existing Utilities: Contractor shall be responsible for verification of existing utilities in all areas where work is to be performed. Caution shall be exercised during all excavation to prevent interruption or severance of existing utilities, such interruption or severance

being the sole responsibility of the Contractor. When any obstructions prevent the installation of this work, the Architect shall be notified. Location of utilities other than those shown may exist within the site.

1.4 REFERENCES

A. California Building Code, including Chapters 18 and 33, and accessibility regulations.

B. Standard Specifications for Public Works Construction (SSPWC), current edition, as adopted by local jurisdiction.

C. California Department of Transportation, "Manual of Traffic Controls for Construction and Maintenance Work Zones", current edition, as adopted by local jurisdiction.

D. Applicable municipal and agency standards regarding excavation, shoring, and dewatering work.

E. CAL-OSHA Requirements, including all applicable portions of Title 8 and the California Labor Code.

F. Local jurisdictional and agency Engineering and Public Works regulations and standards.

G. Local Parking and Fire Department regulations.

H. Uniform Plumbing Code, as adopted by the local jurisdiction.

1.5 PRELIMINARY OPERATION

The Owner reserves the right to operate any systems of equipment prior to final completion and acceptance of the work. Such Preliminary operation shall not be construed as an acceptance of any work.

1.6 SUBMITTALS

A. Materials List: Within thirty days after award of Contract, provide complete list of all proposed materials, fixtures, and equipment. Submittal shall include manufacturer's catalog numbers, type, size and such other information as required to identify all items.

B. Operation and Maintenance Documents
   1. Deliver operation and maintenance manuals on equipment.
   2. Tools for equipment maintenance and operation shall be presented to the Owner.

1.7 COORDINATION OF WORK

Coordinate all work with that of other trades. No extras or additional time will be allowed for delays resulting from coordination problems with the work of other trades.

1.8 PERMITS AND FEES

A. Arrange and pay for all City and/or County inspection costs, construction fees, sterilization charges, installation fees, or other charges necessary to the furnishing of utility services.

B. Owner will pay for all permanent meter, capacity, acreage, and facility benefit fees.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

A. Improvements shall be constructed per the referenced standards, the improvement drawings, and as specified in this Specification.

B. Where criteria shown on drawings or specified in this specification exceed that of the referenced standards, and the work involves non-public improvements, the more stringent criteria shall apply.

2.2 SYSTEM COMPONENTS

A. Pipe

1. General
   a. All components shall comply with "Standard Specifications" and as shown on drawings.
   b. Use of asbestos concrete pipe is prohibited.
2. Ductile Iron Pipe: Conform to AWWA C151, with cement mortar lining complying with AWWA C104, Class 51.
3. Polyvinyl Chloride (PVC) Pipe and Type K Copper
   a. Pipe 3 inches and less in diameter shall be Copper Type K or Schedule 80 PVC.
   b. Pipe larger than 3 inches diameter shall be Type C-900 PVC of grade to comply with AWWA C900, Class 150.
4. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with “Water Service” in large letters. Install trace wire 6 inches above top of pipe.

B. Valves

1. Valves 3 inches and larger shall be iron body, bronze mounted, parallel seat, double disc, non rising stem and shall comply with AWWA Specification C-500. Valves shall be rated for working pressure of 150 psi, and shall have connections suitable for pipe connections.
2. Valves 2-1/2 inches and less shall have bronze union bonnet, solid wedge non rising stem, 125 lb. Stockham B-115 or equal.

C. Boxes: Valve boxes shall be Brooks RT1 with Galvanized Cast Iron Lids.

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PART 3 - EXECUTION

3.1 COORDINATION

Coordinate the installation schedule for this portion of the Work with the overall construction schedule for the Work to ensure orderly progress of the Work with an absolute minimum of delay.

3.2 SYSTEM LAYOUT

Layout the system in careful coordination with the Drawings, determining proper elevations for all components of the system and using only the minimum number of bends to produce a satisfactorily functioning system. Follow the general layout shown on the Drawings in all cases except where other work may interfere.

3.3 INSTALLATION

A. General

1. Pipe, Valves, Fittings, and related components shall be installed to conform to the referenced standards.
2. Connections to existing lines shall be made per local agency regulations.
3. Materials shall be installed as specified in the referenced standards. Provide minimum cover for all piping as specified in referenced standards.
4. Provide valve access boxes for all below-grade valves.
5. Install joints per referenced standards and manufacturers recommendations.
6. Dielectric Isolators: Where incompatible piping materials come in contact except for the use of valves, isolate from each other with dielectric unions, line size.
7. Building Footing Clearances: Piping shall cross footings through sleeves. Provide Architect approved seals at all footing sleeving to prevent water migration.
8. Concrete Work: Unless specifically indicated on the drawings to be furnished by others, furnish and install concrete work such as pads, bases, kick blocks, and the like, where shown.
9. Monuments: At future building pads, monument water stub outs by installing a precast concrete handhole with appropriately marked cover at their termination.

B. Thrust Blocks:

1. A reaction or thrust block shall be installed at all valves and at all fittings for pipe larger than 4 inches diameter, per the drawings.
2. A reaction or thrust device shall be provided on all deadened and crosses having one or more openings plugged. The size and shape of the thrust device shall be to prevent movement of the water mains when subjected to the maximum requirements shown on the Drawings.
3. Thrust devices shall be cast-in-place concrete, metal harness, or other suitable devices. If the thrust exceeds the bearing value of the surrounding soil, the soil shall be precompacted before placing concrete. To insure against lateral movement of the waste main and/or valve or fitting where a change in direction of the water main is made by the use of such fitting, a metal harness of the tie rods and pipe clamps may be used, except for pipe having rubber ring type joints. Steel tie rods and pipe clamps shall be coated with one coat approved primer.

3.6 UTILITY SERVICE CONNECTIONS

A. Before trenching, verify the horizontal location and depths of all utility lines within the area.

B. Arrange and pay for all connection and inspection fees resulting from work within the public Right-of-Way.

C. Reconstruct, repair, or replace all pavements, sidewalk, landscape, and other items to the satisfaction of the City Inspector.

D. Arrange for the marking of all utility lines in all areas of trenching or excavation operations.

3.7 TEST AND ADJUSTMENTS

A. Piping tests shall be made in the presence of the project inspector. Piping shall be tested in accordance with NFPA 24 and the water serving agency.

B. Furnish all test pumps, gauges, equipment, and personnel required and test as necessary to demonstrate the integrity of the finished installation to the review of pertinent authorities and the Architect.

C. Valves: Test all valve bonnets for tightness. Test operate all valves at least once from closed-to-open-to-closed position while valve is under test pressure. Test all automatic valves for proper operation at the settings indicated. Test pressure relief valve at least three times.

D. Piping Specialties: Test all piping specialties for proper operation.

3.8 INSPECTIONS AND STERILIZATION

A. Give local authorities 24 hour prior notification in order that they may arrange for the following inspection:
   1. Pipe: After installation but prior to backfilling.
   2. Pressure tests.

B. Sterilization of Waterlines: Domestic waterlines shall be sterilized in accordance with local codes and/or AWWA standard C-601 "Disinfection of Water Mains."

3.9 ADJUSTING

Each piece of equipment including valve cans and vaults and all of the systems shall be adjusted to grade, and insure proper functioning of all controls, elimination of noise and vibration, and left in first class operating condition.

3.10 CLEAN-UP

After completion of the work, the Contractor shall thoroughly clean all apparatus and fixtures and remove cement, grease, oil, etc.

END OF SECTION 33 1100

SECTION 33 3000 - SANITARY SEWER

PART 1 - GENERAL

1.1 SECTION INCLUDES

1. Site sanitary sewer piping.
2. Connections to existing sewer system.
3.. Leakage and alignment testing.

1.2 RELATED REQUIREMENTS

A.	Section 014000	Quality Requirements
B.	Section 31 20 00	Earthwork
C.	Section 31 23 34	Trenching, Backfilling & Compacting
D.	Section 33 40 00	Storm Drainage

1.3 FIELD CONDITIONS

Lay-Out/Field Conditions

1. Verify drawing dimensions with actual field conditions. Inspect related work and adjacent features and report to Engineer all conditions which prevent proper execution of this work.
2. The lines are drawn to scale, but some appurtenances are diagrammatic, and shall be followed as closely as actual construction permits. All deviations from drawings required to make this conform to the site conditions, and to the work of others, shall be made as necessary or directed. Verify dimensions with requirements prior to starting work.
3. Accuracy of Data: The data given herein and on the drawings are as exact as could be secured, but their absolute accuracy is not guaranteed. The specifications and drawings are for the assistance and guidance of the Contractor. Exact locations, distances, levels, etc., will be governed by the actual conditions and the Contractor shall use the data contained herein with this understanding.
4. Existing Utilities: Verify the location of existing utilities in all areas where work is to be performed. Extreme caution shall be exercised during all excavation to prevent interruption or severance of existing utilities. When any instructions prevent the installation of this work, the Architect shall be notified. Location of utilities other than those shown may exist within the site.

1.4 REFERENCES

A. California Building Code, including Chapters 18 and 33, and accessibility regulations.

B. Standard Specifications for Public Works Construction (SSPWC), current edition, as adopted by local jurisdiction.

C. California Department of Transportation, "Manual of Traffic Controls for Construction and Maintenance Work Zones", current edition, as adopted by local jurisdiction.

D. All applicable municipal and agency standards regarding excavation, shoring, and dewatering work.

E. CAL-OSHA Requirements, including all applicable portions of Title 8 and the California Labor Code.

F. Local jurisdictional and agency Engineering and Public Works regulations and standards.

G. Uniform Plumbing Code, as adopted by the local jurisdiction.

H. Cast Iron Soil Pipe Institute standard specifications for gray cast-iron pipe current edition.

1.5 SUBMITTALS

A. Record Drawings: Provide record drawing per Section 017700 showing and maintaining an accurate record of the underground piping installation. Locate and size all lines, valves, depths of lines, slope of lines and other pertinent data such as meters and cleanouts.

B. Product data on materials to be provided.

1.6 COORDINATION OF WORK

Coordinate all work with that of other trades.

1.7 PERMITS AND FEES

A. Arrange and pay for all City and/or District inspection fees, construction fees, installation fees, or other charges necessary to the furnishing of utility services. Arrange and pay for installation of any structures and any service connections.

B. Owner will pay for all permanent capacity, and facility benefit fees.

1.8 TESTS

A.. Alignment and Leakage Testing: Tests for leakage and alignment will be conducted per the SSPWC.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

A. Improvements shall be constructed per the referenced standards, the improvement drawings, and as specified in this Specification.

B. Where criteria shown on drawings or specified in this specification exceed that of the referenced standards, and the work involves non-public improvements, the more stringent criteria shall apply.

2.2 PIPE

A. Below grade sewer pipes shall be SDR 35 PVC.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Conform to requirements of Section 31 23 34 for trenching and backfill.

3.2 INSTALLATION OF PIPE

A. General
1. Pipe shall be installed per the manufacturer's recommendations and the "Standard Drawings and Specifications."
2. Run as straight as possible using easy bends with long turn. All offsets shall be made at an angle of 45 degrees or more. Underground pipe shall be installed with bell ends of pipe up grade. Pipe shall be laid with uniform bearing with excavation to receive bell ends.
3. Dielectric Isolators: Where incompatible piping materials come in contact except for the use of valves, isolate from each other with dielectric unions, line size.
4. Building Footing Clearances: Piping shall cross footings through sleeves.
5. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with “Sewer Service” in large letters. Install trace wire 6 inches above top of pipe.

B. Concrete Work: Provide concrete work such as pads, bases, kick blocks, and the like.. Concrete and reinforcing steel shall be equal to that specified in Section 32 1300

3.3 INSTALLATION OF CLEANOUTS

Cleanouts shall be constructed in accordance with the plans. Cleanouts shall be Zurn 6 inch Diameter brushed bronze in Concrete Paving areas. All other cleanouts shall be Brooks RT-1 with galvanized Lid marked “Sewer”.

3.4 FIELD TESTS

A. General
1. Sewer lines will be checked by Project Inspector when backfill has reached the top of the pipe. Both external and internal inspections for alignment may be made at this time.
2. Correct any section of the line found to be unsatisfactory in material, alignment, grade, or joints. Final acceptance of the project will be contingent upon complete backfilling and surface repairs and passage of final alignment and leakage tests.

B. Leakage: After alignment tests are completed, and before flows are allowed in the line, conduct leakage tests. The entire system shall be tested for exfiltration in the presence of

the Project Inspector. The leakage shall meet the requirements of the "SSPWC" section 306-7.8.

3.5 UTILITY SERVICE CONNECTIONS

A. Before trenching, verify the horizontal location and invert elevations of all sanitary sewer connection points, and the horizontal location of all other utility lines.

B. Arrange and pay for all connection and inspection fees resulting from work within the public Right-of-Way.

C. Reconstruct, repair, or replace all pavements, sidewalk, landscape and other items.

D. Arrange for the marking of all utility lines in all areas of trenching and excavation operations

3.6 CLEAN-UP

A. All debris resulting from the work of this Section, together with all the tools, equipment and appliances used shall be completely removed from the site upon completion of the work, and the work shall be in broom clean condition.

END OF SECTION 33 3000

SECTION 33 40 00 - STORM DRAINAGE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Catch basins, area drains, junction structures and appurtenances including connector pipes.

B. Storm drain piping and connections to existing storm drain systems.

1.2 RELATED REQUIREMENTS

A.	Section 01 40 00	Quality Requirements
B.	Section 31 22 19	Finish Grading
C.	Section 31 23 34	Trenching, Backfilling & Compacting
D.	Section 33 46 00	Subdrainage

1.3 FIELD CONDITIONS

Field Conditions

1. Verify drawing dimensions with actual field conditions.
2. The lines are drawn to scale, but some appurtenances are diagrammatic, and shall be followed as closely as actual construction permits. All deviations from drawings required to make this conform to the site conditions, and to the work of others, shall be made as necessary or directed. The Contractor shall verify all dimensions prior to starting work.
3. Accuracy of Data: The data given herein and on the drawings are based on available information, and the Contractor is responsible for verification of the accuracy of all data. The specifications and drawings are for the assistance and guidance of the Contractor. Exact locations, distances, levels, etc., will be governed by the actual conditions, and the Contractor shall verify these data prior to constructing the work.
4. Existing Utilities: Contractor shall be responsible for verification of existing utilities in all areas where work is to be performed. Extreme caution shall be exercised during all excavation to prevent interruption or severance of existing utilities, such interruption or severance being the sole responsibility of the Contractor. When any instructions prevent the installation of this work, the Architect shall be notified. Location of utilities other than those shown which may exist within the site is unknown.

1.4 REFERENCES

A. California Building Code, including Chapters 18 and 33, and accessibility regulations.

B. Standard Specifications for Public Works Construction (SSPWC), current edition as adopted by local jurisdiction.

C. California Department of Transportation (Caltrans), Standard Specifications, current

edition.

D. California Department of Transportation, "Manual of Traffic Controls for Construction and Maintenance Work Zones", current edition as adopted by local jurisdiction.

E. CAL-OSHA Requirements, including all applicable portions of Title 8 and the California Labor Code.

F. Uniform Plumbing Code, as adopted by the local jurisdiction.

G. Cast Iron Soil Pipe Institute standard specifications for gray cast-iron pipe current edition.

1.5 SUBMITTALS

A. Record Drawings: Provide record drawing showing and maintaining an accurate record of the underground piping installation. Locate and size all lines, valves, depths of lines, slope of lines and other pertinent data.

B. Materials List: Within thirty days after award of Contract, provide product literature of proposed materials, fixtures and equipment. Submittal shall include manufacturer's catalog numbers, type, size and such other information as required to identify all items.

1.6 COORDINATION OF WORK

Coordinate all work with that of other trades.

1.7 PERMITS AND FEES

A. Arrange and pay for all Agency or County inspection fees, construction fees, installation fees, or other charges necessary to the furnishing of utility services. Arrange and pay for installation of any structures and any service connections.

B. Owner will pay for all permanent capacity, and facility benefit fees.

1.8 PRODUCT HANDLING

A. Protect materials before, during and after installation and to protect the installed work of other trades. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner, and at no additional cost to the Owner.

B. Contractor shall provide proper storage facilities during the progress of the work. Provide for safety and equipment before requesting final acceptance.

PART 2 - PRODUCTS

2.1 PIPE

A. All on-site storm drainage pipes shall SDR 35 Polyvinyl Chloride Pipe.

B. Tracer Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Storm Sewer Service" in large letters. Install trace wire 6 inches above top of pipe

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2.2 CATCH BASINS AND JUNCTION BOXES

Catch basins shall be as shown on the drawings. Equivalent precast units may be substituted after receiving approval of Engineer.

2.3 GRATES AND FRAMES

A. Grates, covers, and frames shall be as shown on the drawings and shall be ADA compliant and heel proof.

B. Cast Iron shall be painted with bituminous paint.

C. Steel shall be hot dipped galvanized after fabrication.

2.4 MISCELLANEOUS METAL

Miscellaneous metal shall be hot-dipped galvanized after fabrication.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Perform excavation of every description and of whatever materials encountered, to the depths indicated on the drawings or as necessary.

B. Excavation for precast catch basins and similar structures shall be made to allow for a minimum clearance of 12-inches on all sides.

C. Dispose of the excavated materials not required or suitable for backfill as directed by the Geotechnical Engineer.

D. Perform such grading as may be necessary to prevent surface water from flowing into the trenches.

E. Provide adequate equipment for the removal of storm or subsurface waters which may accumulate in the excavated areas. If subsurface water is encountered, the Contractor shall utilize approved means to adequately dewater the excavation so that it will be dry for working and pipe laying.

F. Conform to requirements of Section 31 2334 for trenching and backfill.

3.2 INSTALLATION OF PIPE

A. Pipe, Valves, Fittings, and related components shall be installed to conform to the referenced standards.

B. All or part of the work within Public streets, may be required by the City to be bored and jacked. Contractors shall take all necessary steps to comply with the requirements of the City, including all safety and barricade requirements of the Public Works Department.

C. All connections to existing lines shall be made per city regulations.

D. All materials shall be installed as specified in the referenced "Standard Specifications." Provide minimum cover for all piping as specified in referenced standards.

E. Joints: Install per referenced standards and manufacturers recommendations.

F. Dielectric Isolators: Where incompatible piping materials come in contact except for the use of valves, isolate from each other with dielectric unions, line size.

G. Building Footing Clearances: Piping shall cross footings through sleeves. Provide Architect approved seals at all footing sleeving to prevent water migration.

H. Concrete Work: Unless specifically indicated on the drawings to be furnished by others, furnish and install concrete work such as pads, bases, kick blocks, and the like, where shown.

3.3 INSTALLATION OF STRUCTURES

Concrete storm drain structures shall be constructed in accordance with the "Standard Specifications."

3.4 FIELD TEST

A. General
1. Storm drain line will be checked by the Owner’s or City’s representative when backfill has reached the top of the pipe. Both external and internal inspections for alignment may be made at this time.
2. The Contractor shall correct at his expense, to the Engineer's satisfaction, any section of the line found to be unsatisfactory in material, alignment, grade, or joints.
3. Final acceptance of the project will be contingent upon complete backfilling and surface repairs, and passage of final alignment and leakage tests.

B. Leakage
1. After alignment tests are completed, and before flows are allowed in the line, the Contractor shall conduct leakage tests per "Standard Specifications."
2. All costs of leakage tests shall be borne by the Contractor and shall be included in contract price.

END OF SECTION 33 40 00

SECTION 33 46 00 - SUBDRAINAGE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Work includes, but is not necessarily limited to bioswales and planter drainage systems.

1.2 RELATED REQUIREMENTS

A.	Section 01 40 00	Quality Requirements
B.	Section 31 22 00	Earthwork
C.	Section 33 40 00	Storm Drainage
D.	Section 31 23 34	Trenching, Backfilling & Compaction

1.3 REFERENCES/QUALITY ASSURANCE

A. Standards and Organization: Referenced ASTM Standards.

1.4 SUBMITTALS

A. Materials List: Within 30 days, submit to the Architect a complete list of proposed materials for the work.

PART 2 - PRODUCTS

2.1 DRAINAGE PIPING

A. General:
   1. Drainage piping of a specific type shall be the product of a single manufacturer.
   2. Piping shall be labeled by the appropriate testing or standards organization for the type provided.
   3. All fittings and jointing systems shall be compatible with piping provided.

B. Product Characteristics: Plastic Pipe: 3-inches and greater in diameter.
   1. Material: PVC per ASTM D2729
   2. Rating: SDR 35
   3. Joining System
      a. Elastomeric gasketed joints.
      b. Solvent cement joints, schedule 40 socket type, acceptable for piping 6 inch diameter or less.
      c. Galvanized threaded couplings, nipples, and unions for drain to pipe connection.
   4. Perforations at Foundation Perimeter Drainage Piping: Provide 1/4 inch diameter perforations at 12 inches on center. Provide two rows of perforations located at

ends of 160 degree arc projecting downward from cross-sectional center point of pipe.

C. Product Characteristics: Plastic pipe up to 4 inch diameter.
   1. Material: PVC per ASTM D 1785
   2. Rating: Schedule 80
   3. Jointing System: Solvent welded

2.2 PRE-CAST COMPONENTS

A. All components shall be prefabricated, factory pre-cast, and supplied by a single manufacturer. Design is based on products manufactured by Brookes. Equal products of Christy and Quick Crete are acceptable.

2.3 CONCRETE

A. Per Section 32 13 00

2.4 FILTER FABRIC

A. Mirafi or equal, Series 140N, non-woven polyester sheet fabric.

2.5 BACKFILL AND BEDDING

A. Per Section 32 23 34.

2.6 CRUSHED ROCK

A. Per Standard Specifications Section 200-1.2, 1” size, Class A per ASTM C 131.

2.8 OTHER MATERIALS

A. Provide additional products and materials necessary for the completion of work shown on drawings.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:
   1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
   2. Verify that all surface and drainage conditions comply with Drawings and as necessary for proper execution of the work, including grade fall, line, cover, and clearance.

B. Discrepancies: In the event of discrepancy, immediately notify the Architect/Engineer. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 PIPE AND STRUCTURES INSTALLATION

A. Pipe Installation:
   1. Trench and install bedding for all piping per Section 31 23 34.
   2. Install piping per manufacturer's recommendations.
   3. Solid grout space between pipe and wall of drainage structure. Shape piping termination to accommodate drainage flow.

B. Backfill:
   1. Backfill all piping and structures per Section 31 23 34 and as directed by the Geotechnical Engineer.
   2. Jetting is not permitted.

3.03 TESTING

A. Test all drainage lines for positive flow and blockage. Repair as necessary.

END OF SECTION 33 4600

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