SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Southton Service Center Remodel

B. Owner's Name: Bexar County Public Works.

C. Architect's Name: Slay Architecture.

D. The Project consists of the construction of an addition and an interior remodel of the Fleet Maintenance Building located at 9874 Southton Road..

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00 52 00 - Agreement Form.

1.03 DESCRIPTION OF ALTERATIONS WORK

A. Scope of demolition and removal work is indicated on drawings and specified in Section 02 41 00.

B. Plumbing: Alter existing system and add new construction, keeping existing in operation.

C. HVAC: Replace existing system with new construction.

D. Electrical Power and Lighting: Alter existing system and add new construction, keeping existing in operation.

E. Fire Suppression Sprinklers: Alter existing system and add new construction, keeping existing in operation.

F. Fire Alarm: Alter existing system and add new construction, keeping existing in operation.

G. Security System: Alter existing system and add new construction, keeping existing in operation.

H. Contractor is required to remove and deliver the following to Owner prior to start of work:

1.04 OWNER OCCUPANCY

A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.

B. Owner intends to occupy the Project upon Substantial Completion.

C. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

D. Schedule the Work to accommodate Owner occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.

B. Arrange use of site and premises to allow:
   1. Use of site and premises by the public.

C. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.

D. Existing building spaces may not be used for storage.

E. Utility Outages and Shutdown:

SLAY ARCHITECTURE

Project Manual
For
Bexar County Public Works

Southton Service Center Remodel

9874 Southton
San Antonio, Texas, 78233

Architects Project #21014

Bexar County Event # 1087

Permitting Documents

April 30, 2024

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Southton Service Center

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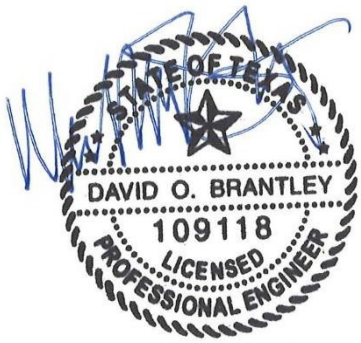
DIVISION 26 **ELECTRICAL**

September 30, 2021



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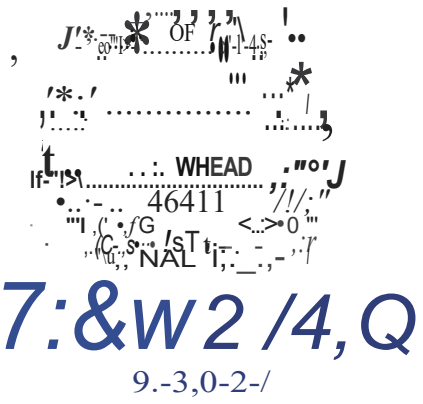


SECTION 00101
PROJECT TITLE PAGE

PROJECT MANUAL FOR:

SOUTHTON SERVCE CENTER
9874 Southton
SAN ANTONIO, TEXAS 78233

OWNER
Bexar County Public Works
1948 Probant Street
San Antonio, Texas 78214
210.335.0877

ARCHITECT
SLAY ARCHITECTURE
123 Altgelt Avenue
San Antonio, Texas 78201
210.736.3009

09/30/2021

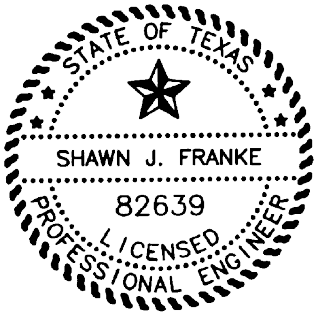
09/30/2021

and

99001 McPherson Drive, suite 104
Laredo, Texas 78045
956.791.0405

CIVIL
SLAY ENGINEERING CO., INC
123 Altgelt Ave
San Antonio, Texas 78201
210.734.4388
Contact: Roger Lawhead

09-30-2021



MECHANICAL, ELECTRICAL & PLUMBING
HMG Consulting Mechanical, & Electrical, & PLUMBING Engineers
8000 IH-10 West, Suite 1004
San Antonio, Texas 78230
210-349-0800

STRUCTURE
Lundy & Franke Engineering
528 Heimer
San Antonio, Texas, 78232
210-979-7900

LANDSCAPE
C2 Landgroup Inc.
301 East Cevallos
San Antonio, Texas, 78204

1. Limit disruption of utility services to hours the building is unoccupied.
2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days' notice notice to Owner and authorities having jurisdiction.
3. Prevent accidental disruption of utility services to other facilities.

1.06 WORK SEQUENCE

A. Coordinate construction schedule and operations with Owner.

END OF SECTION

SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Correlation of Contractor submittals based on changes.

E. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

1.03 SCHEDULE OF VALUES

A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.

C. Forms filled out by hand will not be accepted.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.

C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

D. Forms filled out by hand will not be accepted.

E. For each item, provide a column for listing each of the following:
   1. Item Number.
   2. Description of work.
   3. Scheduled Values.
   4. Previous Applications.
   5. Work in Place and Stored Materials under this Application.
   6. Authorized Change Orders.
   7. Total Completed and Stored to Date of Application.
   8. Balance to Finish.
   9. Retainage.

F. Execute certification by signature of authorized officer.

G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

H. Submit one electronic copy of each Application for Payment.

I. Include the following with the application:
   1. Transmittal letter as specified for submittals in Section 01 30 00.
   2. Construction progress schedule, revised and current as specified in Section 01 30 00.
   3. Partial release of liens from major subcontractors and vendors.
   4. Affidavits attesting to off-site stored products.

1.05 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.

B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
   1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
   2. Promptly execute the change.

C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within_____days.

D. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 01 6000.

E. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
   1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
   2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.

F. Substantiation of Costs: Provide full information required for evaluation.
   1. On request, provide the following data:
      a. Quantities of products, labor, and equipment.
      b. Taxes, insurance, and bonds.
      c. Overhead and profit.

G. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

H. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

I. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

J. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 70 00.

END OF SECTION

SECTION 01 21 00
ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Contingency allowance.

B. Inspecting and testing allowances.

1.02 RELATED REQUIREMENTS

1.03 CONTINGENCY ALLOWANCE

A. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.

B. Funds will be drawn from the Contingency Allowance only by Change Order.

C. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.04 INSPECTING AND TESTING ALLOWANCES

A. Costs Included in Inspecting and Testing Allowances: Cost of engaging an inspecting or testing agency; execution of inspecting and tests; and reporting results.

1.05 ALLOWANCES SCHEDULE

A. Contingency Allowance: Include the stipulated sum/price of $100,000 for use upon Owner's instructions.

B. Inspecting and Testing Allowance: Include the sum of $5,000 for payment of inspecting services specified in Section 01 40 00 - Quality Requirements.

C. HVAC Testing, Adjusting, and Balancing Allowance: Include the sum of $2,500 for testing, adjusting, and balancing mechanical systems as specified in Section 23 0583.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Preconstruction meeting.

C. Progress meetings.

D. Construction progress schedule.

E. Submittals for review, information, and project closeout.

F. Requests for Interpretation (RFI) procedures.

G. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 00 72 00 - General Conditions: Dates for applications for payment.

B. Section 01 60 00 - Product Requirements: General product requirements.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to Architect:
   1. Requests for Interpretation (RFI).
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.
   9. Coordination drawings.
   10. Correction Punch List and Final Correction Punch List for Substantial Completion.
   11. Closeout submittals.

1.04 PROJECT COORDINATOR

A. Project Coordinator: Construction Manager.

B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for sub-contractor access, traffic, and parking facilities.

C. During construction, coordinate use of site and facilities through the Project Coordinator.

D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 10 00 - Summary.

F. Coordinate field engineering and layout work under instructions of the Project Coordinator.

G. Make the following types of submittals to Architect through the Project Coordinator:

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

A. Schedule meeting after Notice of Award.

B. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor.

C. Agenda:
   1. Execution of Owner-Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.
   3. Distribution of Contract Documents.
   4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
   5. Designation of personnel representing the parties to Contract and Architect.
   6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   7. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.02 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.

B. Plan for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:
   1. Contractor.
   2. Owner.
   3. Architect.
   4. Contractor's superintendent.
   5. Major subcontractors.
      a. As requested.

D. Agenda:
   1. Review minutes of previous meetings.
   2. Review of work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems that impede, or will impede, planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Maintenance of progress schedule.
   7. Corrective measures to regain projected schedules.
   8. Planned progress during succeeding work period.
   9. Maintenance of quality and work standards.
   10. Effect of proposed changes on progress schedule and coordination.
   11. Other business relating to work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE

A. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

B. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.

C. Within 10 days after joint review, submit complete schedule.

D. Submit updated schedule with each Application for Payment.

3.04 REQUESTS FOR INTERPRETATION (RFI)

A. Definition: A request seeking one of the following:
   1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
   2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.
      a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
      b. Do not forward requests which solely require internal coordination between subcontractors.
   2. Prepare in a format and with content acceptable to Owner.
   3. Prepare using an electronic version of the form appended to this section.
   4. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
   1. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
      a. Approval of submittals (use procedures specified elsewhere in this section).
      b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
      c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
      d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).

E. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

F. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
   1. Indicate status of every RFI. Update log promptly and on a regular basis.
   2. Note dates of when each request is made, and when a response is received.
   3. Highlight items requiring priority or expedited response.
   4. Highlight items for which a timely response has not been received to date.

G. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.

3.05 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
   1. Submit at the same time as the preliminary schedule specified in Section - 01 32 16 - Construction Progress Schedule.
   2. Coordinate with Contractor's construction schedule and schedule of values.

3.06 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.07 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.
   7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.08 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Waivers and Conditional waivers prior to Retainage paymnebt of Liens
      a. by General Contractor.
      b. by Sub Contractors.
   6. Other types as indicated.

D. Final Property Survey.

E. Submit for Owner's benefit during and after project completion.

3.09 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Shop Drawings: See General Conditions

2. Product Data: See General Conditions
3. Samples: See General Conditions
4. Governmental Review Comments: Written comments and process stamps by authorized governmental representatives on or accompanying returned documents previously submitted for building permits, operating licenses, code or ordinance approvals or variances, or other similar or related governmental reviews or approvals.
5. "A ACTION": Fabrication, manufacture and/or construction may proceed, providing the Work is in accordance with all requirements of the Contract Documents. The Architect's final acceptance of the Work will be contingent upon such compliance.
6. "B ACTION": Fabrication, manufacture and/or construction may proceed. The Architect's final acceptance of the Work will be contingent upon compliance with all notations and all requirements of the Contract Documents.
7. "C ACTION": No work shall be fabricated, manufactured and/or constructed. The Contractor shall redraw and resubmit the Shop Drawings or other submittals to conform with all requirements of the Contract Documents. Resubmit to the Architect, until resubmission is not required. Submittals marked "C ACTION" are not permitted on the construction site.

B. Contractors Duties
1. Before submission of first submittals and prior to submission of first Application for Payment, submit Schedule of Submittals. List:
   a. Specification Section Number,
   b. Projected Date of Delivery to Architect,
   c. Date fabrication of items must begin to prevent delay in work schedule, and
   d. Subcontractor name and telephone number.
2. Submit shop drawings, product data, samples, and manufacturer's instruction within 45 days of the Contract Date.
3. Review and approve all material developed for submittal in compliance with Contract Documents. Determine and verify conformance of materials and submittals to requirements of Contract Documents.
   a. Where work is noted as "by others", indicate contractor or subcontractor providing that construction.
   b. Where dimensions are noted "field dimension", indicate whether dimension has been field verified and if not, Contractor or subcontractor responsible for the field verifications.
   c. By submitting Shop Drawings, Product Data and Samples to Architect/Engineer the Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto, or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.
4. Unless otherwise noted in the individual specification section, submittals shall contain:
   a. Date of Submission and previous submission dates if applicable
   b. Project Title and Number.
   c. Name of Contractor.
   d. Name of Supplier and Manufacturer.
   e. Identification of product by specification section number.
   f. Field dimensions clearly indicated as such.
   g. Identification of deviations from the Contract Documents.
   h. Emphasize deviations by "clouding" around deviations with felt tip "Highlighter" pen in color sharply contrasting with submittal. Provide written commentary explaining reasons for deviations.
   i. Contractor's stamp, initialed or signed, certifying review of submittal, coordination and compliance with the requirements of the Work.

5. Deliver submittal material developed to Architect/Engineer for proper distribution and review.
6. Submit with reasonable promptness and in such sequence as to cause no delay in the in the work of the Owner or any Separate Contractor, all Shop Drawings, Product Data and Samples required by the Contract Documents.
7. Transmit each item under Architect/Engineer accepted form.
8. Submit construction schedule and schedule of values within 15 days after date of Owner-Contractor Agreement. After review by Architect/Engineer, revise and resubmit as required. Schedule of Values shall be used as a basis for the Contractor's Application for Payment.
9. Comply with progress schedule for submittals and related Work progress. Coordinate submittal of related items.
10. Coordinate submittals with requirements of Work and of Contract Documents
11. Sign or initial cover sheet of each shop drawing or product data submittal, and each sample label to certify contractor's review of submittals and compliance with requirements of Contract Documents.
12. After Architect/Engineer review of submittal, revise and resubmit as required, identifying changes made since previous submittal.
13. Reproduce and distribute copies of reviewed submittals to concerned parties. Instruct recipients to promptly report deficiencies or conditions which prevent compliance.
14. Do not fabricate products or begin work which requires submittals until return of submittal with Architect/Engineer acceptance, then complete work in accordance with accepted submittals.
15. The Contractor shall not be relieved from responsibility for errors or omissions in the Shop Drawings, Product Data or Samples by the Architect/Engineer's acceptance thereof. Architect/Engineer's review of Contractor's shop drawings is an aid to the Contractor to ensure Contractor correctly interpreted the Contract Documents and understands what is required by them.

C. Architects Duties
1. Receive and log submittals from Contractor.
2. Receive and log reviewed submittals from Engineer.
3. Review Architectural submittals after receipt from Contractor for conformance with submission requirements. Return non-conforming submittals to Contractor without review for resubmission in conformance with requirements.
4. Review Architectural submittals with reasonable promptness. Indicate modifications required, if any.
5. Affix stamp and initial or sign and indicated requirement for resubmittal or acceptance of submittal and return to Contractor.
6. Notify Contractor that submittal is ready for pick-up, for distrubution, or revision and resubmission.

D. Engineers Duties
1. Review Engineering submittals after receipt from Architect for conformance with submission requirements. Return non-conforming submittals to Architect without review for resubmission in conformance with requirements.
2. Review Engineering submittals with reasonable promptness. Indicate modifications required, if any.
3. Affix stamp and initial or sign and indicate requirements for resubmittal or acceptance of submittal and return to Architect.

E. Resubmittals
1. Make resubmittals under procedures for initial submittals; identify changes made since previous submittals.

3.10 SHOP DRAWINGS

A. Unless otherwise noted in the specifications, submit in the form of one (1) electronic copy or four (4) opaque reproductions (Hardcopy). Opaque reproductions will be retained by the Architect/Engineer. After review, reproduce and distribute in accordance with requirements in Contractor's Duties above.
   1. File one copy of shop drawings in Project Record Documents file for transmittal to Owner at completion of project. See Section 01700 for additional information.
   2. Both electronic and hardcopies shall have General Contractor's review comments on them.

B. Present in a clear and thorough manner. Title each drawing with Project name; identify each element of drawings by reference to sheet number and detail, schedule, or room number of Contract Documents.

C. Identify field dimensions; show relation to adjacent or critical features for Work or products.

D. Action on Architectural Shop Drawings:
   1. Shop Drawings which are reviewed with no corrections will be stamped "A ACTION". The Architect will return one stamped reproducible transparency to the Contractor shall be responsible for reproducing and distributing them as necessary.
   2. Shop Drawings which have been reviewed and require only minor corrections will be stamped "B ACTION". The Architect will return one stamped reproducible transparency to the Contractor who shall be responsible for reproducing and distribution them as necessary.
   3. Shop Drawings which have been reviewed and rejected will be stamped "C ACTION".
   4. If the Shop Drawings are stamped "C ACTION", the Architect will return two stamped copies, one opaque and one transparent, to the Contractor. The Contractor shall resubmit revised shop drawings to the Architect until "A ACTION" or "B ACTION" has been indicated as described above.

E. Action on Engineering Shop Drawings: As above, unless otherwise indicated in the specification.

3.11 PRODUCT DATA

A. Unless otherwise noted in the specifications, submit four copies; two copies will be retained by the Architect/Engineer.

B. Mark each copy to identify applicable products, models, options, and other data; supplement manufacturer's standard data to provide information unique to the Work.

C. Submit only pages which are pertinent, referenced to specification Section and Article number. Show reference standards, performance characteristics, and capacities, wiring and piping diagrams and controls, component parts, finishes, dimensions, and required clearances.

D. Modify manufacturer’s standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the Work. Delete information not applicable.

E. Action on Architectural Product Data Literature:
   1. Product Data which has been reviewed and results in no corrections will be stamped "A ACTION". The Architect/Engineer will return two stamped copies to the Contractor. The contractor shall be responsible for reproducing and distributing copies as necessary.
   2. Product Data which is reviewed and requires only minor corrections will be stamped "B ACTION".
   3. Product Data which has been reviewed and rejected will be stamped "C ACTION".
   4. If stamped "C ACTION", the Architect/Engineer will return two stamped copies to the Contractor. The Contractor shall resubmit new information to the Architect/Engineer until "A ACTION" or "B ACTION" has been indicated as described above.

3.12 SAMPLES

A. Unless otherwise indicated in individual specification sections, submit two sets of samples.

B. Submit full range of manufacturer's standard colors, textures, and patterns for Architect/Engineer's selection.

C. Submit samples to illustrate functional characteristics of the product, with integral parts and attachment devices. Illustrate color range by bracketing with number of samples required to fully describe range to be supplied.Submit samples to illustrate functional characteristics of the product, with integral parts and

D. Coordinate submittals of different sections for interfacing work.

E. One set of samples will be returned to the Contractor and one set will be retained by Architect/Engineer.

F. Action on Architectural Samples:
   1. Samples which are reviewed with no corrections will be stamped "A ACTION". The Architect will return one stamped Sample to the Contractor.
   2. Samples which are reviewed and returned for corrections as noted, and subsequent resubmittal, will be stamped "B ACTION".
   3. Samples which are reviewed and rejected because they do not comply with the requirements will be marked "C ACTION".
   4. If the Samples are stamped "B ACTION" or "C ACTION", the Architect will return one stamped Sample to the Contractor. The Contractor shall resubmit two new sets of Samples until "A ACTION has been indicated as described above

END OF SECTION

SECTION 01 35 53
SECURITY PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Security measures including personnel identification and miscellaneous restrictions.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: use of premises and occupancy.

1.03 SECURITY PROGRAM

A. Protect Work , existing premises and Owner's operations from theft, vandalism, and unauthorized entry.

1.04 PERSONNEL IDENTIFICATION

A. Provide identification badge to each person authorized to enter premises.

B. Badge To Include: Personal photograph, name, assigned number , expiration date and employer.

C. Require return of badges at expiration of their employment on the Work.

1.05 RESTRICTIONS

A. Do no work on Sundays.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. References and standards.

D. Testing and inspection agencies and services.

E. Control of installation.

F. Mock-ups.

G. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Section 01 21 00 - Allowances: Allowance for payment of testing services.

B. Section 01 30 00 - Administrative Requirements: Submittal procedures.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.

1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

D. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.

1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

1.04 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ services of an independent testing agency to perform certain specified testing; payment for cost of services will be derived from allowance specified in Section 01 21 00; see Section 01 21 00 and applicable sections for description of services included in allowance.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 3 EXECUTION

2.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step-in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

202 MOCK-UPS

A. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Architect will use accepted mock-ups as a comparison standard for the remaining Work.

D. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

203 TESTING AND INSPECTION

A. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
   5. Perform additional tests and inspections required by Architect.
   6. Submit reports of all tests/inspections specified.

B. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

C. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel and provide access to the Work and to manufacturers' facilities.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.

5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

204 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary sanitary facilities.

C. Temporary Controls: Barriers, enclosures, and fencing.

D. Security requirements.

E. Vehicular access and parking.

F. Waste removal facilities and services.

G. Project identification sign.

1.02 RELATED REQUIREMENTS

A. Section 01 51 00 - Temporary Utilities.

B. Section 01 55 00 - Vehicular Access and Parking.

1.03 TEMPORARY UTILITIES - SEE SECTION 01 51 00

A. Owner will provide the following:
   1. Electrical power, consisting of connection to existing facilities.
   2. Water supply, consisting of connection to existing facilities.

1.04 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.05 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 SECURITY - SEE SECTION 01 35 53

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.07 VEHICULAR ACCESS AND PARKING - SEE SECTION 01 55 00

A. Coordinate access and haul routes with governing authorities and Owner.

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.08 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site periodically.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.09 PROJECT IDENTIFICATION

A. Provide project identification sign of design and construction indicated on drawings.

B. Erect on site at location indicated.

C. No other signs are allowed without Owner permission except those required by law.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Re-use of existing products.

B. Transportation, handling, storage, and protection.

C. Product option requirements.

D. Substitution limitations.

E. Procedures for Owner-supplied products.

F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01 25 00 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

B. Section 01 40 00 - Quality Requirements: Product quality monitoring.

C. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

D. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging, and substitutions.

1.03 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. See Section 01 40 00 - Quality Requirements, for additional source quality control requirements.

C. Use of products having any of the following characteristics is not permitted:
   1. Made using or containing CFC's or HCFC's.
   2. Made of wood from newly cut old growth timber.
   3. Containing lead, cadmium, or asbestos.

D. Where other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 61 16.

2. If wet-applied, have lower VOC content, as defined in Section 01 61 16.

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 01 25 00 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

A. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:
   1. Review Owner reviewed shop drawings, product data, and samples.
   2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
   3. Handle, store, install and finish products.
   4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

G. Comply with manufacturer's warranty conditions, if any.

H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

I. Prevent contact with material that may cause corrosion, discoloration, or staining.

J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Cutting and patching.

C. Surveying for laying out the work.

D. Cleaning and protection.

E. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

F. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 30 00 - Administrative Requirements: Submittals procedures, electronic document submittal service..

C. Section 07 84 00 - Firestopping.

1.03 QUALIFICATIONS

A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

1.04 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

C. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

D. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

1. At All Times: Excessively noisy tools and operations will not be tolerated inside the building at any time of day; excessively noisy includes jackhammers.

1.05 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or mis-fabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

F. Utilize recognized engineering survey practices.

G. Establish elevations, lines, and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

H. Periodically verify layouts by same means.

I. Maintain a complete and accurate log of control and survey work as it progresses.

3.04 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-complying work.

C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

F. Restore work with new products in accordance with requirements of Contract Documents.

G. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of the penetrated element.

I. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.06 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.07 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.08 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

B. Testing, adjusting, and balancing HVAC systems: See Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.

3.09 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Clean filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, drainage systems, and_____.

G. Clean site: sweep paved areas, rake clean landscaped surfaces.

H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.10 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.11 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Materials transparency manual.

D. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Individual Product Sections: Specific requirements for operation and maintenance data.

C. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   2. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   3. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Materials Transparency Manual:
   1. Compile and submit a digital and a printed version of information disclosing materials content for interior finishes, furnishings (including workstations), built-in furniture. Meet IWBI (BS) requirements for format and content.

D. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 3 EXECUTION

2.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Addenda.
   3. Change Orders and other modifications to the Contract.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Record Drawings: Legibly mark each item to record actual construction including:
   1. Field changes of dimension and detail.
   2. Details not on original Contract drawings.

202 OPERATION AND MAINTENANCE DATA

A. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

B. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

C. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

203 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 - inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of built site elements.

B. Selective demolition of building elements for alteration purposes.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.

B. Section 01 10 00 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

C. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

D. Section 01 60 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.

E. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of benchmarks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

1.03 DEFINITIONS

A. Demolition: Dismantle, raze, destroy, or wreck any building or structure or any part thereof.

B. Remove: Detach or dismantle items from existing construction and dispose of them off site unless items are indicated to be salvaged or reinstalled.

C. Remove and Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition.

D. Remove and Reinstall: Detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.

E. Existing to Remain: Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.04 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Site Plan: Indicate:
   1. Areas for temporary construction and field offices.

C. Demolition Plan: Submit demolition plan as required by OSHA and local AHJs.
   1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.

D. Demolition firm qualifications.

E. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 3 EXECUTION

201 DEMOLITION

A. Remove other items indicated, for salvage, relocation, and recycling.

202 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Comply with applicable requirements of NFPA 241.
   3. Use of explosives is not permitted.
   4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   5. Provide, erect, and maintain temporary barriers and security devices.
   6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   8. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
   9. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
   10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Do not begin removal until built elements to be salvaged or relocated have been removed.

D. Protect existing structures and other elements to remain in place and not removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

E. Hazardous Materials:
   1. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.

203 EXISTING UTILITIES

A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

204 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
   1. Verify construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Remove existing work as indicated and required to accomplish new work.
   1. Remove items indicated on drawings.

C. Services including, but not limited to, HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications: Remove existing systems and equipment as indicated.
   1. Maintain existing active systems to remain in operation and maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.
   4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.

D. Protect existing work to remain.
   1. Prevent movement of structure. Provide shoring and bracing as required.
   2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch to match new work.

205 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire retardant treated wood materials.

B. Concealed wood blocking, nailers, and supports.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

B. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2018, with Errata (2019).

C. AWPA U1 - Use Category System: User Specification for Treated Wood; 2023.

D. PS 20 - American Softwood Lumber Standard; 2021.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide technical data on insulated sheathing, wood preservative materials, and application instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
   2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Sizes: Nominal sizes as indicated on drawings, S4S.

B. Moisture Content: S-dry or MC19.

2.03 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
   2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
   3. Anchors: Toggle bolt type for anchorage to hollow masonry.

2.04 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.

B. Fire Retardant Treatment:
   1. Products:
      a. Koppers, Inc; FlamePRO: www.koppersperformancechemicals.com/#sle.
      b. Viance, LLC; D-Blaze: www.treatedwood.com/#sle.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 PREPARATION

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices unless otherwise specifically detailed.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes, AWC (WFCM) Wood Frame Construction Manual, and_____.

E. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

F. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

C. Provide the following specific nonstructural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.
   6. Wall-mounted door stops.
   7. Chalkboards and marker boards.

8. Wall paneling and trim.
9. Joints of rigid wall coverings that occur between studs.

3.05 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.06 CLEANING

A. Waste Disposal: See Section 01 74 19 - Construction Waste Management and Disposal.
1. Comply with applicable regulations.
2. Do not burn scrap on project site.
3. Do not burn scraps that have been pressure treated.
4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation and integral vapor retarder at cavity wall construction, perimeter foundation wall, underside of floor slabs, over roof deck, over roof sheathing, exterior wall behind _____wall finish, and interior wall with facer providing exposed finish.

B. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 REFERENCE STANDARDS

A. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

C. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2022.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1.04 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation in Metal Framed Walls: Batt insulation with integral vapor retarder.

B. Insulation Above Lay-In Acoustical Ceilings: Batt insulation with no vapor retarder.

2.02 MINERAL FIBER BOARD INSULATION MATERIALS

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS

A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
   1. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   2. Thermal Resistance:
      a. Walls R-value of 19.
      b. Roof: R-value of 38.
   3. Facing: Aluminum foil, flame spread 25 rated; one side.
   4. Products:
      a. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Mineral Wool Blanket Thermal Insulation: Flexible or semi-rigid preformed insulation, complying with ASTM C665.

1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
3. Provide foil facing on one side, at locations indicated on drawings.
4. Products:
    a. Johns Manville; MinWool Sound Attenuation Fire Batts: www.jm.com/#sle.
    b. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

A. Wire Mesh: Galvanized steel, hexagonal wire mesh.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Install with factory-applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.

F. Retain insulation batts in place with wire mesh secured to framing members.

G. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

3.03 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, and exterior penetrations.

B. Precast concrete splash pads.

1.02 RELATED REQUIREMENTS

A. Section 07 71 23 - Manufactured Gutters and Downspouts.

1.03 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.

D. CDA A4050 - Copper in Architecture - Handbook; current edition.

E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Samples: Submit two samples, 2 by 2 inches in size, illustrating metal finish color.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sheet Metal Flashing and Trim:
   1. Substitutions: See Section 01 60 00 - Product Requirements.

B. Exterior Penetration Flashing Panel:
   1. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SHEET MATERIALS

A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal, shop pre-coated with PVDF coating.
   1. Fluoropolymer Coating: High performance organic powder coating, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
   2. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
   3. Color: As selected by Architect from manufacturer's standard colors.

203 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.

F. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

204 GUTTERS AND DOWNSPOUTS

A. See Section 07 71 23 for manufactured gutters and downspouts.

B. Gutters: SMACNA (ASMM) Rectangular profile.

C. Downspouts: Rectangular profile.

D. Gutters and Downspouts: Size for rainfall intensity determined by a storm occurrence of 1 in 10 years in accordance with SMACNA (ASMM).

E. Splash Pads: Precast concrete type, of size and profiles indicated; minimum 3,000 psi at 28 days, with minimum 5 percent air entrainment.

F. Seal metal joints.

END OF SECTION

SECTION 07 71 23
MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-finished galvanized steel gutters and downspouts.

1.02 RELATED REQUIREMENTS

A. Section 07 62 00 - Sheet Metal Flashing and Trim.

1.03 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.

C. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Comply with SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.

B. Comply with applicable code for size and method of rain water discharge.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Samples: Submit two samples, 6 inch long illustrating component design, finish, color, and configuration.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

B. Prevent contact with materials that could cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gutters and Downspouts:
   1. Hickman Edge Systems; Box Gutter: www.hickmanedgesystems.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Pre-Finished Galvanized Steel Sheet: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch thick base metal.
   1. Finish: Shop pre-coated with modified silicone coating.
   2. Color: As selected by Architect from manufacturer's standard colors.

2.03 COMPONENTS

A. Gutters: CDA rectangular style profile.

B. Downspouts: CDA rectangular profile.

C. Anchors and Supports: Profiled to suit gutters and downspouts.
   1. Anchoring Devices: In accordance with CDA requirements.

2. Gutter Supports: Brackets.
3. Downspout Supports: Brackets.

D. Fasteners: Galvanized steel, with soft neoprene washers.

2.04 FABRICATION

A. Form gutters and downspouts of profiles and size indicated.

B. Fabricate with required connection pieces.

C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

D. Hem exposed edges of metal.

E. Fabricate gutter and downspout accessories; seal watertight.

2.05 FINISHES

A. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604, multiple coat, thermally cured fluoropolymer finish system; color as indicated.

2.06 ACCESSORIES

A. Splash Pans: Same metal type as downspouts, formed to 8 by 16 inches size; rolled sides ____ inch high for inverted pan placement.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that surfaces are ready to receive work.

3.02 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.

B. Sheet Metal: Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.

C. Slope gutters 1/16 inch per foot .

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS - DOW SILICONES CORPORATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 09 30 00 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data for Joint Sealants: Submit manufacturer's technical datasheets for each product to be used, and include the following:

1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
2. List of backing materials approved for use with the specific product.
3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
4. Substrates that product is not compatible with.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Joint Sealants:

1. Substitutions: Not permitted.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:

2.03 JOINT SEALANTS - GENERAL

END OF SECTION

SECTION 07 95 13
EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Expansion joint cover assemblies for floor, wall, ceiling, and soffit surfaces.

1.02 RELATED REQUIREMENTS

A. Section 07 62 00 - Sheet Metal Flashing and Trim: Roof expansion and control joint covers.

B. Section 07 92 00 - Joint Sealants: Sealing expansion and control joints using gunnable and pourable sealants.

C. Section 09 21 16 - Gypsum Board Assemblies: Placement of expansion joint assemblies in gypsum board walls and ceilings.

D. Section 09 51 00 - Acoustical Ceilings: Expansion joint assemblies in suspended ceiling grids.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

C. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2020.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.

C. Samples: Submit two samples 6 inch long, illustrating profile, dimension, color, and finish selected.

D. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Expansion Joint Cover Assemblies:
   1. Balco, Inc; HDNB – Smooth Heavy Duty: www.balcousa.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 EXPANSION JOINT COVER ASSEMBLY APPLICATIONS

A. Interior Floor Joints Subject to Thermal Movement:
   1. Manufacturers:
      a. Balco, Inc; No-Bump Floor to Floor System, Aluminum (NBAF): www.balcousa.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Interior Wall/Ceiling Joints Subject to Thermal Movement:
   1. Manufacturers:
      a. Balco, Inc; WD Wall and Ceiling Snap-On Joint Cover: www.balcousa.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

C. Exterior Wall Joints Subject to Thermal Movement:
   1. Manufacturers:
      a. Balco, Inc; Exterior Wall, Elastomeric Face Seal System (FCWW): www.balcousa.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 EXPANSION JOINT COVER ASSEMBLIES

A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.
   1. Joint Dimensions and Configurations: As indicated on drawings.
   2. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
   3. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
   4. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.

B. Floor Joint Covers: Coordinate with indicated floor coverings.

C. Covers in Gypsum Board Assemblies: Provide style with anchoring wings that can be completely covered by joint compound.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper; or ASTM B308/B308M, 6061 alloy, T6 temper.
   1. Exposed Finish Outdoors: Natural anodized.

B. Resilient Seals:
   1. For Ceilings: Any resilient material, flush, pleated, or hollow gasket.

C. Anchors and Fasteners: As recommended by cover manufacturer.

D. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

3.02 INSTALLATION

A. Install components and accessories in accordance with manufacturer's instructions.

B. Align work plumb and level, flush with adjacent surfaces.

C. Rigidly anchor to substrate to prevent misalignment.

3.03 PROTECTION

A. Do not permit traffic over unprotected floor joint surfaces.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Thermally insulated hollow metal doors with frames.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware.

1.03 ABBREVIATIONS AND ACRONYMS

A. ANSI: American National Standards Institute.

B. NAAMM: National Association of Architectural Metal Manufacturers.

C. NFPA: National Fire Protection Association.

D. SCIF: Sensitive Compartmented Information Facility.

E. SDI: Steel Door Institute.

F. UL: Underwriters Laboratories.

1.04 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2022.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021a.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.

H. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

I. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2017.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
   3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
   4. Door Edge Profile: Manufacturers standard for application indicated.
   5. Typical Door Face Sheets: Flush.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.
      e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
   2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
   3. Door Thickness: 1-3/4 inches, nominal.
   4. Top Closures for Outswinging Doors: Flush with top of faces and edges.
   5. Door Face Sheets: Flush.
   6. Weatherstripping: Refer to Section 08 71 00.
   7. Door Finish: Factory primed and field finished.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Frame Finish: Factory primed and field finished.

C. Exterior Door Frames: Face welded type.

1. Frame Finish: Factory primed and field finished.
2. Weatherstripping: Separate, see Section 08 71 00.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

A. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Coordinate frame anchor placement with wall construction.

C. Install door hardware as specified in Section 08 71 00.

3.04 TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

END OF SECTION

SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush and flush glazed configuration; non-rated.

1.02 RELATED REQUIREMENTS

A. Section 08 11 13 - Hollow Metal Doors and Frames.

B. Section 08 71 00 - Door Hardware.

C. Section 08 80 00 - Glazing.

D. Section 09 93 00 - Staining and Transparent Finishing: Field finishing of doors.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging, and inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:
   1. Haley Brothers;_____: www.haleybros.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DOORS AND PANELS

A. Doors: See drawings for locations and additional requirements.
   1. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at each location.
   2. Wood veneer facing for field transparent finish as indicated on drawings.

2.03 DOOR AND PANEL CORES

A. Core for Low Pressure Decorative Laminate (LPDL), Non-Rated and 20 Minute Rated Doors: ANSI A208.1 Grade M-2 particleboard, minimum, with no seams on faces; edges reinforced as required to pass performance grade specified.

2.04 DOOR FACINGS

A. Veneer Facing for Transparent Finish: Red oak, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
   1. Vertical Edges: Any option allowed by quality standard for grade.
   2. "Running Match" each pair of doors and doors in close proximity to each other.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

C. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

D. Provide edge clearances in accordance with the quality standard specified.

2.06 FINISHES - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Stain: As selected by Architect.
      c. Sheen: Flat.

B. Seal door top edge with color sealer to match door facing.

2.07 ACCESSORIES

A. Hollow Metal Door Frames: See Section 08 12 13.

B. Glazing: See Section 08 80 00.

C. Door Hardware: See Section 08 71 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

3.03 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION

SECTION 08 51 13
ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extruded aluminum windows with operating sash.

B. Factory glazing.

C. Operating hardware.

D. Insect screens.

1.02 RELATED REQUIREMENTS

A. Section 07 25 00 - Weather Barriers: Sealing frame to water-resistive barrier installed on adjacent construction.

B. Section 08 80 00 - Glazing.

1.03 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights; 2022.

B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Include component dimensions, information on glass and glazing, internal drainage details, and descriptions of hardware and accessories.

C. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
   1. Evidence of AAMA Certification.
   2. Evidence of WDMA Certification.
   3. Evidence of CSA Certification.
   4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.

1.05 FIELD CONDITIONS

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Manufacturer Warranty: Provide 5-year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum Windows Manufacturers:
   1. Arcadia, Inc; ULT 500: www.arcadiainc.com/#sle.
   2. Winco Window Company, Inc Series 3600: www.wincowindow.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

202 BASIS OF DESIGN - AW PERFORMANCE CLASS WINDOWS

A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 having Performance Class of AW, and Performance Grade at least as high as specified design pressure.

B. Horizontal Sliding; with Matching Fixed Units:
   1. Basis of Design: Boyd Aluminum; Series 950 Horizontal Slider, 4 inch deep frame, Thermally Broken: www.boydaluminum.com/#sle.

C. Substitutions: See Section 01 60 00 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

203 ALUMINUM WINDOWS

A. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with operating hardware, related flashings, and anchorage and attachment devices.
   1. Frame Depth: 3-1/2 inch.
   2. Operable Units: Double weatherstripped.
   3. Provide factory-glazed units.
   4. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.
   5. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   6. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
   7. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

B. Horizontal Sliding Type:
   1. Construction: Thermally broken.
   2. Provide screens.
   3. Glazing: Double; bronze tinted; low-e.
   4. Exterior Finish: Class I natural anodized.
   5. Interior Finish: Class I natural anodized.

204 COMPONENTS

A. Frames: 3-1/2 inch wide by 3-1/2 inch deep profile, of 2-7/8 inch thick section; thermally broken with interior portion of frame insulated from exterior portion; flush glass stops of snap-on type.

B. Sills: 3-1/2 inch thick, extruded aluminum; sloped for positive wash; fit under sash leg to 1/2 inch beyond wall face; one piece full width of opening; jamb angles to terminate sill end.

C. Insect Screens: Extruded aluminum frame with mitered and reinforced corners; screen mesh taut and secure to frame; secured to window with adjustable hardware allowing screen removal without use of tools.
   1. Hardware: Spring loaded steel pins; four per screen unit.
   2. Screen Mesh: Vinyl-coated fiberglass, window manufacturer's standard mesh.
   3. Frame Finish: Same as frame and sash.

D. Operable Sash Weatherstripping: Wool pile; permanently resilient, profiled to achieve effective weather seal.

E. Fasteners: Stainless steel.

F. Glazing Materials: See Section 08 80 00.

G. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

2.05 HARDWARE

A. Sash lock: Lever handle with cam lock.

B. Operator: Lever action handle fitted to projecting sash arms with limit stops.

C. Pulls: Manufacturer's standard type.

D. Bottom Rollers: Stainless steel, adjustable.

E. Limit Stops: Resilient rubber.

2.06 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41, clear anodic coating not less than 0.7 mil thick.

B. Class II Natural Anodized Finish: AAMA 611 AA-M12C22A31, clear anodic coating not less than 0.4 mil thick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings and adjoining water-resistive barrier materials are ready to receive aluminum windows; see Section 07 25 00.

3.02 PRIME WINDOW INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

D. Install sill and sill end angles.

E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

F. Install operating hardware not pre-installed by manufacturer.

G. Install glass and infill panels in accordance with requirements; see Section 08 80 00.

3.03 TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

3.04 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

3.05 CLEANING

A. Remove protective material from factory finished aluminum surfaces.

B. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.

C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

D. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

END OF SECTION

SECTION 08 80 00
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing compounds.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealants for other than glazing purposes.

B. Section 08 11 13 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

C. Section 08 14 16 - Flush Wood Doors: Glazed lites in doors.

D. Section 08 51 13 - Aluminum Windows: Glazing provided by window manufacturer.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).

E. ASTM C1036 - Standard Specification for Flat Glass; 2021.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

G. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.

H. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

I. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

J. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2020.

K. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2020.

L. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2023.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Extra Insulating Glass Units: One of each glass size and each glass type.

1.05 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Fabricators:
1. Viracon, Inc: www.viracon.com/#sle.
2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Float Glass Manufacturers:
1. Vitro Architectural Glass (formerly PPG Glass);_____: www.vitroglazings.com/#sle.
2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
1. Design Pressure: Calculated in accordance with ASCE 7.
2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
4. Glass thicknesses listed are minimum.

B. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
3. Impact Resistant Safety Glass: Complies with ANSI Z97.1 - Class B, or 16 CFR 1201 - Category I criteria.
4. Tinted Type: ASTM C1036, Class 2 - Tinted, Quality - Q3, with color and performance characteristics as indicated.

2.04 INSULATING GLASS UNITS

A. Manufacturers:

1. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fabricator: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.

C. Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
3. Spacer Color: Bronze.
4. Edge Seal:
   a. Single-Sealed System: Provide silicone, polysulfide, or polyurethane sealant as seal applied around perimeter.
   b. Color: Black.
5. Purge interpane space with dry air, hermetically sealed.

D. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.
1. Applications: Exterior glazing unless otherwise indicated.
2. Space between lites filled with air.
3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
   a. Tint: Clear.
4. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
   a. Tint: Clear.
5. Total Thickness: 1 inch.
6. Thermal Transmittance (U-Value), Summer - Center of Glass:_____, nominal.

205 BASIS OF DESIGN - INSULATING GLASS UNITS

A. Basis of Design - Insulating Glass Units: Vision glazing, with low-e coating.
1. Applications: Exterior insulating glass glazing unless otherwise indicated.
2. Space between lites filled with air.
3. Total Thickness: 1 inch.
4. Thermal Transmittance (U-Value), Summer - Center of Glass:_____, nominal.
5. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
6. Spacer Color: Black.
7. Edge Seal:
8. Color: Black.
9. Purge interpane space with dry air, hermetically sealed.

206 GLASS COATINGS

A. Solar Control Coating: Two-component, metal-oxide nano-particles with 5 percent solids content, minimum.
1. Application: Locations as indicated on drawings.
2. Color: Clear, fade resistant.
3. Dry Film Thickness: 10 microns, bubble and crack resistant.

207 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Acoustic insulation.

D. Cementitious backing board.

E. Gypsum wallboard.

F. Joint treatment and accessories.

G. Textured finish system.

1.02 RELATED REQUIREMENTS

A. Section 07 21 00 - Thermal Insulation: Acoustic insulation.

B. Section 09 22 16 - Non-Structural Metal Framing.

C. Section 09 30 00 - Tiling: Tile backing board.

1.03 REFERENCE STANDARDS

A. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.

B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).

C. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2018.

D. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2019.

E. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.

F. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020.

G. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

H. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2023.

I. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units; 2022, with Editorial Revision (2023).

J. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

K. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

L. GA-216 - Application and Finishing of Gypsum Panel Products; 2021.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of gypsum board assemblies with size, location, and installation of service utilities.

B. Sequencing: Install service utilities in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Provide data on metal framing, gypsum board, accessories, and joint finishing system.

C. Samples: Submit two samples of predecorated gypsum board, 12 by 12 inches in size, indicating finish color and texture.

D. Steel Framing Industry Association (SFIA) Certification:
   1. Submit documentation that metal studs and connectors used on project meet or exceed requirements of International Building Code.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

B. Store metal products to prevent corrosion.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.
   1. See PART 3 for finishing requirements.

2.02 METAL FRAMING MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.

B. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. ClarkDietrich;_____: www.clarkdietrich.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

C. Nonstructural Framing System Components: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.
   1. Studs: C-shaped with knurled or embossed faces.
   2. Runners: U shaped, sized to match studs.
   3. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.

D. Non-structural Framing Accessories:

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. Gold Bond Building Products, LLC provided by National Gypsum Company;_____: www.goldbondbuilding.com/#sle.
   2. USG Corporation;_____: www.usg.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
      a. Mold resistant board is required at all locations.
   3. Thickness:
      a. Vertical Surfaces: 5/8 inch.
   4. Paper-Faced Products:

a. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond Fire-Shield C 5/8" Gypsum Board: www.goldbondbuilding.com/#sle.

5. Mold-Resistant, Paper-Faced Products:
   a. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Gypsum Board: www.goldbondbuilding.com/#sle.

C. Backing Board For Wet Areas: One of the following products:
   1. Application: Surfaces behind tile in wet areas including restrooms.
   2. Application: Horizontal surfaces behind tile in wet areas including countertops.
   3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
      a. Thickness: 1/2 inch.
      b. Products:
         1) USG Corporation; Fiberock Brand Aqua-Tough AR Interior Panels Regular 1/4 in. (6.4 mm): www.usg.com/#sle.
         2) Substitutions: See Section 01 60 00 - Product Requirements.

D. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
   1. Application: Vertical surfaces behind thinset tile, except in wet areas.
   2. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   3. Type: Regular and Type X, in locations indicated.
   4. Type X Thickness: 5/8 inch.
   5. Regular Board Thickness: 1/2 inch.
   6. Edges: Tapered.
   7. Products:
      a. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Fire-Shield Gypsum Board: www.goldbondbuilding.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 GYPSUM BOARD ACCESSORIES

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C1007AISI S220 and manufacturer's instructions.

B. Studs: Space studs at 16 inches on center.
   1. Extend partition framing to structure where indicated and to ceiling in other locations.
   2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.

C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

D. Blocking: Install mechanically fastened steel channel blocking for support of:
   1. Framed openings.
   2. Toilet accessories.
   3. Wall-mounted door hardware.

3.03 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

D. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations indicated on drawings. Provide vent area specified.

3.05 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
   2. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.

C. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.06 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.07 CLEANING

A. Clean_____.

3.08 PROTECTION

A. Protect installed gypsum board assemblies from subsequent construction operations.

END OF SECTION

SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal partition, ceiling, and soffit framing.

B. Framing accessories.

1.02 RELATED REQUIREMENTS

A. Section 05 40 00 - Cold-Formed Metal Framing: Execution requirements for anchors for attaching work of this section.

B. Section 07 62 00 - Sheet Metal Flashing and Trim: Head and sill flashings.

C. Section 08 31 00 - Access Doors and Panels.

D. Section 08 51 13 - Aluminum Windows: Product requirements for window anchors.

E. Section 09 21 16 - Gypsum Board Assemblies: Metal studs for gypsum board partition framing.

F. Section 09 21 16 - Gypsum Board Assemblies: Execution requirements for anchors for attaching work of this section.

1.03 REFERENCE STANDARDS

A. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.

C. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

D. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing, Connectors, and Accessories:
   1. ClarkDietrich;_____: www.clarkdietrich.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FRAMING MATERIALS

A. Loadbearing Studs: As specified in Section 05 40 00.

B. Non-Loadbearing Framing System Components: AISI S220; sheet steel, of size and properties necessary for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
   1. Studs: C-shaped with flat faces.
      a. Products:
         1) ClarkDietrich; ProSTUD: www.clarkdietrich.com/#sle.
         2) Substitutions: See Section 01 60 00 - Product Requirements.
   2. Runners: U-shaped, sized to match studs.
   3. Ceiling Channels: C-shaped.

C. Partition Head to Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and braced with continuous bridging on both sides.

D. Non-Loadbearing Framing Accessories:
   1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
   2. Bracing and Bridging: ASTM A653/A653M G90 galvanized steel; for lateral bracing of wall studs with slots for engaging on-module studs.
      a. Products:
         1) Simpson Strong-Tie; DBR Drywall Spacer Bracer: www.strongtie.com/#sle.
         2) Substitutions: See Section 01 60 00 - Product Requirements.
   3. Framing Connectors: ASTM A653/A653M steel clips; secures cold rolled channel to wall studs for lateral bracing.
      a. Products:
         1) ClarkDietrich; FastBridge Clip (FB33): www.clarkdietrich.com/#sle.
   4. Flexible Wood Backing: Fire-retardant-treated wood with sheet steel connectors.
      a. Products:
         1) ClarkDietrich; Danback: www.clarkdietrich.com/#sle.
   5. Fasteners: ASTM C1002 self-piercing self-tapping screws.

2.03 FABRICATION

A. Fabricate assemblies of framed sections to sizes and profiles required.

B. Fit, reinforce, and brace framing members to suit design requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that rough-in utilities are in proper location.

3.02 INSTALLATION OF STUD FRAMING

A. Extend partition framing above ceiling as indicated..

B. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs as indicated.

C. Align and secure top and bottom runners at 24 inches on center.

D. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.

E. Install studs vertically at 16 inches on center.

F. Align stud web openings horizontally.

G. Secure studs to tracks using fastener method. Do not weld.

H. Stud splicing is not permissible.

I. Fabricate corners using a minimum of three studs.

J. Install double studs at wall openings, door and window jambs, not more than 2 inches from each side of openings.

K. Brace stud framing system rigid.

L. Coordinate erection of studs with requirements of door frames; install supports and attachments.

M. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.

N. Blocking: Use steel channels secured to studs. Provide blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, and opening frames.

3.03 CEILING AND SOFFIT FRAMING

A. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.

B. Install furring independent of walls, columns, and above-ceiling work.

C. Securely anchor hangers to structural members or embed them in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.

D. Space main carrying channels at maximum 72 inches on center, and not more than 6 inches from wall surfaces. Lap splice securely.

E. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

F. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.

3.04 TOLERANCES

A. Maximum Variation From True Position: 1/8 inch in 10 feet.

B. Maximum Variation From Plumb: 1/8 inch in 10 feet.

END OF SECTION

SECTION 09 30 00
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Cementitious backer board as tile substrate.

D. Stone thresholds.

E. Ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

B. Section 09 21 16 - Gypsum Board Assemblies: Tile backer board.

1.03 REFERENCE STANDARDS

A. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.

B. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018 (Reapproved 2023).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

PART 2 PRODUCTS

2.01 TILE

A. Manufacturers: All products by the same manufacturer.
   1. Floor & DecorSan Giorgio.flooranddecor.com/porcelain
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Porcelain Tile, Type [floor]: ANSI A137.1standard grade.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373
   2. Size: [12 by 12] inch, nominal.
   3. Thickness: 3/8 inch.
   4. Edges: Interlocking shape.
   5. Surface Finish: Matte Galzed
   6. Trim Units: Matching bullnose, cove base, and cove shapes in sizes coordinated with field tile.
   7. Products:
      a. Floor & Decor[San Giorgio].flooranddecor.com/porcelain
      b. Substitutions: See Section01 60 00-Product Requirements.

C. Porcelain Tile, Type wall: ANSI A137.1 standard grade.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Size: 12 by 24 inch, nominal.
   3. Thickness: 3/8 inch.
   4. Edges: Interlocking shape.

5. Surface Finish: Matte glazed.
6. Color(s): To be selected by Architect from manufacturer's standard range.
7. Pattern:_____.
8. Trim Units: Matching bullnose, cove base, and cove shapes in sizes coordinated with field tile.
9. Products:
    a. Floor & DecorSan Giorgio.flooranddecor.com/porcelain
    b. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 TRIM AND ACCESSORIES

A. Thresholds: 2 inches wide by full width of wall or frame opening; beveled edge on both long edges; without holes, cracks, or open seams.
    1. Thickness: 1/2 inch.
    2. Material: Solid surface acrylic resin, mineral filler, and pigments; non-porous, color and pattern consistent throughout thickness.
    3. Color and Pattern: as selected by Architect from standard color range.
    4. Applications:
        a. At doorways where tile terminates.

2.03 SETTING MATERIALS

A. Provide setting and grout materials from same manufacturer.

B. Manufacturers:
    1. LATICRETE International, Inc;_____: www.laticrete.com/#sle.
    2. Mapei Corporation;_____: www.mapei.com/#sle.
    3. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 GROUTS

A. Provide setting and grout materials from same manufacturer.

B. Manufacturers:
    1. LATICRETE International, Inc;_____: www.laticrete.com/#sle.
    2. Mapei Corporation;_____: www.mapei.com/#sle.

END OF SECTION

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 RELATED REQUIREMENTS

A. Section 07 21 00 - Thermal Insulation: Acoustical insulation.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.

B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

C. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on suspension system components and acoustical units.

C. Samples: Submit two samples 4 by 4 inch in size illustrating material and finish of acoustical units.

1.05 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc;_____: www.armstrongceilings.com/#sle.
   2. USG Corporation;_____: www.usg.com/ceilings/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Suspension Systems:
   1. Same as for acoustical units.
   2. Armstrong World Industries, Inc;_____: www.armstrongceilings.com/#sle.
   3. USG Corporation;_____: www.usg.com/ceilings/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACOUSTICAL UNITS

A. Acoustical Panels, Type A: Painted mineral fiber, with the following characteristics:
   1. Application(s): Lobby & Meeting Room.
   2. Classification: ASTM E1264 Type III.
   3. Size: 24 by 24 inches.
   4. Thickness: 3/4 inch.
   5. Panel Edge: Square.
   6. Suspension System: Exposed grid.

B. Acoustical Panels, Type B: Mineral fiber with membrane-faced overlay, with the following characteristics:
   1. Application(s): Office.

2. Classification: ASTM E1264 Type IV.
    a. Form: 1, water felted.
    b. Pattern: "G" - smooth.
3. Size: 24 by 48 inches.
4. Thickness: 1.3 inches.
5. Light Reflectance: 0.85 percent, determined in accordance with ASTM E1264.
6. NRC: 0.95, determined in accordance with ASTM E1264.
7. Panel Edge: Square.
8. Color: White.
9. Suspension System Type B: Exposed grid.
10. Products:
    a. USG Corporation; Juno Acoustical Panels: www.usg.com/#sle.
    b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

B. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
    1. Materials:
        a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.

C. Exposed Suspension System, Type A: Hot-dipped galvanized steel grid with steel cap.
    1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
    2. Profile: Tee; 15/16 inch face width.
    3. Finish: Baked enamel.
    4. Color: White.
    5. Products:
        a. USG Corporation; Donn Brand ZXLA 15/16 inch Acoustical Suspension System: www.usg.com/ceilings/#sle.
        b. Substitutions: See Section 01 60 00 - Product Requirements.

D. Exposed Suspension System, Type B: Hot-dip galvanized steel grid and cap.
    1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
    2. Profile: Tee; 9/16 inch face width.
    3. Finish: Baked enamel.
    4. Color: White.
    5. Products:
        a. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Perimeter Moldings: Same metal and finish as grid.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

B. Locate system on room axis according to reflected plan.

C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Install in bed of acoustical sealant.
   2. Use longest practical lengths.

D. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

H. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

F. Install hold-down clips on panels within 20 ft of an exterior door.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.06 CLEANING

A. Clean surfaces.

B. Replace damaged or abraded components.

END OF SECTION

SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Installation accessories.

1.02 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

B. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2020.

C. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

1.04 FIELD CONDITIONS

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Vinyl Tile - Type_____: Solid vinyl with color and pattern throughout thickness.
   1. Manufacturers:
      a. Mannington Commercial;_____: www.manningtoncommercial.com#sle.
   2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
   3. Square Tile Size: 18 by 18 inch.
   4. Total Thickness: 0.125 inch.
   5. Color: To be selected by Architect from manufacturer's full range.

2.02 RESILIENT BASE

A. Resilient Base - Type_____: ASTM F1861, Type TS, rubber, vulcanized thermoset; style as scheduled.
   1. Manufacturers:
      a. Mannington Commercial; Type TP: www.manningtoncommercial.com#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Height: 6 inches.
   3. Thickness: 0.125 inch.
   4. Finish: Satin.
   5. Length: Roll.
   6. Color: As indicated on drawings.

7. Color: To be selected by Architect from manufacturer's full range.
8. Accessories: Premolded external corners and internal corners.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

C. Adhesive for Vinyl Flooring:
   1. Manufacturers:
      a. H.B. Fuller Construction Products, Inc; TEC Flexera HT - High Tack Premium Universal PSA Adhesive: www.tecspecialty.com/#sle.
      b. Substitutions: Section 01 6000 - Product Requirements.

D. Moldings, Transition and Edge Strips: Same material as flooring.
   1. Manufacturers:
      a. Mannington Commercial;_____: www.manningtoncommercial.com#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Test as Follows:
      a. Alkalinity (pH): ASTM F710.
      b. Internal Relative Humidity: ASTM F2170.
      c. Moisture Vapor Emission: ASTM F1869.
   2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

B. Prohibit traffic until filler is fully cured.

C. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installation:
   1. Fit joints and butt seams tightly.
   2. Set flooring in place, press with heavy roller to attain full adhesion.

D. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
   1. Resilient Strips: Attach to substrate using adhesive.

3.04 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

C. Install square tile to ashlar pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

3.05 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Install base on solid backing. Bond tightly to wall and floor surfaces.

C. Scribe and fit to door frames and other interruptions.

3.06 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09 68 13
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

B. Removal of existing carpet tile.

1.02 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).

B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

C. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

D. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

1.04 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tile Carpeting:
   1. Mannington Commercial; Color Anchor II: www.manningtoncommercial.com#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Tile Carpeting, Type CS: pattern loop, manufactured in one color dye lot.
   1. Product: Color Anchor II manufactured by Mannington.
   2. Tile Size: 24 by 24 inch, nominal.
   3. Thickness: 3/8 inch.
   4. Color: See Sheet A8.2.
   5. Pattern: Running Bond.
   6. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
   7. Maximum Electrostatic Charge: 3 Kv. at 20 percent relative humidity.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Embossed aluminum,_____color.

C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
   1. Test as Follows:
      a. Alkalinity (pH): ASTM F710.
      b. Internal Relative Humidity: ASTM F2170.
      c. Moisture Vapor Emission: ASTM F1869.
   2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Remove existing carpet tile.

B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

C. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

D. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

E. Vacuum clean substrate.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.

F. Fully adhere carpet tile to substrate.

G. Trim carpet tile neatly at walls and around interruptions.

H. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 91 13
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

B. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

C. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:
   1. Base Manufacturer: PPG.
   2. PPG Paints;_____: www.ppgpaints.com/#sle.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

2.03 PAINT SYSTEMS - EXTERIOR

A. Paint ME-OP-2L - Ferrous Metals, Primed, Latex, 2 Coat:
   1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
   2. Semi-gloss: Two coats of latex enamel;_____.

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Alkali Resistant Water Based Primer; MPI #3.
      a. Products:
         1) PPG Paints Perma-Crete Interior/Exterior Alkali Resistant Primer, 4-603XI. (MPI #3)
         2) Substitutions: See Section 01 60 00 - Product Requirements
   2. Interior/Exterior Quick Dry Alkyd Primer for Metal; MPI #76.
      a. Products:
         1) PPG Paints Multiprime Multi-Purpose Primer, 4160 Series. (MPI #76)
         2) Substitutions: See Section 01 60 00 - Product Requirements

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 Commercial Blast Cleaning. Protect from corrosion until coated.

G. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance.

D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

END OF SECTION

SECTION 09 91 23
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Materials for backpriming woodwork.

D. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.

E. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Ceramic and other tiles.
   7. Glass.
   8. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

C. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

D. SSPC-SP 2 - Hand Tool Cleaning; 2018.

E. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
   2. MPI product number (e.g., MPI #47).
   3. Cross-reference to specified paint system products to be used in project; include description of each system.
   4. Manufacturer's installation instructions.

1.05 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 fc measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
   1. If a single manufacturer cannot provide specified products; minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
   2. Substitution of MPI-approved products by a different manufacturer is preferred over substitution of unapproved products by the same manufacturer.
   3. Substitution of a different paint system using MPI-approved products by the same manufacturer will be considered.

B. Paints:
   1. Base Manufacturer: PPG.
   2. PPG Paints: www.ppgpaints.com/#sle.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

2.03 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, wood, uncoated steel, shop primed steel, galvanized steel, aluminum, and acoustical ceilings.
   1. Two top coats and one coat primer.
   2. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, 141, or 142.
      a. Products:
         1) PPG Paints Pure Performance Interior Latex, 9-510XI Series, Semi-Gloss. (MPI #141)

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Alkali Resistant Water Based Primer; MPI #3.
      a. Products:
         1) PPG Paints Perma-Crete Interior/Exterior Alkali Resistant Primer, 4-603XI. (MPI #3)
         2) Substitutions: See Section 01 60 00 - Product Requirements
   2. Interior Latex Primer Sealer; MPI #50.

a. Products:
    1) PPG Paints Speedhide Zero Interior Latex Sealer, 6-4900XI. (MPI #50)
    2) Substitutions: See Section 01 60 00 - Product Requirements

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
    1. Gypsum Wallboard: 12 percent.
    2. Plaster and Stucco: 12 percent.
    3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
    4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
    5. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

G. Galvanized Surfaces:
    1. Prepare surface according to SSPC-SP 2.

H. Ferrous Metal:
    1. Solvent clean according to SSPC-SP 1.
    2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
    3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 Commercial Blast Cleaning. Protect from corrosion until coated.

I. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Sand wood and metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

END OF SECTION

SECTION 10 21 13.19
PLASTIC TOILET COMPARTMENTS - ASI ACCURATE/GLOBAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Solid plastic toilet compartments.

B. Solid plastic urinal screens.

1.02 RELATED REQUIREMENTS

A. Section 10 28 00 - Toilet, Bath, and Laundry Accessories.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2023a.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

D. ASTM B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings; 2018, with Editorial Revision.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

H. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

I. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on panel construction, hardware, accessories, and finishes.

C. Shop Drawings:
   1. Indicate plans, elevations, and dimensions. Include door swings, toilet fixture centerlines, and floor drains on plans.
   2. Indicate details of wall, floor, and ceiling supports and attachments.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver materials or begin installation until building is enclosed, with complete protection from outside weather, and building temperature maintained at minimum of 60 degrees F.

B. Lay cartons flat, with adequate support to ensure flatness and prevent damage to prefinished surfaces.

C. Do not store where ambient temperature exceeds 120 degrees F.

1.06 FIELD CONDITIONS

A. Ambient Conditions: Maintain environmental conditions such as temperature, humidity, and ventilation within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Existing Conditions: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Manufacturer: ASI Accurate Partitions: www.asi-accuratepartitions.com/#sle.

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PLASTIC TOILET COMPARTMENTS

A. Toilet Compartments: Solid plastic (HDPE), standard privacy, floor anchored, overhead braced.

B. Urinal Screens: Solid plastic (HDPE), wall hung.

C. Design Criteria:
   1. Accessibility: Design compartments indicated on drawings to comply with ICC A117.1 and ADA Standards.
   2. Fire Performance: Provide assemblies that pass when tested in accordance with NFPA 286.

D. Fabrication:
   1. Fabricate toilet compartment components to sizes indicated.
   2. Coordinate requirements and provide cutouts for through-partition toilet accessories.
   3. Provide manufacturer's standard corrosion-resistant supports, leveling mechanisms, anchors, and anchoring assemblies for pilasters and posts.
   4. Floor-Anchored, Overhead-Braced Units: Provide supports, leveling mechanisms, Easy-Stall shoes, and anchors at pilasters to suit floor conditions.

2.03 COMPONENTS

A. Doors and Panels: Single sheets of solid molded homogenous high-density polyethylene (HDPE).
   1. Finish:
      a. Color: As selected from manufacturer's color card.
      b. Texture: Manufacturer's standard for selected color.
   2. Edges: 1/4-inch radius machined edges.
   3. Heat Sink: Extruded aluminum attached to bottom of doors and panels.

B. Door and Panel Dimensions:
   1. Thickness: 1 inch.
   2. Door Panel Height: 55 inches.
   3. Door Height Above Floor: 14 inches.
   4. Urinal/Entrance Screen Panel Height: 55 inches.
   5. Urinal/Screen Screen Panel Height Above Floor: 14 inches.

C. Pilasters: 1 inch thick, of sizes required to suit compartment width and spacing; minimum 3 inches wide.
   1. Pilaster Height: 82 inches.
   2. Pilaster Shoes: Formed 20 gauge, 0.0359 inch ASTM A666 Type 304 stainless steel with No.4 finish, 5 inches high, concealing floor fastenings; secured to pilaster with stainless

steel tamper-resistant screws; secured to floor with concrete anchors.

3. Pilaster Anchors: Manufacturer's standard stainless steel mounting bars attached to pilaster and secured to building structure.

D. Urinal or Entrance Screen Post: Manufacturer's standard post design of square aluminum tube with satin finish 1-3/4 by 1-3/4 inches, with shoe matching that on pilaster.

E. Head Rails: Hollow anodized aluminum tube, 1- by 1-5/8-inch size, with anti-grip surface and cast-socket wall brackets.

2.04 MATERIALS

A. Aluminum Castings: ASTM B26/B26M.

B. Aluminum Extrusions: ASTM B221 (ASTM B221M).

C. High-Density Polyethylene (HDPE):
1. Composition: Formed from waterproof, nonabsorbent, high-density polyethylene resins.
2. Properties: Mark-resistant self-lubricating surface.
3. Fire Resistance: ASTM E84, Class B.
4. Material Fire Ratings: NFPA 286, Pass.
5. Material Fire Ratings: ICC (IBC), Class B.

D. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.

2.05 HARDWARE AND ACCESSORIES

A. Brackets:

B. Door Hardware: Brushed stainless steel:
1. Hinges: Brushed stainless steel vault hinges, gravity type, adjustable for door close positioning; two per door.
2. Latch and Keeper: Surface mount slide.
3. Coat Hook: Manufacturer's standard coat hook with rubber bumper; one per compartment, mounted on door.
4. Door Pull: Provide door pull for outswinging doors. Provide on both sides of doors designated as accessible.
5. Door Bumper: Provide rubber-tipped door bumpers at out-swinging doors.

C. Attachments, Screws, and Bolts: Stainless steel , tamper-resistant type..

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Attach Easy Stall shoe system to floor with 1/4 by 2 inch screws. Insert pilaster into Easy Stall shoe and secure after height adjustment.

C. Maintain maximum 1/2-inch space between pilasters and panels.

D. Maintain maximum 1-inch space between wall and panels.

E. Attach panel brackets securely to walls using anchor devices.

F. Attach panels and pilasters to brackets. Locate head rail joints at pilaster centerlines.

G. Do not permit field touch-up of scratches or damaged finish. Replace damaged or scratched materials with new materials.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.04 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to locate doors in partially opened position when unlatched. Return outswinging doors to closed condition.

3.05 CLEANING

A. Clean partition and screen surfaces with materials and cleansers in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES - ASI

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Custodial accessories.

B. Grab bars.

C. Mirrors.

D. Paper towel dispensers.

E. Soap and hand sanitizer dispensers.

F. Specialty accessories.

G. Toilet tissue dispensers.

H. Waste receptacles.

1.02 RELATED REQUIREMENTS

A. Section 09 21 16 - Gypsum Board Assemblies: Placement of wood blocking, steel sheet blocking, and backing plates in stud wall construction for attachment of accessories.

B. Section 09 30 00 - Tiling: Ceramic washroom accessories.

C. Section 10 21 13.19 - Plastic Toilet Compartments.

1.03 ABBREVIATIONS AND ACRONYMS

1.04 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

B. ASTM C1036 - Standard Specification for Flat Glass; 2021.

C. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

D. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2024.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Manufacturer: American Specialties, Inc: www.americanspecialties.com/#sle.

B. Substitutions: See Section 01 60 00 - Product Requirements.

1. All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by Architect minimum of 10 working days prior to bid date and must be made available to all bidders. Proposed substitutes must be accompanied by review of specification and ASI Technical Data Sheets noting compliance on line-by-line basis.

2.02 CUSTODIAL ACCESSORIES

A. Mop and Broom Holder: 0.0375 inch thick stainless steel, Type 304, hat-shaped channel.

1. Mounting: As indicated in product listing.
2. Holders: Cadmium-plated steel with spring-loaded rubber cam holders.

3. Length: Manufacturer's standard length for number of holders.

203 GRAB BARS

A. Grab Bars: Type 304 stainless steel.
   1. Standard Duty Grab Bars:
      a. Push/Pull Point Load: 250 lbf, minimum.
      b. OD: As indicated in product listing.
      c. Tubing Thickness: 18 gauge, 0.05 inch.
      d. Clearance: 1-1/2 inch clearance between wall and inside of grab bar.
      e. Length and Configuration: As indicated in product listing.
      f. Products:
         1) Model 3401-36 - 36 inch length - Exposed Flange, 1-1/4 inch OD, Smooth - Straight Grab Bar.

204 MIRRORS

A. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass, ASTM C1036.
   1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
   2. Size: 24 inches wide by 36 high..
   3. Channel Frame: One piece roll formed 20 gauge, 0.0375 inch, 1/2 inch by 1/2 inch Type 304 stainless steel channel that encases mirror and backing with tight mitered corners, and tamperproof hanging system; satin finish.
   4. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
   5. Products:
      a. Model 0537 Series - Fixed Tilt Mirror with Shelf.

205 PAPER TOWEL DISPENSERS

A. Paper Towel Dispenser: Manual, roll paper type.
   1. Cover: Stainless steel.
   2. Stainless Steel Thickness: As indicated on Technical Data Sheet for selected ASI model.
   3. Capacity: 6 inch diameter roll.
   4. Mounting: As indicated in product listing.
   5. Refill Indicator: Transparent viewing slot.
   6. Products:
      a. Model 8165 - Traditional Collection - Paper Towel Holder - Roll - Surface-mounted.
      b. Substitutions: Section 01 60 00 - Product Requirements.

206 SOAP AND HAND SANITIZER DISPENSERS

A. Automated Soap Dispenser: Foam soap dispenser, with container concealed below deck.
   1. Mounting: As indicated in product listing.
   2. Material and Finish: As indicated in product listing.
   3. Minimum Capacity: As indicated in product listing.
   4. Products:
      a. Model 20363 - Roval Collection - Soap Dispenser - Liquid - Surface-mounted.
      b. Substitutions: Section 01 60 00 - Product Requirements.

207 SPECIALTY ACCESSORIES

A. Toilet Tissue Holder:
   1. Material: As indicated in product listing.
   2. Products:
      a. Model 0715 - Toilet Tissue Holder - Double Roll - Chrome Plated - Surface-mounted.

b. Substitutions: Section 01 60 00 - Product Requirements.

B. Robe Hook:
1. Mounting: As indicated in product listing.
2. Products:
a. Model 0740-Z - Robe Hook - Single - Chrome Plated Zamak - Surface-mounted.
b. Substitutions: Section 01 60 00 - Product Requirements.

208 TOILET TISSUE DISPENSERS

A. Toilet Tissue Holder: Recessed or surface-mounted.
1. Mounting: As indicated in product listing.
2. Material: Chrome-plated zinc alloy, satin finish.
3. Products:
a. Model 74022 - Toilet Tissue Holder - Double - Bright Stainless Steel - Recessed.
b. Substitutions: Section 01 60 00 - Product Requirements.

209 WASTE RECEPTACLES

A. Waste Receptacle: Stainless steel, open top, continuously welded bottom pan and seamless exposed flanges.
1. Mounting: As indicated in product listing.
2. Minimum Capacity: As indicated in product listing.
3. Products:
a. Model 20826 - Roval Collection - Waste Receptacle - 12.8 gal - Surface-mounted.

210 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Stainless Steel Sheet: ASTM A666, Type 304.

C. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

D. Fasteners, Screws, and Bolts: Hot dip galvanized; tamperproof; security type.

211 FABRICATION

A. Roval Collection:
1. Basic Construction Requirements:
a. Doors: Curved design, one piece Type 304, 18 gauge, 0.05 inch stainless steel.
b. Cabinets: Type 304, 22 gauge, 0.0312 inchstainless steel, trimless; joints welded, sight-exposed welds finished to match sheet finish. Full access back panels.
c. Hinges: Concealed, heavy-duty stainless steel multi-staked piano hinge, full length of cabinet.
d. Locks: Two flush, rimless tumbler locks, keyed alike other toilet accessory locks, with one key for each lock.
e. Exposed Finish: No.4 satin finish, unless noted otherwise.

B. Traditional Collection:
1. Basic Construction Requirements:
a. Doors: Type 304, 22 gauge, 0.0312 inch stainless steel, double pan construction, with 1/4 inch thick structural fiberboard core.
b. Cabinets: Type 304, 22 gauge, 0.0312 inch stainless steel, formed perimeter trim with 1/4 inch return to wall four sides; joints welded, sight-exposed welds finished to match sheet finish.

c. Hinges: Heavy-duty stainless steel multi-staked piano hinge, 3/16 inch diameter barrel, full length of cabinet; hinge leaves spot-welded to door and cabinet body.
d. Locks: Tumbler locks, keyed alike other toilet accessory locks, with one key for each lock.
e. Cabinet and Door Finish: No.4 satin finish.

2.12 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section_____: Placement of rough-in frame for cabinets.

1.03 REFERENCE STANDARDS

A. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Kidde, a unit of United Technologies Corp;_____: www.kidde.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:
   1. Kidde, a unit of United Technologies Corp;_____: www.kidde.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Class: A:B:C type.
   2. Size: 5 pound.
   3. Size and classification as scheduled.
   4. Finish: Baked polyester powder coat, White color.
   5. Temperature range: Minus 40 degrees F to____degrees F.

2.03 FIRE EXTINGUISHER CABINETS

A. Cabinet Construction: Non-fire rated.
   1. Formed primed steel sheet; 0.036 inch thick base metal.

B. Cabinet Configuration: Semi-recessed type.
   1. Size to accommodate accessories.
   2. Projected Trim: Returned to wall surface, with_____inch projection, and_____inch wide face.

C. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinges.

D. Door Glazing: Float glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.

E. Door Glazing: Acrylic plastic, clear, 1/8 inch thick, flat shape and set in resilient channel glazing gasket.

F. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

G. Fabrication: Weld, fill, and grind components smooth.

H. Finish of Cabinet Exterior Trim and Door: Red enamel.

I. Finish of Cabinet Interior: White colored enamel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, 44" inches from finished floor to Inside Top of Cabinet.

C. Secure rigidly in place.

D. Place extinguishers in cabinets.

END OF SECTION

SECTION 10 56 17
WALL MOUNTED STANDARDS AND SHELVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Steel shelf standards, brackets, and accessories.

B. Aluminum shelf standards, brackets, and accessories.

C. Shelves.

1.02 RELATED REQUIREMENTS

A. Section 09 21 16 - Gypsum Board Assemblies: Blocking in metal stud walls for attachment of standards.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.

B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Shelf Standards and Brackets:
   1. Knape & Vogt Manufacturing Company; 87™/187™ Series: www.knapeandvogt.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COMPONENTS

A. Steel Shelf Standards, Brackets, and Accessories:
   1. Super-Duty Shelf Standards and Brackets: Single-slotted channel standards for brackets adjustable in 1 inch increments along entire length of standard, drilled and countersunk for screws.
      a. Product: KV 87/187.
      b. Load Capacity: Recommended by manufacturer for loading of 540 to 1,060 pounds per pair of standards.
      c. Face Width: 5/8 inch, single slotted.
      d. Material: 12 gauge, 0.1046 inch sheet steel.
      e. Lengths: As indicated on drawings.
      f. Finish: Electroplated, chrome-look.

g. Brackets: 12 gauge, 0.1046 inch sheet steel, reinforced, locking into slots with molded nylon cam lock lever; size to suit shelves; same finish as standards.
h. Bracket Quantity: Provide one bracket for each 12 inches of standard length.

B. Aluminum Shelf Standards, Brackets, and Accessories:
1. Aluminum Components: ASTM B221 (ASTM B221M), alloy 6063, temper as indicated, with anodized finish complying with to AAMA 611, or powder coating complying with AAMA 2603 or AAMA 2604 for select colors.
2. Wall-Mounted Shelf Standards: Channel type extruded aluminum standards mounted on walls and designed to hold shelf support brackets inserted into channel ends or access slots and slid to desired position.
a. Material: Extruded aluminum, ASTM B221 6063-T6 alloy and temper.
b. Lengths: As indicated on drawings.
c. Finish: White powdercoat.
d. Manufacturer/Profile No:_____.
e. Mounting: Surface.

C. Shelving:
1. Aluminum Shelves: Extruded aluminum sections with textured flat top and bottom ribs; ASTM B221 6063-T5 alloy and temper; finished on all surfaces.
a. Shelf Deflection: 1/4 inch in 36 inches, maximum, under specified uniform load.
b. Shelf Thickness: 6/10 inch.
c. Shelf Length: 36 inches.
d. Shelf Depth: 18 inches.
e. Finish: White powdercoat.
f. Accessories: Provide shelf lip brackets, shelf hold-down clips, shelf splines, label holders, and shelf end caps.

D. Fasteners: Screws as recommended by manufacturer for intended application or as otherwise required by project conditions. Finish of exposed to view fasteners to match finish of standards and other components.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Mount standards or brackets to solid backing capable of supporting intended loads.

C. Install brackets, shelving, and accessories.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 10 73 13
AWNINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal awnings.

1.02 RELATED REQUIREMENTS

A. Section 07 62 00 - Sheet Metal Flashing and Trim.

1.03 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Metal Product Data: Product data sheets, including material descriptions and finishes, and preparation instructions and recommendations.

C. Shop Drawings: Indicate awning profiles, sizes, connection attachments, anchorage, size and type of fasteners, graphic images, patterns, accessories, and locations.

D. Executed warranty.

E. Specimen warranty.

1.05 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide two-year manufacturer warranty for materials. Complete forms in Owner's name and register with manufacturer.

C. Finish Warranty: Provide 20-year manufacturer warranty against excessive degradation of factory-applied finishes. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Awnings:
   1. Mapes Architectural CanopiesSuper Lumideck, Flat.cad@mapes.com
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 AWNINGS - GENERAL

A. Design Criteria: Design and fabricate to resist the following loads without failure, damage, or permanent deflection:
   1. Wind: 105 psf positive, 47 psf negative; minimum.
   2. Snow: 5 psf; minimum.
   3. Live: 12 psf; minimum.
   4. Thermal Movement: Plus/minus 1/8 inch, maximum.

B. Configuration: As indicated on drawings.

C. Provide a complete system ready for erection at project site.

D. Shop fabricate to the greatest extent possible; disassemble if necessary for shipping.

2.03 METAL AWNINGS

A. Description: Flat, metal framework with metal covering attached to building exterior over a door or window to protect from sun or rain.

B. Type: Face-mounted.

C. Size: as indicated on plans with 8" Fascia .

D. Framework: Aluminum.

E. Covering Materials:
   1. Interlocking extruded aluminum decking modules.

2.04 COMPONENTS

A. Aluminum Framing System:
   1. Aluminum Outriggers, Front Bars, Diagonal Supports, Hinged Arms, Mounting Brackets, Shapes, and Plates: ASTM B211/B211M, 6061 alloy, T6 temper.
   2. Framing: 3 inch square, tubing.
   3. Fittings: Elbows, T-shapes, wall brackets; cast aluminum.
   4. Mounting: Brackets and flanges, with aluminum inserts for mounting in metal purlin framed wall construction.
   5. Exposed Fasteners: Flush countersunk galvanized steel screws or bolts; consistent with design of system.
   6. Exposed Aluminum Finish: Color anodized with organic seal.

2.05 FABRICATION - FRAMING

A. Fit and shop assemble components in largest practical sizes, for delivery to site.

B. Fabricate components with joints tightly fitted and secured.

C. Exposed Fastenings: Unobtrusively located; consistent with design of component, except where specifically noted otherwise.

D. Supply components required for anchorage of framing. Fabricate anchors and related components of same material and finish as framing, except where specifically noted otherwise.

E. Continuously seal joined pieces by intermittent welds and plastic filler.

F. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

2.06 FINISHES

A. High Performance Organic Coatings: AAMA 2604; multiple coats, thermally cured fluoropolymer system.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall substrate anchors are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

3.03 INSTALLATION - FRAMING

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects.

C. Provide anchors required for connecting framing to structure. Anchor framing to structure.

D. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 INSTALLATION - METAL COVERING

A. Install in accordance with manufacturer's instructions.

B. Fasten metal covering panels to metal support members, aligned level and plumb.

C. Install fascia panels, trim, and flashing.

D. Separate dissimilar metals using concealed bituminous paint.

E. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

3.05 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Misalignment From True Position: 1/4 inch.

END OF SECTION

SECTION 12 21 13
HORIZONTAL LOUVER BLINDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Horizontal slat louver blinds.

B. Operating hardware.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the placement of concealed blocking to support blinds. See Section 06 10 00.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Samples: Submit two samples, 4 inch long illustrating slat materials and finish, cord type and color.

PART 2 PRODUCTS

2.01 BLINDS WITHOUT SIDE GUIDES

A. Description: Horizontal slat louvers hung from full-width headrail with full-width bottom rail.

B. Slat Support: Woven polypropylene cord, ladder configuration.

C. Head Rail: Pre-finished, formed aluminum box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats.

D. Headrail Attachment: Wall brackets.

END OF SECTION

SECTION 12 32 00
MANUFACTURED WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured standard and custom casework, with cabinet hardware.

1.02 RELATED REQUIREMENTS

A. Section 09 22 16 - Non-Structural Metal Framing: Reinforcements in metal-framed partitions for anchoring casework.

B. Section 12 36 00 - Countertops: Additional requirements for countertops.

C. Section 22 40 00 - Plumbing Fixtures: Sinks and fittings installed in casework.

D. Section 26 27 26 - Wiring Devices: Switches, receptacles installed in casework.

1.03 DEFINITIONS

A. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches above finished floor, tops of cases less than 72 inches above finished floor and all members visible in open cases or behind glass doors.

B. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches above finished floor and bottoms of cabinets more than 30 inches but less than 42 inches above finished floor.

C. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches above finished floor.

1.04 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

C. BHMA A156.9 - Cabinet Hardware; 2020.

D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Component dimensions, configurations, construction details, joint details, attachments.

C. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors and reinforcements, placement dimensions and tolerances, clearances required, and keying information.

D. Samples for Finish Selection: Fully finished, for color selection. Minimum sample size: 2 inches by 3 inches.

E. Maintenance Data: Manufacturer's recommendations for care and cleaning.

F. Finish touch-up kit for each type and color of materials provided.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion, at no additional cost to Owner. Defects include, but are not limited to:
   1. Ruptured, cracked, or stained finish coating.
   2. Discoloration or lack of finish integrity.

3. Cracking or peeling of finish.
4. Failure of hardware.

PART 2 PRODUCTS

201 MANUFACTURERS

A. Thermally Fused Laminate Casework:
   1. Advanced Cabinet Systems; Premium Grade: www.advancedcabinetsystems.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Obtain casework from single source and manufacturer, unless otherwise indicated.

202 CASEWORK, GENERAL

A. Quality Standard: AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Wood Veneer Faced Cabinets: Custom Grade.

203 FABRICATION

A. Assembly: Shop assemble casework items for delivery to site in units easily handled and to permit passage through building openings.

B. Construction: As required for selected grade.

C. Structural Performance: Safely support the following minimum loads:
   1. Base Units: 500 pounds per linear foot across the cabinet ends.
   2. Suspended Units: 300 pounds static load.
   3. Drawers: 125 pounds, minimum.

D. Access Panels: Where indicated, for maintenance of utility service and mechanical and electrical components.

E. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

F. Apron Frames: Construction similar to other cabinets, with modifications.
   1. Frames fabricated from panels standard with the manufacturer. Include front and back panels, with drawer suspension framing mechanically fastened to support channels spanning between them.

204 THERMALLY FUSED LAMINATE CASEWORK

A. Thermally Fused Laminate Casework: Thermally fused laminate panel construction; each unit self-contained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels. Include adjustable levelers for base cabinets.
   1. Style: Flush overlay. Ease doors and drawer fronts slightly at all edges.
   2. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with following front-to-back dimensions:
      a. Base Cabinets: 24 inches.
      b. Tall Cabinets: 22 inches.
      c. Wall Cabinets: 16 inches.
   3. Panels: Grade M-2 particleboard or Grade 155 MDF core, with melamine-impregnated decorative surface papers and transparent protective topcoat; NEMA LD 3 Type VGL.
      a. Surface Color and Pattern: As selected by Architect from manufacturer's standard line.

205 COUNTERTOPS

A. Countertops: See Section 12 36 00.

2.06 CABINET HARDWARE

A. Comply with BHMA A156.9 requirements.
   1. Acceptable base materials for plated finishes include brass, bronze, and steel.

B. Shelves in Cabinets:
   1. Shelf Standards and Rests: Vertical standards with rubber button fitted rests, satin chromium plated over nickel on base material.

C. Swinging Doors: Hinges, pulls, and catches.
   1. Hinges: Visible, number as required by referenced standards for width, height, and weight of door.
      a. Visible Hinges: Installed on framed cabinet face, and on door face, bright chromium plated over nickel on base material.
   2. Pulls: Chrome wire pulls, 4 inches wide.
   3. Catches: Magnetic.

D. Drawers: Pulls and slides.
   1. Pulls: Chrome wire pulls, 4 inches wide.
   2. Slides: Steel, full extension arms, ball bearings; self-closing; capacity as recommended by manufacturer for drawer height and width.

2.07 MATERIALS

A. Wood-Based Materials:
   1. Solid Wood: Air-dried to 4.5 percent moisture content, then tempered to 6 percent moisture content before use.
   2. Composite Wood Panels: Containing no urea-formaldehyde resin binders.
      a. Products:
         1) Roseburg Forest Products; Medite II: www.roseburg.com/#sle.
         2) Substitutions: See Section 01 60 00 - Product Requirements.

B. Thermally Fused Laminate (TFL): Melamine resin, NEMA LD 3, Type VGL laminate panels.

2.08 ACCESSORIES

A. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
   1. Color: As selected by Architect from manufacturer's standard range.
   2. Use only at edges indicated; use plastic laminate cladding at all other edges.
   3. Use at exposed edges.
   4. Use at exposed shelf edges.

PART 3 EXECUTION

3.01 PREPARATION

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

3.02 EXAMINATION

A. Site Verification of Environmental Conditions:
   1. Do not deliver casework until the following conditions have been met:
      a. Building has been enclosed (windows and doors sealed and weather-tight).
      b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
      c. Ceiling, overhead ductwork, piping, and lighting have been installed.
      d. Installation areas do not require further “wet work” construction.

B. For Base Cabinets Installation: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 1/2 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.

C. For Wall Cabinets Installation: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:

D. Verify adequacy of support framing and anchors.

E. Verify that service connections are correctly located and of proper characteristics.

3.03 INSTALLATION

A. Perform installation in accordance with manufacturer's instructions.

B. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.

C. Set casework items plumb and square, securely anchored to building structure.

D. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.

E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:
   1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
   2. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
   3. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
   4. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.

F. Base Cabinets: Fasten cabinets to service space framing and/or wall substrates, with fasteners spaced not more than 16 inches on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.

G. Install hardware uniformly and precisely.

H. Countertops: Install countertops intended and furnished for field installation in one true plane, with ends abutting at hairline joints, and no raised edges.

I. Replace units that are damaged, including those that have damaged finishes.

3.04 ADJUSTING

A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

3.05 CLEANING

A. Clean casework and other installed surfaces thoroughly.

3.06 PROTECTION

A. Do not permit finished casework to be exposed to continued construction activity.

B. Protect casework and countertops from ongoing construction activities. Prevent workmen from standing on, or storing tools and materials on casework or countertops.

C. Repair damage, including to finishes, that occurs prior to Date of Substantial Completion, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION

SECTION 12 36 00
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work.

1.02 RELATED REQUIREMENTS

A. Section 123200 - Manufactured Wood Casework.

1.03 REFERENCE STANDARDS

A. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

C. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

E. PS 1 - Structural Plywood; 2023.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Flat Sheet Thickness: 1/2 inch, minimum.
   2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.

a. Manufacturers:
    1) Formica Corporation; Everform: https://www.formica.com/en-us/collections/commercial-ranges
    2) Substitutions: See Section 01 60 00 - Product Requirements.
b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
c. NSF approved for food contact.
d. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
e. Color and Pattern: As selected by Architect from manufacturer's full line.

3. Other Components Thickness: 1/2 inch, minimum.
4. Back and End Splashes: Same sheet material, square top; minimum 6 inches high.
5. Fabricate in accordance with manufacturer's standard requirements.

2.02 MATERIALS

A. Extruded Aluminum: ASTM B211/B211M, 6463 alloy, T5 temper.

B. Wood-Based Components:
1. Wood fabricated from old growth timber is not permitted.

C. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

D. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

E. Joint Sealant: Mildew-resistant silicone sealant, white.

2.03 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
1. Join lengths of tops using best method recommended by manufacturer.
2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
2. Height: 4 inches, unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

C. Field Joints: 1/8 inch wide, maximum.

3.05 CLEANING

END OF SECTION

SECTION 13 34 19
METAL BUILDING SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufacturer-engineered, shop-fabricated structural steel building frame.

B. Metal wall and roof panels including soffits and gutters and downspouts.

C. Exterior doors, windows, and louvers.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications.

B. Section 07 92 00 - Joint Sealants: Sealing joints between accessory components and wall system.

C. Section 08 11 13 - Hollow Metal Doors and Frames.

D. Section 08 52 00 - Wood Windows.

1.03 REFERENCE STANDARDS

A. AISC 360 - Specification for Structural Steel Buildings; 2022.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

E. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2019.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

H. ASTM F3125/F3125M - 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; 2022.

I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

J. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on profiles, component dimensions, fasteners.

C. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections; wall and roof system dimensions, panel layout, general construction details, anchors and methods of anchorage, and installation; framing anchor bolt settings, sizes, locations from datum, and foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature.

D. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.

1.05 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty for materials.

1. Include coverage for exterior pre-finished surfaces to cover pre-finished color coat against chipping, cracking or crazing, blistering, peeling, chalking, or fading. Include coverage for weather tightness of building enclosure elements after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Buildings Systems:

1. Ceco Building Systems; PRIMARY METAL FRAMING SYSTEMS: www.cecobuildings.com/#sle.
2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ASSEMBLIES

A. Single span rigid frame.

B. Bay Spacing: 25 ft.

C. Primary Framing: Rigid frame of rafter beams and columns, canopy beams, and wind bracing.

D. Secondary Framing: Purlins, and other items detailed.

E. Wall System: Preformed metal panels of horizontal profile, with Flute Insulated Metal Wall Panel, and accessory components.

F. Roof System: Preformed metal panels oriented parallel to slope, with CFR-IMP Insulated Standing Seam Roof Panels, and accessory components.

G. Roof Slope: 1/8 inches in 12 inches.

2.03 PERFORMANCE REQUIREMENTS

A. Installed Thermal Resistance of Wall System: R-value of 19.

B. Installed Thermal Resistance of Roof System: R-value of 38.

C. Design structural members to withstand dead load, and design loads due to pressure and suction of wind calculated in accordance with 2021 INTERNATIONAL BUILDING code.

D. Exterior wall and roof system shall withstand imposed loads with maximum allowable deflection of 1/90 of span.

E. Provide drainage to exterior for water entering or condensation occurring within wall or roof system.

F. Permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to temperature range of_____degrees F.

2.04 MATERIALS - FRAMING

A. Structural Steel Members: ASTM A36/A36M.

B. Plate or Bar Stock: ASTM A529/A529M, Grade 50.

C. Anchor Bolts: ASTM A307, Grade A, with no preference for protective coatings.

D. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1; galvanized to ASTM A153/A153M.

E. Primer: SSPC-Paint 20 zinc rich.

2.05 MATERIALS - WALLS AND ROOF

A. Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Designation SS (structural steel), Grade 33 (230), with G90/Z275 coating.

B. Insulation: Semi-rigid glass fiber type, faced with reinforced white vinyl, ASTM E84 Class A, flame spread index of 25 or less where exposed, friction fit, 3 inches thick.

C. Joint Seal Gaskets: Manufacturer's standard type.

D. Fasteners: Manufacturer's standard type, galvanized to comply with requirements of ASTM A153/A153M, finish to match adjacent surfaces when exterior exposed.

E. Metal Mesh: Galvanized steel wire, woven.

F. Trim, Closure Pieces, Caps, Flashings, Gutters, Downspouts, Rain Water Diverter, Fascias, and Infills: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

2.06 COMPONENTS

A. Doors and Frames: See Section 08 11 13.

B. Windows: See Section 08 52 00.

C. Wall Louvers: type Z blade design, same finish as adjacent material, with steel mesh bird screen and frame, blank sheet metal at unused portions.

2.07 FABRICATION - FRAMING

A. Fabricate members in accordance with AISC 360 for plate, bar, tube, or rolled structural shapes.

B. Anchor Bolts: Formed with bent shank, assembled with template for casting into concrete.

C. Provide wall opening framing for doors, windows, and other accessory components.

2.08 FABRICATION - WALL AND ROOF PANELS

A. Siding: Minimum 1-1/2" inch metal thickness, PBR profile indicated, 1-1/2" inch deep, lapped edges fitted with continuous gaskets.

B. Roofing: Minimum 1-1/2" inch metal thickness, PBR profile, lapped edges fitted with continuous gaskets.

C. Girts/Purlins: Rolled formed structural shape to receive siding, roofing and liner sheet.

D. Flashings, Closure Pieces, Fascia: Same material and finish as adjacent material, profile to suit system.

E. Fasteners: To maintain load requirements and weather tight installation, same finish as cladding, non-corrosive type.

2.09 FABRICATION - GUTTERS AND DOWNSPOUTS

A. Fabricate of same material and finish as roofing metal.

B. Form gutters and downspouts and scuppers of rectangular profile and size indicated to collect and remove water. Fabricate with connection pieces.

2.10 FINISHES

A. Framing Members: Clean, prepare, and shop prime. Do not prime surfaces to be field welded.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position

3.02 ERECTION - FRAMING

A. Erect framing in accordance with AISC 360.

B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Locate braced bays as indicated.

C. Set column base plates with non-shrink grout to achieve full plate bearing.

D. Do not field cut or alter structural members without approval.

E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.03 ERECTION - WALL AND ROOF PANELS

A. Install in accordance with manufacturer's instructions.

B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

C. Fasten cladding system to structural supports, aligned level and plumb.

D. Locate end laps over supports. End laps minimum 2 inches. Place side laps over bearing.

E. Provide expansion joints where indicated.

F. Use concealed fasteners.

G. Install sealant and gaskets, providing weather tight installation.

3.04 ERECTION - GUTTERS AND DOWNSPOUTS

A. Rigidly support and secure components. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.

B. Slope gutters minimum 1/16 inch/ft.

C. Install splash pans under each downspout.

3.05 INSTALLATION - ACCESSORY COMPONENTS IN WALL SYSTEM

3.06 TOLERANCES

A. Framing Members: 1/4 inch from level; 1/8 inch from plumb.

B. Siding and Roofing: 1/8 inch from true position.

END OF SECTION

SECTION 22 0000

PLUMBING GENERAL PROVISIONS

1.0 GENERAL

1.1 SUMMARY

a. Except as modified in this section, General Conditions, Supplementary Conditions, applicable provisions of Division 01, General Requirements, and other provisions and requirements of the contract documents apply to work of Division 22, Plumbing.

b. Applicable provisions of this section apply to all sections of Division 22, Plumbing.

c. It is the intent of the Contract Documents to provide an installation complete in every respect. In the event that additional details of special construction may be required for work indicated or specified in this section or work specified in other sections, it shall be the responsibility of the Contractor to provide same as well as to provide material and equipment usually furnished with such systems or required to complete the installation, whether mentioned or not.

d. Refer to Division 23 for piping, insulation, valves, etc.

1.2 CODE REQUIREMENTS AND PERMITS

a. Perform work in accordance with applicable statutes, ordinances, codes, and regulations of governmental authorities having jurisdiction.

b. Resolve any code violation discovered in contract documents with the Engineer prior to award of the contract. After award of the contract, make any correction or additions necessary for compliance with applicable codes at no additional cost to Owner.

c. Obtain and pay for all permits and inspections.

1.3 REFERENCE SPECIFICATIONS AND STANDARDS

a. Materials which are specified by reference to Federal Specifications; ASTM, ASME, ANSI, or AWWA Specifications; Federal Standards; or other standard specifications must comply with latest editions, revisions, amendments or supplements in effect on date bids are received. Requirements in reference specifications and standards are minimum for all equipment, material, and work. In instances where capacities, size or other feature of equipment, devices or materials exceed these minimums, meet listed or shown capacities.

1.4 CONTRACTOR QUALIFICATIONS

a. An acceptable contractor for the work under this division shall be a specialist in this field and have the personal experience, training, skill and the organization to provide a practical working system. If required, he shall be able to furnish acceptable evidence of having contracted for and installed not less

than three systems of comparable size and type to this one, that have served their owners satisfactorily for not less than three years.

b. The foreman for this work shall have had experience in installing not less than three such systems and shall be approved before the work is begun. Adequate and competent supervision shall be provided to ensure first class workmanship and installation.

c. Work shall be executed, and all materials installed in accordance with the best practice of the trades in a thorough, substantial, workmanlike manner by competent workmen, presenting a neat appearance when completed. Work shall be performed by mechanics skilled in the trade.

d. The Contractor shall be responsible for all construction techniques required for all mechanical systems specified and shown on the drawings.

1.5 REQUEST FOR INFORMATION

a. The Contractor may, after exercising due diligence to locate required information, request from the Consultant clarification or interpretation of the requirements of the Contract Documents. The consultant shall respond to such Contractor's requests for clarification or interpretation. However, if the information requested by the Contractor is apparent from field observations, is contained in the Contract documents or is reasonably inferable from them, the Contractor shall be responsible to the Owner for all reasonable costs charged by the consultant to the Owner for the Additional Services required to provide such information.

1.6 CONTRACT DRAWINGS

a. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements of work or show all offsets or required fittings. Determine exact locations from field measurements. Making adjustments to field conditions is considered a part of the work required.

b. When the mechanical and electrical Contract Documents do not give exact details to the elevation of pipe, conduit and ducts, the Contractor shall physically arrange the systems to fit in the space available at the elevations intended with proper grade for the functioning of the system involved. Piping, exposed conduit and the duct systems are generally intended to be installed true and square to the building construction and located as high as possible against the structure in a neat and workmanlike manner. The Contract Documents do not show all required offsets, control lines, pilot lines and other location details. Work shall be concealed in all finished areas.

c. Prior to locating mechanical equipment, plumbing fixtures, water heaters, water coolers and other plumbing or mechanical items, obtain approval as to exact method and exact placement and location of equipment in the various areas shown on the drawings. In no case shall the locations be determined by scaling the drawings. Plumbing fixtures shall be mounted at the heights directed by the Architect and local code authorities. Relocate equipment and devices and pay all costs of modifying work of all trades necessitated by failure to comply with this requirement.

d. These specifications are accompanied by drawings of the building and details of the installation indicating the locations of equipment, piping, ductwork, outlets, switch controls, circuits, lines, etc. The drawings and these specifications are complementary to each other, and what is required by one shall be as binding as if required by both.

e. It is the Contractor's responsibility to properly use all information found on the Architectural, Structural, Mechanical and Electrical Drawings where such information affects his work.

f. The drawings show diagrammatically the location of the various outlets and apparatus. Exact locations of these outlets and apparatus shall be determined by reference to the general drawings and to all detail drawings, equipment drawings, rough-in drawings, etc., by measurements at the building, and in cooperation with the other trades. The Owner reserves the right to make any reasonable change in location of any outlet or apparatus before installation, without additional cost to the Owner.

g. Should the drawings or specifications disagree within themselves, or with each other, the better quality or greater quantity of work or materials shall be estimated upon, and unless otherwise directed by the Architect in writing, shall be performed or furnished.

1.7 OFFSETS

a. The Contract Documents are diagrammatic as stated above. Not all offsets are shown. This applies to all ductwork, piping, flues, or any other component that is routed underground or throughout the structure. The Contractor shall be responsible to layout all piping in a manner that allows for complete maintenance access. Contractor shall provide and install, without additional costs, all offsets necessary to complete this project and to provide a complete, working, accessible, and maintainable system.

2.0 PRODUCTS

2.1 Per Senate Bill 1289 passed in 2017, all state entities are required to provide all iron and steel products to be manufactured in the United States.

3.0 EXECUTION

3.1 Consider space limitations imposed by contiguous work in selection and location of equipment and material. Do not provide equipment or material which is not suitable in this respect.

3.2 OBSTRUCTIONS

a. The drawings indicate certain information pertaining to surface and subsurface obstructions which have been taken from available drawings. Such information is not guaranteed, however, as to accuracy of location or complete information.

b. Before any cutting or trenching operations are begun, verify with Owner's representative, utility company, municipalities, and other interested parties that all available information has been provided. Verify locations given.

c. Should obstruction be encountered, whether shown or not, alter routing of new work, reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.

d. Assume total responsibility for and repair any damage to existing utilities or construction, whether or not such existing facilities are shown.

3.3 CUTTING AND PATCHING

a. The Contractor shall be responsible for timely placing of all equipment and piping to avoid cutting new construction.

3.4 OPENINGS

a. Framed, cast or masonry openings for piping or equipment is specified under other divisions. However, drawings and layout work for exact size and location of all such openings are included under this division.

3.5 COORDINATION

a. Contract Documents are diagrammatic in showing certain physical relationships to other trades. Interface and coordination with other work including utilities and electrical work is the exclusive responsibility of the contractor.

b. Contractor shall coordinate with Division 26 and other divisions as required. This is to include but not be limited to verification of power, voltage, phase and other characteristics as being compatible with that called for on the electrical drawings and Division 26 specifications, as well as that called for in Division 22 drawings and specifications or other divisions requiring electrical connections or interface with this division. This shall be done prior to placing orders for equipment.

c. Arrange mechanical work in a neat, well organized manner with services running parallel with primary lines of the building construction, and with the maximum overhead clearance possible.

d. Locate operating and control equipment properly to provide easy access. Arrange entire mechanical work with adequate access for operation and maintenance.

e. Advise other trades of openings required in their work for the subsequent move-in of large units of mechanical work.

f. Verify exact locations of existing equipment and determine exact requirements for connections prior to routing services to equipment.

3.6 CONCEALED WORK

a. Where the word "concealed" is used in connection with insulating, painting, piping, ducts and the like, the word is understood to mean hidden from sight as in chases, furred spaces or suspended ceilings. "Exposed" is understood to mean open to view.

3.7 PROTECTION

a. The Contractor shall be responsible for the protection of all materials and equipment to be installed under this Division from physical and weather damage.

b. Provide all hoisting and scaffolding equipment required for proper installation of equipment. The contractor shall take full responsibility for the safety of the materials and equipment using such hoisting equipment and scaffolding.

c. Adequately protect work, equipment, fixtures, and materials. At work completion, all work shall be clean and in good condition.

3.8 GUARANTEE

a. Guarantee work for 1 year from the date of final acceptance of the project and during that period make good any faults or imperfections that may arise due to defects or omissions in materials or workmanship.

3.9 MATERIALS AND EQUIPMENT

a. Furnish new and unused materials and equipment of Domestic Manufacturers meeting requirements of the paragraph specifying acceptable manufacturers. Where two or more units of same type or class of equipment are required, provide units of a single manufacture.

3.10 ACCEPTABLE MANUFACTURERS

a. The following is a list of acceptable manufacturers for items of equipment specified under Division 23, Mechanical. Manufacturers names and catalog numbers specified under sections of Division 23 are used to establish standards of design, performance, quality and serviceability and not to limit competition. Equipment of similar design, equal to that specified, manufactured by a manufacturer named below will be acceptable on approval.

b. A request for prior approval of equipment not listed must be submitted 14 days before bid due date. Only manufacturers specified in sections of Divisions 22 or 23, on drawings or listed below (including subsequent addenda) will be acceptable. There will be no exceptions to this requirement. Submit complete design and performance data to the Architect.

Item	Manufacturer
Plumbing Fixtures	American-Standard, Kohler, TOTO
Plumbing Fixtures, Trim	American-Standard, Chicago-Faucet, Moen Commercial, Elkay, Kohler, McGuire, Symmons, T & S Brass
Water Closet Seats	Bemis, Beneke, Church
Stainless Steel Sinks	Elkay, Just
Flush Valves	Sloan, Delaney, Zurn
Mixing Valves	Leonard, Powers, Symmons, Bradley
Drains, Cleanouts Carriers and Hydrants	J.R. Smith, Josam, Wade, Zurn
Water Hammer Arresters	J.R. Smith, Wade, Zurn
Trap Primers	Precision Plumbing Products

Access Doors	Inryco/Milicor, Karp
Water Heaters	A.O. Smith, Rheem, State, Lochinvar
Valves	Hammond, Nibco, Powell, Stockham, Walworth
Backflow Preventer Valves	Beeco/Hersey, Febco, Watts
Pumps	Aurora, Bell and Gossett, Paco, Taco
Insulation	CertainTeed, Johns-Manville, Knauf, Owens-Corning, Kingspan
Expansion Tanks	Taco, Wood Industrial, Amtrol
Circuit Setters	Bell & Gossett, Taco
Thermometers and Gauges	Ashcroft, Dwyer, Marsh, Trerice

c. Manufacturers listed in schedules, on the drawings or in a specific section of the specifications for a specific product is the basis of design. Any other submitted product will be construed to be a proposed substitute, even if listed in the acceptable manufacturers list, and must comply with the following paragraphs.

d. Acceptance of materials and equipment will be based on manufacturer's published data and will be tentative subject to the submission of complete shop drawings indicating compliance with the contract documents and that adequate and acceptable clearances for entry, servicing, and maintenance will exist. Acceptance of materials and equipment under this provision shall not be construed as authorizing any deviations from the contract documents, unless the attention of the Architect has been directed in writing to the deviations.

e. Each proposed substitute shall be referenced to the trade name of the specified product, and the paragraph and page number of the specifications where the specified items occur. Each proposed substitute shall be accompanied by adequate supporting information including catalog cuts, diagrams, representative samples, published ratings, drawings, and other such descriptive information as may be required to properly illustrate the complete characteristics of materials and equipment. In addition, a detailed statement indicating item-by-item and paragraph-by-paragraph wherein the product to be offered deviates from the specification shall be submitted for each proposed alternate. Any such alternate proposal must include all necessary changes and additions to other work occasioned by such substitution. In addition, each alternate proposal must stipulate that the substituted product will fit the space allotted the specified product and provide the same or greater clearances for maintenance, removal and/or access.

f. When requested by the Architect, the Contractor shall provide a sample of the proposed substitute item. In some cases, samples of both the specified item and the proposed item shall be provided for comparison purposes.

g. Should a substitution be accepted, and should the substitute material prove defective, or otherwise unsatisfactorily for the service intended within the guarantee period, this material or equipment shall be replaced with the material or equipment specified at no additional cost to the Owner.

3.11 SUBMITTAL DATA AND SHOP DRAWINGS

The submittals shall include a specification compliance analysis for review and approval before work shall begin. The compliance document shall address each paragraph of the specification by indicating COMPLY, EXCEED, or EXCEPTION. Do not indicate COMPLY unless the proposed system exactly meets the paragraph requirement. If EXCEED or EXCEPTION is indicated, then provide a clear and concise explanation of the variance from the specifications and the net effect this would have on the specified system performance. This is to be included with each submittal.

a. Submittal data. Submit descriptive literature, physical data, and performance data by the appropriate specification section or the specific sheet where products are shown on the contract drawings that are not referenced by the specification for review. All specification sections require a submittal. Submit each spec section separately but at one time. Submittals can be contained in one binder or binders, however, each specification section must be submitted as a single submittal and each section must be clearly marked or tagged with the specification section number. Each submittal shall bear the specification section number it is related to. Any submittal received without referring to the appropriate specification section number will be returned without review. Include identifying symbols and equipment numbers used in plans and specifications, with reference to specification paragraphs, and drawing numbers of all equipment and material submitted. Submittal data shall specifically list all proposed deviations from the contract documents. Submittals that are not clearly marked will be rejected for that reason.

b. Contractor's Check. Shop drawings and submittal data will be submitted only by the Contractor. Indicate by signed stamp that the drawings and submittal data have been checked, that the work shown on the drawings and submittal data is in accordance with contract requirements and that dimensions and relationship with work of other trades have been checked. If drawings and submittal data are submitted for approval that have not been checked and signed by the Contractor, they will be returned for checking before being considered by the Architect.

c. Engineer's approval of submitted material constitutes an acknowledgment only and in no way relieves the contractor of full responsibility for providing all systems complete in accordance with the intent of the drawings and specifications. Contractor is responsible for confirming and correlating dimensions at job site, for information which pertains to fabrication processes or construction techniques and for coordination of work with all other trades. Any materials or equipment provided by this contractor without approved shop drawings constitutes the contractor's agreement to comply with the engineer's intent whether specified, shown or implied.

d. In addition, the Contractor cannot produce submittals and shop drawings by copying sealed engineering plans in whole or in part. The Contractor must produce their own shop drawings, no exceptions.

3.12 OPERATING AND MAINTENANCE INSTRUCTIONS

a. Secure three copies of operating and maintenance instructions, service manuals, and parts listed applicable to each item of equipment furnished. Deliver three bound sets for the Owner's use. Include nameplate data and design parameters in operation and maintenance manuals. Clearly distinguish between information which applies to the equipment and information which does not apply. Also include all approved submitted data, all warranties on equipment, contractor's warranty and all test and balance reports. Delivery of required documents is a condition of final acceptance.

b. Upon completion of work, and at time designated by Architect, provide services of a competent representative of the contractor for a period of at least 24 hours to instruct the owner's representative in the operation and maintenance of the entire system.

3.13 PROJECT RECORD DOCUMENTS

a. Preparation. Maintain at the job site a separate set of white prints of the contract drawings for the sole purpose of recording the "as built" changes and diagrams of those portions of work in which actual construction is significantly at variance with the contract drawings. Mark the drawings with a colored pencil. Prepare, as the work progresses and upon completion of work, drawings clearly indicating locations of various lines, valves, traps, equipment, and other pertinent items, as installed. Include flow- line elevation of sewer lines. Record underground and under slab piping installed, dimensioning exact location and elevation of such piping.

b. Deliver. At conclusion of project, obtain without cost to Owner, sepias of original mechanical drawings and transfer as-built changes to these. Delivery of as-built prints and reproducible is a condition of final acceptance.

c. Throughout progress of the work of this Contract, maintain an accurate record of all changes in the Contract Documents. Upon completion of the Work of this Contract, transfer the recorded changes to the AutoCAD drawing files and specification word processing files. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff. Thoroughly coordinate all changes within the Record Documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other Documents where such entry is required to properly show the change. Include all addenda items, request for information Architect’s Supplemental Instructions and any other document that causes a change in the Construction Documents. Accuracy of records shall be such that future search for items shown in the Contract Documents may reasonably rely on information obtained from the approved Record Documents.

d. The Contractor shall mark any deviations on a daily basis. The Architect will visit the site and will require to see the "As-Built" documentation periodically. If the Contractor does not keep an accurate set of as-built drawings, the pay request may be altered or delayed at the request of the Architect. Mark the drawings with a colored pencil.

e. Record Documents shall consist of the following:

(1) Job Set: Promptly following award of Contract, secure from the Architect, at no charge to the Architect, one complete set of all mechanical documents comprising the Contract.

(2) Final Record Documents: Obtain the Revit drawings files at the Contractor’s expense ($200 and signed release form).

(a) The Contractor shall transfer all change data shown on the job set of to the corresponding electronic files, coordinating the changes as required, and clearly indicating at each affected detail and other drawing the full description of all changes made during construction and the actual location of items. Call attention to each entry by drawing a "cloud" around the area or areas affected.

(3) Submit the completed total set of Record Documents to the Engineer as described above. Participate in review meeting or meetings as required by the Engineer, make all required

changes in the Record Documents, and promptly deliver the final Record Documents to the Architect. Upon completion of Work, the Contractor shall certify the "Record Drawings" for correctness by signing the following certification:

CERTIFIED CORRECT (3/8" high letters)

(Name of the Contractor)

By

Date

(Name of the Sub-Contractor)

By

Date

f. Deliver record drawings to the Architect in the number and manner specified in Division 01 - General Requirements.

3.14 OPERATING TESTS

a. After all mechanical systems have been completed and put into operation, subject each system to an operating test under design conditions to ensure proper sequence and operation throughout the range of operation. Make adjustments as required to ensure proper functioning of all systems. Special tests on individual systems are specified under individual sections.

3.15 SUBSTITUTIONS REQUIRING CHANGES

a. Manufacturers and power requirements indicated on the mechanical and electrical drawings are the basis of design. If changes are required for the equipment submitted, such as changes in conduit size, conductors, breakers, disconnects, panels, etc., it shall be made at no additional cost to the Owner.

3.16 PIPE SLEEVES

a. Fit with sleeves all pipes passing through masonry and concrete construction. Fabricate sleeves of schedule 40 galvanized steel pipe. Size sleeve for minimum clearance between pipe or insulation and sleeve.

b. Extend each sleeve through the floor or wall. Cut the sleeve flush with each surface, except that in exposed locations, extend floor sleeves 3 inches from finished wall or above finished floor line.

c. Caulk all sleeves water and airtight. Seal annular space between pipes and sleeves with fire stop material, see specification on fire stopping found elsewhere in this specification. Install per manufacturer's recommendations to meet or exceed fire rating of penetrated wall (minimum 1-1/2 hour). Reference architectural drawings for wall fire ratings.

d. Sleeve pipe through concrete foundations, below grade with Thunderline Link-Seal wall penetration seals. Equip seals with stainless steel nuts, bolts and pressure plate.

3.17 FIRESTOPPING

a. All piping, tubing, etc. passing through fire rated floors and/or walls shall have the void area between the material passing through floor and/or wall sealed with an approved fire-stop material to maintain the fire rating of the floor and/or wall. Depending on the particular installation, the contractor shall use FS900 series fire stop caulk or FS500/600 series fire-stop components as manufactured by International Protective Coatings or approved equivalent.

b. All fire stop systems shall be installed as required by the manufacturer and U.L. requirements for each application.

c. The Contractor shall procure the services of an independent inspection service to review and provide a certified letter to the Contractor, Engineer and the City of Austin, stating all firestopping has been installed per UL listing and the manufacturer's recommendations. Independent service shall have experience in the inspection of firestopping materials and methods installed.

3.18 PRECEDENCE OF MATERIALS

a. The specifications determine the nature and setting of materials and equipment. The drawings establish quantities, dimensions and details.

b. The installation precedence of materials shall be as follows. Note that if an interference is encountered, this shall guide the Contractor in the determination of which trade shall be given the "Right-of-Way".

Building lines
Structural Members
Soil and Drain Piping
Condensate Drains
Vent Piping
Supply, Return, and Outside Air Ductwork
Exhaust Ductwork
Domestic Water (Cold and Hot)
Refrigerant Piping
Electrical Conduit

End of Section 22 0000

SECTION 22 07 19.01

LOW TEMPERATURE PIPING INSULATION

1.0 GENERAL

1.1 SCOPE

a. This section provides for installing and furnishing low temperature piping insulation of Fiberglass. The insulation will be used for low temperature application for domestic cold water, condensate drains, and horizontal portions of waste lines above grade that receive condensate from air handling units or evaporators.

1.2 RELATED WORK

a. Division 23, HVAC. Insulation - General.

2.0 PRODUCTS

2.1 PIPE INSULATION

Use one of the following as noted in the schedule below:

a. Fiberglass premolded pipe insulation, 4 PCF density, k-value 0.23 btu· in/hr· ft²· ℉ at 75℉, R- value = 4.3/inch, with factory-applied reinforced All Service Jacket having integral laminated aluminum vapor barrier.

	Thickness (Inches)		
Insulated Unit	Fiberglass	Koolphen-K	Armaflex AP
Condensate Drain Lines	—	—	1/2
Above Ground Sanitary Waste Piping receiving Condensate from HVAC Equipment	1/2	3/4	—
Domestic Cold Water Piping (All)	1	3/4	—
Refrigerant Suction Piping	—	—	1 (1)
(1) Pipe 1-1/2" and less - 1" insulation; larger than 1-1/2" - 1-1/2" insulation			

2.2 FLANGE, VALVE AND FITTING INSULATION

a. Provide molded or mitered covers for flanges, valves and fittings. Refer to paragraph 3.2 for method of fabrication.

2.3 INSULATION SHIELD

a. Field Fabricated. Use sections of high density Koolphen-K, fiberglass, or foamglass insulation that will support the bearing area at hangers and supports. Further support insulation at hangers and supports with a shield of galvanized metal extending not less than 4 inches on either side of the support bearing area, covering at least half of the pipe circumference, and conforming to the schedule below.

Adhere metal shield to insulation so that metal will not slide with respect to insulation. Pipe

Diameter	Insulated Section Length in Inches	Minimum U.S. Standard Gauge of Metal Shield
3" and smaller	12	18

2.4 SEALANT, ADHESIVE AND FINISH

a. Sealant. Use Foster 95-44 or Childers CP-76 to be used at valve covers and vapor stops.

b. Adhesive. Furnish Foster 85-60 or Childers CP-127 to seal longitudinal laps of the vapor barrier jacket and to adhere butt joint covers. Self-sealing laps and butt strips are not allowed.

c. Finish. Use Foster 30-65 or Childers CP-34 with glass fabric reinforcement.

d. Finish Armaflex AP insulation installed outdoors with minimum two coats of Armstrong Finish per manufacturer's recommendations.

2.5 ALUMINUM JACKETING

a. Apply aluminum jacketing to all fiberglass and Phenolic insulated pipe located outdoors or as noted. For piping in crawl spaces, apply white PVC sealed jacketing.

(1) Piping. Furnish for finishing insulated pipe, a self-fastening jacket of type 3003-H14 aluminum alloy, 0.016-inch thick.

(2) Valves, Fittings and Flanges. For finishing all valves, fittings and flanges, and smaller installations, provide formed aluminum covers, 0.024-inches thick, Type 3003-H14 aluminum alloy.

(3) Straps and seals. Provide aluminum strapping seals for jackets and covers according to manufacturer's recommendations.

(4) Acceptable manufacturers. Jacketing as manufactured by Preformed Metal Products Company, Childers or Johns-Manville will be acceptable.

2.6 HEAT TRACING

a. Provide a parallel resistance heating cable with minimum 4.0 watts per lineal foot. Cable shall be UL listed and selected for 120 volt single phase service. Provide an adjustable thermostat with remote sensing bulb to energize cable when ambient temperature drops below 40F, field adjustable, Thermon or approved equal. Heat trace all water piping located outdoors or exposed to outside temperatures.

3.0 EXECUTION

3.1 PIPE

a. Apply insulation to clean, dry pipes. Butt insulation joints firmly together. Seal longitudinal laps and butt strips with adhesive.

b. Where piping is interrupted by fittings, flanges, valves or hangers and at intervals not to exceed 25 feet on straight runs, an isolating seal (vapor stop) shall be formed between the vapor barrier jacket and the bare pipe by liberal application of the sealant to the exposed joint faces carried continuously down to and along 4 inches of pipe and up to and along 2 inches of the jacket. This shall be provided only for chilled water service. In areas with high ambient temperature and humidity conditions, seal all butt joints with vapor stop sealant in accordance with recommendations of the insulation manufacturer.

3.2 VALVES, FLANGES AND FITTINGS

a. Insulate all valves, flanges and fittings with factory molded or mitered fitting covers secured with wire. Thickness of insulation shall be equal to that of adjoining piping. Mitered covers for pipe 2" and smaller shall be minimum 3-piece to the side, and pipe 2-1/2" and larger shall be minimum 6 pieces to the side. The fitting shall then be rasped or otherwise formed to have a smooth appearance.

b. Finish with 1/4-inch layer of Foster 30-65 or Childers CP-34 reinforced with glass fabric.

3.3 SHIELDS AND HANGERS

a. When the insulation is jacketed in aluminum, install a length of 40-pound roofing felt 1/2 inch longer than the insulation shield between shield and jacket.

End of Section 22 07 19.01

SECTION 22 07 19.02

HIGH TEMPERATURE PIPING INSULATION (FIBERGLASS)

1.0 GENERAL

1.1 SCOPE

a. This section provides for furnishing and installing high temperature piping insulation, including domestic hot water and hot water return piping.

1.2 RELATED WORK

a. Division 23, HVAC. Insulation - General.

2.0 PRODUCTS

2.1 INSULATION

a. Use premolded fiberglass pipe insulation, 4 PCF density, R-value = 4.3/inch with a factory- applied, all service reinforced jacket having integral laminated aluminum vapor barrier or phenolic foam rated for 210F if listed for the service. Phenolic foam to be CFC/HCFC free, ASTM C1126, Insul-phen by Resolco, 2.5 PCF density, K-value = .13, R-value = 7.6/inch with factory applied ASJ. Provide insulation thickness as listed.

Insulating Unit	Fiberglass Thickness (Inches)	Phenolic Foam Thickness (Inches)
Domestic Hot Water Piping, 1-1/2" and smaller	1	1
Domestic Hot Water Piping, 2" and greater	1-1/2	1-1/2

2.2 INSULATION SHIELD

a. Field Fabricated. Use sections of high density fiberglass, calcium silicate, or foamglass insulation that will support the bearing area at hangers and supports. Further support insulation at hangers and supports with a shield of galvanized metal extending not less than 4 inches on either side of the support bearing area, covering at least half of the pipe circumference, and conforming to the schedule below. When pipe is guided at top and bottom, metal shields shall cover the whole pipe circumference. Adhere metal shield to insulation so that metal will not slide in respect to insulation.

Pipe Diameter	Insulated Section Length in Inches	Minimum U.S. Standard Gauge of Metal Shield
3" and smaller	12	18

2.3 ADHESIVE, FINISH AND CEMENT

a. Adhesive. Furnish Foster 85-60 or Childers CP-127 to seal longitudinal laps of vapor barrier jacket and to adhere joint butt covers.

b. Finish. Use Foster 46-50 or Childers CP-10/11 with glass fabric reinforcement.

c. Cement. Furnish Johns-Manville No. 460 on insulated fittings, flanges and valves.

3.0 EXECUTION

3.1 PIPE

a. Apply insulation to clean, dry pipes. Butt insulation joints firmly together. Seal longitudinal laps and butt strips with adhesive. Insulation using self sealing laps and butt strips is acceptable.

3.2 VALVES, FITTINGS AND FLANGES

a. Omit insulation at screwed unions and at valves smaller than 1-1/2 inches, except at VAV box heating coils and on steam and condensate piping, where insulation is required.

b. On concealed piping, insulate fittings and valves 2-1/2 inches IPS and larger, with factory molded or mitered fitting covers. Mitered covers for pipe 2" and smaller shall be minimum 3-piece to the side, and pipe 2-1/2" and larger shall be minimum 6-pieces to the side. The fitting shall then be rasped or otherwise formed to have a smooth appearance. Thickness of insulation shall be equal to that of adjoining pipe. Finish with coating reinforced with white 10" by 10" glass fabric.

c. On concealed piping, insulate fittings and valves 2 inches IPS and smaller with mineral wool and insulating cement to a thickness equal to or greater than adjoining straight pipe. At Contractor's option, provide molded or mitered fittings, finished with coating reinforced with glass fabric. Mitered covers for pipe 2" and smaller shall be minimum 3-piece to the side, and pipe 2-1/2" and larger shall be minimum 6-pieces to the side. The fitting shall then be rasped or otherwise formed to have a smooth appearance.

d. In exposed areas, insulate all fittings, flanges and valves with factory molded or mitered fitting covers. Thickness of insulation shall be equal to that of adjoining pipe. Mitered covers for pipe 2" and smaller shall be minimum 3-piece to the side, and pipe 2-1/2" and larger shall be minimum 6-pieces to the side. The fitting shall then be rasped or otherwise formed to have a smooth appearance. Finish with coating reinforced with white glass fabric.

e. Finish with 1/4-inch layer of Foster 46-50 or Childers CP-10/11 reinforced with glass fabric.

3.3 SHIELDS AND HANGERS

a. When the insulation is jacketed in aluminum, install a length of 40-pound roofing felt 1/2 inch longer than the insulation shield between shield and jacket.

End of Section 22 07 19.02

SECTION 22 1116

DOMESTIC WATER PIPING AND APPURTENANCES

1.0 GENERAL

1.1 SCOPE

a. This section provides requirements for furnishing and installing domestic hot and cold water piping.

1.2 RELATED WORK

a. Division 2, Plumbing.

(1) Earthwork.

(2) Access Doors.

(3) Valves, Strainers and Vents.

(4) Low Temperature Piping Insulation.

(5) High Temperature Piping Insulation.

(6) Pipe and Pipe Fittings - General.

1.3 STANDARDS

a. Perform work in accordance with applicable statutes, ordinances, codes, and regulations of governmental authorities having jurisdiction.

b. Resolve any code violation discovered in contract documents with the Engineer prior to award of the contract. After award of the contract, make any correction or additions necessary for compliance with applicable codes at no additional cost to Owner.

c. Obtain and pay for all permits and inspections.

2.0 PRODUCTS

2.1 PIPING AND FITTINGS

Provide pipe and pipe fittings of domestic manufacturers only.

a. Underground Piping.

(1) 2-1/2-inch and smaller, provide ASTM B-88, hard-drawn, Type K copper water tube with wrought copper fittings.

b. Underfloor Piping. Furnish ASTM B 88 cold drawn, Type K copper water tube. Run continuous with no joints under the floor slab to 12-inches above finished floor. Insulate all underfloor piping with 1-inch thick Armaflex AP pipe insulation to 6-inches above finished floor.

c. Above Ground Piping. Provide seamless ASTM B 88 Type L or CDA alloy 194 heavy copper water tube with wrought copper fittings, ANSI B 16.22. Tape all bare copper piping located in CMU block walls with polyvinyl tape.

d. Solder. Use Harris "Stay-Safe-Bridgit", lead free, UPC and NSF approved, silver bearing solder with Harris "Stay-Clean" liquid solder flux. Apply per manufacturer's recommendations.

e. Unions. Provide Class-150, standard, 300-pound water-oil-gas service galvanized, malleable iron unions with ground joint and bronze seat. Flange joints larger than 2-inch. Provide dielectric isolating unions at all junctions or connections between metallic piping of dissimilar metal.

2.2 VALVES

Provide valves of one manufacturer only. Do not provide valves of more than one manufacturer throughout project.

a. Above Ground Gate Valves.

(l) 2-1/2-inches and smaller. Provide Class 150, ASTM B-62, cast bronze composition body and bonnet, ASTM B-371 alloy 694 Copper-silicon alloy stem, brass packing gland, Teflon-impregnated packing, rising stem, solid wedge, union bonnet, screwed end all bronze gate valves with malleable iron handwheel. Stockham B-120, Wallworth 11, Powell 2714, Nibco T-134.

(2) 3-inches and larger. Provide Class 125, OS&,Y, IBBM, bronze mounted, solid wedge, ASTM A-126 Class B cast body and bonnet, flanged end gate valves with two-piece packing gland assembly and graphite impregnated Aramid fiber. Stockham G-623, Powell 1793 or Nibco F-617-O.

b. Below Ground Gate Valves. Provide Class 200, WWP, AWWA, non-rising stem, IBBM, double disk with parallel seat, ASTM A-126 Class B cast body and bonnet, flanged end gate valves with 1-1/4-inch shaft and 2-inch operating nut. Stockham G-745-O, Kennedy 561X, Mueller A-23600-6, or Nibco F609-RW.

(l) Provide an adjustable, extension type cast iron valve box with screw or locking slide adjustment, flared base and locking lid with 3/16-inch minimum wall thickness. Provide valve box for each valve. Use covers with appropriate identification marking cast on cover of type service. Western Iron Works Fig. 6-1.

c. Check Valves.

(l) 2-1/2-inches and smaller. Provide Class 125, ASTM B-62, MSS-SP80 cast bronze composition body and cap, screwed end all bronze check valves with brass or bronze swing type disc. Hammond IB904, Stockham B-319, Jenkins 4092, Walworth 3406, Nibco T-413-B or Powell 578.

d. Ball Valves. 600 PSI, ASTM B62, B61/B584 cast bronze of ASTM B62, B61 or B584 body, replaceable reinforced Teflon seats, full port, blowout proof stems, stainless steel ball and stem with screwed ends. Watts B-6800-SS, Apollo 77-140 or Nibco T-585-70-66.

e. Balancing Valves. Provide Nibco series Fig. 1710 balancing valves with NPT connections. Size, install and balance set in accordance with manufacturer's recommendations.

f. Pressure Reducing Valve. Provide a spring-loaded valve, with bronze body, threaded end with adjustable spring of corrosion-resistant steel and neoprene coated nylon diaphragm. 200 PSI maximum inlet pressure and adjustable from 25 to 75 PSI outlet pressure. Fisher type 75A or Watts U5B series.

2.3 EXPANSION TANKS

a. Expansion tanks shall be provide for all domestic hot water heaters and boilers to absorb excessive water pressure and eliminate damage to piping and weeping of the temperature and pressure relief valves. Tanks shall use a bladder or diaphragm for the separation of air and water. Tanks shall be listed and approved for use in the City of Austin. Size and install expansion tanks as recommended by the manufacturer.

(1) Domestic hot water expansion tanks shall be constructed to ensure that all wetted components are of FDA approved materials.

3.0 EXECUTION

3.1 INSTALLATION

a. Make entire installation per local code requirements.

b. Keep the inside of the piping free from foreign matter.

c. Cut all piping neatly, using approved type mechanical cutters without damaging pipe. Use wheel cutters when applicable.

d. Ream all pipe connections and remove all burrs.

e. Properly flush all water lines adequately to remove all foreign matter from within plumbing systems prior to installation of fixtures.

f. For sets of fixtures installed on 4-inch walls or in concrete masonry unit (CMU) walls, provide a separate hot and cold water supply line for each fixture (do not interconnect in wall). Connect the water supply lines above the ceiling. Maintain structural and aesthetic integrity of walls.

g. Provide all valves, unions and appurtenances shown on floor plans, details, schematics and risers. Provide line-size shut-off valves for all groups of fixtures, each major equipment connection, each floor level and at all main branch connections to mains.

h. Provide access doors to provide access to all valves and to all appurtenances requiring service or maintenance.

i. Shutoff valves.

(1) Valves shown on drawings are partial requirements only. Contractor shall provide and install all valves shown on drawings, specified in this specification section as well as any additional valves required to isolate each fixture; if single fixture; each group and each battery of fixtures from the building main.

(2) Provide valves wherever necessary to make repairable all parts of the water supply system without necessitating shutting off the main water supply to the building.

(3) Size. Provide full size shutoff valves. All valves shall be full size of the line served.

(4) Access door installation. Install shutoff valves such that valve handle is centered behind the door. Valves shall be installed within 6-inches (in depth) from access door and shall be centered in respect to access door opening for easy access.

(5) Provide a full size main shutoff valve in cast iron valve box for each water main entering the building. Locate approximately 2-feet from building.

(6) On buildings with multiple floors, provide a full size shutoff valve at the base of each water supply riser serving plumbing fixture on the upper floors.

j. Balancing valves shall be installed where shown on the drawings and where required to properly balance the hot water return system. Reference water heater specifications for other balancing requirements.

k. Provide all fittings and appurtenances required for a complete and working system.

3.2 MINIMUM COVER

a. For piping located below floors or finished grade, install piping in trench to the required depth to insure two feet minimum cover over pipe.

b. All underground piping shall be embedded in sand in accordance with section VIA-1.13a of the "Standard Construction Specifications of the Water and Wastewater Department.

3.3 DRAINAGE

a. Install water piping systems with uniform horizontal grade of 1/8-inch per 10 feet, to low points to provide complete drainage of the system. Where constant pitch cannot be maintained for long runs, establish intermediate low points and rise to new level.

b. Grade branches to drain to mains or risers. Unless otherwise indicated, terminate low points of risers with drain valve piped to nearest hub or floor drain. Install a 2-inch drain for pipes 2-inches in

diameter and larger. Install line size drain valves for pipes smaller than 2-inches. As drain valves, use gate valves as specified in this section. Route drains to floor drains with adequate air gap for cross connection protection.

3.4 STERILIZATION

a. Sterilize the main water system with solution containing not less than 50 parts per million available chlorine. Allow chlorinating solution to remain in system for period of 8 hours. Have valves and faucets opened and closed several times during the period. After sterilization, flush the solution from the system with clean water until residual chlorine content is less than 0.2 parts per million.

3.5 ROUGH-IN AND FINAL CONNECTIONS

a. Make rough-in and final connection of all services to all fixtures requiring plumbing connections. Contractor shall be responsible for installing fixtures at locations shown on the Architectural drawings and providing all service connections at required locations.

b. Provide service connections to all plumbing fixtures specified and to all equipment furnished by others. Reference section 23 21 00 for rough-in requirements of equipment furnished by others.

3.6 COORDINATION

a. Making adjustments to field conditions is considered a part of the work required. Do not use contract drawings accompanying these specifications for rough-in locations but only for pipe sizing and general routing.

b. Contractor shall examine and familiarize himself with the Architectural, Structural, Electrical and Mechanical drawings to be knowledgeable of all plumbing connections required and space limitations.

c. The drawings are diagrammatic and are not intended to show all the fittings required. Contractor shall include in his bid, costs for items of material and labor which are not specifically called for in drawings or specifications, but which are required to make plumbing installation. Contractor shall make any necessary changes to avoid beams, footings, columns, piers, vents, ducts, equipment or other obstructions
d.

e. In any case where a pipe shown on a plan sheet differs from that shown on a riser, schematic or detail, use the larger of the two sizes shown.

f. Do not route any piping above electrical control panels and related electrical equipment. Prior to installation of any piping, determine the actual space requirements and the location of all electrical panels and related electrical equipment. Make all offsets and adjustments as required.

3.7 MAXIMUM PRESSURE

a. Provide pressure reducing valves on domestic water systems where pressures exceed 70 PSI. Provide a minimum downstream pressure of 60 PSI. Contractor shall obtain pressure readings at building cold water supply connection and forward pressure test findings to the Architect in written letter form prior to start of construction of interior water supply piping.

b. Pressure reducing valves shall be located exposed in mechanical rooms or (where space permits) above ceilings or in walls, with access doors of adequate size.

c. Equip all pressure reducing valves with two gate valves (for shut-off), a strainer, a 1-1/2-inch diameter by-pass with throttling valve (globe valve), a pressure relief valve and two pressure gauges. Relief valve discharge shall be routed to a safe point of discharge outside of building.

3.8 PIPE EXPANSION AND CONTRACTION

a. Provide expansion joints for all hot water piping having straight lengths of 100 feet and greater. Pipe anchors, guides and supports are specified in the section on pipe and pipe fittings general.

b. Provide swing joints to all branch connections and individual pipe connections from mains. Provide a minimum of 2-elbows from main connection for each branch or individual connection. Provide all offsets, changes in direction and swing joints required to compensate for expansion of pipe whether shown or not on the drawings.

c. Contractor shall install pipe with adequate spacing between the water lines and the building construction such that the expansion of the pipe (in length) is less than the space available. Protect all pipe from rupture or damage due to expansion.

3.9 TESTING

a. Test under a cold water hydrostatic pressure of 1-1/2 times operating pressure (150 psig minimum) and carefully check for leaks. Repair all leaks and retest system until system holds for at least 24 hours and proven watertight.

b. Testing shall be verified by Architect/Engineer or appointed Owners representative. At Architect's/Engineer's discretion, the General Contractor shall verify and document the test results. Test findings shall be documented and forwarded to the Architect.

End of Section 22 1116

SECTION 22 1316

SOIL, WASTE, AND SANITARY PVC DRAIN PIPING, VENT PIPING AND APPURTENANANCES

1.0 GENERAL

1.1 SCOPE

a. This Section provides requirements for furnishing and installing piping within buildings and underground laterals.

1.2 RELATED WORK

a. Division 22, Plumbing.

(1) Pipe and Pipe Fittings.

(2) Plumbing Fixtures and Fixture Carriers.

(3) Drains, Hydrants and Cleanouts.

(4) Low Temperature Piping Insulation.

1.3 STANDARDS

a. Perform work in accordance with applicable statutes, ordinances, codes, and regulations of governmental authorities having jurisdiction.

b. Resolve any code violation discovered in contract documents with the Engineer prior to award of the Contract. After award of the Contract, make any correction or additions necessary for compliance with applicable codes at no additional cost to Owner.

c. Obtain and pay for all permits and inspections.

2.0 PRODUCTS

2.1 DRAIN AND VENT PIPE AND FITTINGS

a. Waste and vent pipe and pipe fittings shall be:

(1) Material. Schedule 40 ASTM D-1784, D-2665, D-3311, FHA UM-79, Federal Specification L-P-320a, IAPMO IS 9-75, PS 27-69, NSF Standard No. 14, cell classification 12454-B (Type I, Grade 1) polyvinyl chloride - drain waste and vent (PVC-DWV) pipe and fittings.

(2) PVC pipe and pipe fittings shall have design stresses of 2000 psi at 73□F and shall be listed, tested, and approved for conveying sanitary waste by the Plastic Pipe Institute (PPI) and the National Foundation Testing Laboratory (NSF).

(3) Fittings shall conform to ASTM D-2466 and NSF Standard No.14.
(4) Solvent cement joints shall be made in accordance with ASTM D-2564 using Purple Primer meeting requirements of ASTM F-656, listed for use on PVC.

(5) All piping system components shall be the products of one manufacturer and shall be installed in accordance with the manufacturer's recommendations. Piping shall not be threaded.

(6) Fittings and pipe shall be clearly marked in accordance with the requirements of ASTM standards.

3.0 EXECUTION

3.1 NOTICE AND FEES

a. Give proper notice and pay all fees and other costs for complete sewer service.

3.2 GRADE AND COVER

a. Give horizontal pipe a uniform grade of 1/4-inch per foot where possible, but not less than 1/8-inch per foot, unless otherwise shown. Verify all flowline elevations and pipe grades with local authorities for approval of all sanitary piping with grades less than 1/4-inch per foot. Field verify all flow lines shown on drawings.

b. Prior to installation of any portion of piping, determine the actual space requirements including the space required for proper slope of pipe. Do not install any piping until such flow line elevations and offsets are determined to be acceptable within the limitations of these documents and local code requirements. Make all offsets and adjustments required for proper installation.

3.3 PIPE AND JOINT FABRICATION

a. Cut plastic pipe with pipe cutters using a cutting wheel specifically designed for plastic pipe.

b. Remove all burrs, chips, filings, etc. from both the I.D. and O.D. of the pipe before joining. Use a knife, deburring tool, or a half-pound coarse file to remove all burrs.

c. Bevel all pipe ends to minimize the chances of wiping the solvent cement from the I.D. of the fitting as the pipe is socketed. Use a beveling tool designed to bevel pipe at a 10-degree to 15-degree angle and a depth of 1/16-inch to 3/32-inch.

d. Using a clean, dry, cotton rag, wipe away all loose dirt and moisture from the I.D. and O.D. of the pipe end and the I.D. of the fitting. Do not solvent weld wet surfaces.

e. Apply primer to the pipe surface in the same manner, making sure that the length of pipe evenly brushed is at least equal to the fitting socket depth.

f. For checking penetration, scratch or scrape away the primed surface until a few thousandths of an inch can be so removed. Repeat applications of primer to either or both surfaces as necessary. In cold weather, allow more time for proper penetration.

g. Cover the outer pipe surface literally with solvent cement for a length at least equal to that of the fitting socket depth.

h. Continue alternate application to the fitting socket with a medium layer of solvent cement. Avoid

puddling in the socket. On belled end pipe, do not coat beyond the socket depth or allow cement to run beyond the bell.

i. Apply a second coat of cement to the pipe. Cement layers must be without voids and sufficient to fill any gaps in the joints.

j. Immediately upon finishing cement application and before it starts to set, insert the pipe to the full socket depth while rotating the pipe or fitting 1/4-turn to ensure complete and even distribution of the cement. Hold joint together for a minimum of 10 to 15 seconds to make sure that pipe does not move back out of the socket.

k. Immediately after joining and before joint is set, gently place joint onto a level surface, and wipe off all excess cement from the circumference of the joint.

l. Do not perform joining operations if ambient temperature is below 40-degrees Fahrenheit. Allow a minimum of 72 hours of joint drying time before subjecting joints to any appreciable internal pressure.

3.4 DRAIN PIPE AND FITTINGS

a. Offsets and Fittings.

(1) Use reduction fittings to connect two pipes of different diameter.

(2) Change directions by appropriate use of 45-degree wyes, long-sweep quarter-bends, and sixth- , eighth-, and sixteenth-bends. Sanitary tees may be used on vertical stacks. Use long sweeps at the base of risers.

(3) Provide a separate trap at each fixture, unless a trap is built into the fixture. Provide a Deep Seal trap at each floor drain and hub drain. Place traps so that the discharge from any fixture will pass through only one trap before reaching a building drain.

(4) For sets of fixtures installed in 4-inch walls, provide a separate waste and vent line for each fixture (do not interconnect in wall). Connect the waste lines underfloor and the vent lines above the ceiling. Maintain structural and aesthetic integrity of walls.

(5) Do not route any piping above electrical control panels and related electrical equipment. Prior to installation of any piping, determine the actual space requirements and the location of all electrical panels and related electrical equipment. Make all offsets and adjustments as required.

b. Floor Drains. Provide all required floor drains complete with drain lines and vent lines as required by the section on Drains, Hydrants and Cleanouts.

c. Cleanouts.

(1) Provide drainage lines with properly specified cleanouts. Provide all as required by the section on drains, hydrants and cleanouts.

3.5 VENT PIPING

a. Make vent connections to vent stacks with inverted wye fittings. Extend full-size vents through the roof to at least 6-inches above the roof.

b. Coordinate location of vent penetrations with roofing trades; flashing to be done by roofer.

c. Offset all vents located near building edge such that no vent through roof piping is located within 5-feet from the building edge (measured from building line not building eave). Make offsets in roof structure space.

d. Terminate vent through roof not less than 15-feet away from any shaft, window or outside air intake openings.

e. All vent and vent branch pipes shall be graded and connected to drip back to sanitary waste piping by gravity.

3.6 ROUGH-IN AND FINAL CONNECTIONS

a. Make rough-in and final connection of all services to all fixtures requiring plumbing connections. Contractor shall be responsible for installing fixtures at locations shown on the Architectural drawings and providing all service connections at required locations.

b. Rough-in and final connection of services to all equipment shall be installed in accordance with the latest edition of the manufacturer's rough-in measurements manual. Contractor shall obtain all such documents.

c. Use threaded sanitary tapped tee pipe fittings for p-trap connections at walls.

d. Provide service connections to all plumbing fixtures specified and to all equipment furnished by others. Reference Section 23 21 00 for rough-in requirements of equipment furnished by others where applicable.

e. Install all piping and associated equipment in accordance to manufacturer's recommendations using recommended tools.

f. Provide all fittings and appurtenances required for a complete and working system.

3.7 COORDINATION

a. Making adjustments to field conditions is considered a part of the work required. Do not use contract drawings accompanying these specifications for rough-in locations but only for pipe sizing and general routing.

b. Contractor shall examine and familiarize himself with the Architectural, Structural, Electrical and Mechanical Drawings to be knowledgeable of all plumbing connections required and space limitations.

c. The Drawings are diagrammatic and are not intended to show all the fittings required. Contractor shall include in his bid, costs for items of material and labor which are not specifically called for in drawings or specifications, but which are required to make plumbing installation. Contractor shall make any necessary changes to avoid beams, footings, columns, piers, vents, ducts, equipment or other obstructions.

d. In any case where a pipe shown on a plan sheet differs from that shown on a riser, schematic or detail, use the larger of the two sizes shown.

3.8 PVC PIPE IN RETURN AIR PLENUMS.

a. Insulate all waste and vent pipe located in return air plenums where pipes do not meet the flame/smoke rating of 25/50 requirements.

3.9 TESTING

a. Under Floor.

(1) Test pipe under floors before connecting to sewers.

(2) Maintain not less than 15-feet of hydrostatic head.

(3) Repair all leaks and repeat until system holds for 2-hours without a drop in water level.

b. System Test. After all the various sections of soil, waste and vent piping are installed, but before fixtures are connected, test the system by:

(1) Plugging all outlets.

(2) Filling the entire system with water and maintaining not less than 10-feet of hydrostatic head to any portion of the sanitary or vent piping system. Apply water tests to drainage, waste and vent systems either in its entirety or in sections. Provide extension pieces, wyes, supports, clamps, plugs and all other fittings and materials as required to facilitate plugging and testing.

(3) Repair all leaks and repeat until system holds for 6-hours without a drop in water level.

c. Furnish all equipment and labor required to conduct tests.

d. Contractor shall notify Architect/Engineer or appointed Owner’s representative for visual inspection of test. At Architect's/Engineer's discretion, the General Contractor shall verify and document the test results. Test findings shall be documented and forwarded to the Architect/Engineer.

e. Prior to ceiling and wall cover-up, Contractor shall conduct smoke test of the entire waste and vent system to assure no leaks occur. Prior to test Contractor shall seal all vent through roofs, pump smoke in system. Once complete and accepted by the Architect/Engineer Team, Contractor shall unplug all vent through roofs. Contractor shall conduct a second smoke test when all plumbing fixtures are installed and introduce smoke in piping system as mentioned above. Both tests are to be witnessed and accepted by the Architect/Engineer Team prior to completion of the project.

End of Section 22 1316pvc

SECTION 22 1319.13

DRAINS, HYDRANTS, CLEANOUTS AND APPURTENANCES

1.0 GENERAL

1.1 SCOPE

a. This section provides requirements for furnishing and installing floor drains, cleanouts, hydrants, water hammer arresters and trap primers.

1.2 RELATED WORK

a. Division 22 - Plumbing.

(1) Access Doors.

(2) Pipe and Pipe Fittings - General

(3) Domestic Water Piping.

(4) Soil, Waste and Sanitary Drain Piping, Vent Piping.

1.3 JOB REQUIREMENTS

a. Furnish drains, hydrants and cleanouts shown or specified with all necessary trimmings. Provide drains, drain bodies, hydrants, cleanouts and similar devices of one manufacturer.

b. Provide that all porcelain enameled surfaces be acid resistant.

1.4 STANDARDS

a. Perform work in accordance with applicable statutes, ordinances, codes, and regulations of governmental authorities having jurisdiction.

b. Resolve any code violation discovered in contract documents with the Engineer prior to award of the contract. After award of the contract, make any correction or additions necessary for compliance with applicable codes at no additional cost to Owner.

2.0 PRODUCTS

2.1 DRAINS

a. Floor Drains, Finished Areas, Square Top (FD-1). Furnish a primer coated cast iron floor drain with flashing flange, integral reversible clamping collar, bottom outlet, seepage openings and 6-inch square, adjustable, satin finish nickel bronze strainer head. J.R. Smith 2010B-6NB, Josam 30000-5(6), Wade W-1100-1-G6 or Zurn ZN-415-Y.

2.2 CLEANOUTS

a. Finished Floors and Concrete Floors, Round Top (FCO). Primer coated cast iron floor cleanout with SV hub outlet, taper thread bronze plug, threaded adjustable housing and ferrule, membrane flange, secured/vandal proof, round-heavy duty-satin finished nickel bronze scoriated top that adjusts to finished floor after concrete has set. For cleanouts located under carpet floors provide an integral carpet marker to indicate location after floor carpeting is installed. Reference Architectural drawings for areas with carpet floors. Jay R. Smith No. 4033L (service weight Speedi-Set hub outlet)-F-C-U (-Y, where applicable), Josam 5600-15-22-41-MODIFIED for Heavy Duty Top (-14, where applicable)-Y, Wade W-6030-D-X- 5-26-75-Threaded/Machined for Clamp Device (-72, where applicable) or Zurn ZN-1400 (Neo-Loc)-BP- HD-KC-VP (-CM, where applicable). Set top of floor cleanouts such that top is flush with finished floor.

b. Outside Areas, Round Top (EXTERIOR FCO). Primer coated cast iron, extra heavy traffic duty floor cleanout with taper thread bronze plug, threaded adjustable housing with flanged ferrule, secured/vandal proof, round, extra heavy duty, gasketed satin finished nickel bronze scoriated top that adjusts to finished grade in field after installation. Cast cleanouts flush in a 16" by 16" by 6" thick concrete pad. Concrete pad and cleanout shall be installed such that the top of pad and cleanout top are both set with top flush with finished grade. Jay R. Smith No. 4113L-U (service weight Speedi-Set hub outlet), Josam 56040-1-15-22-Y, Wade W-6030-Z-XS-1-5-75 or Zurn ZN-1400 (Neo-Loc)-BP- MODIFIED for Extra Heavy Duty Top-VP. Set top of exterior floor cleanouts such that top is flush with finished grade.

c. Finished Walls (WCO). Primer coated cast iron cleanout tee with countersunk head, taper thread bronze plug, No-Hub connections and 6-inch diameter-smooth-stainless steel secured access cover with secured/vandal proof screw. J.R. Smith 4532S-U-Y, Josam 58790-15-MODIFIED for No Hub connections, Wade W-8460-R6-5-MODIFIED for No-Hub connections or Zurn Z-1446-NH-BP-VP.

d. Unfinished Areas (WCO). Primer coated cast iron cleanout tee with countersunk head, taper thread bronze plug and No-Hub connections. J.R. Smith 4512S-Y, Josam 58910-Z, Wade W-8560- MODIFIED for No-Hub connections-D or Zurn Z-1445-NH-BP.

2.3 HYDRANTS

a. Wall Hydrants, Non-Freeze, Encased (WH-1). Provide an Line-Guard, Enviro/Guard, Ecolotrol encased flush, anti-siphon, non-freeze wall hydrant with 3/4-inch IPS (threaded end) inlet (of length as required to fit wall construction), satin nickel bronze hinged cover and box face, bronze casing, all bronze interior parts, non-turning operating rod with free-floating compression closure valve, integral backflow preventer, hose connection and tee handle key. Provide to Owner one wall hydrant operating key for each wall hydrant. J.R. Smith 5509-NB, Wade W-8625 or Zurn ZN-1300.

b. Hose Bibbs, Finished Areas, Polished Chrome Finish (HB-1). Provide a polished chrome plated, short-pattern single sink faucet/hose bibb with self-contained and interchangeable operating nut (quarter turn), 3/4-inch flanged female inlet, 3/4-inch hose thread outlet and polished chrome plated lever handle. Equip complete with non-removable, spout end vacuum breaker with 3/4-inch female hose thread inlet and 3/4-inch male hose thread outlet. Chicago Faucet No. 15-E27.

2.4 WATER HAMMER ARRESTERS

a. Type. Plumbing and Drainage Institute (PDI) certified (Standard P.D.I. WH-201), American Society of Sanitary Engineering approved (ASSE Standard ASSE-1010), ANSI A112-26-1M, 350 PSI, piston type, O-ring sealed hydraulic water hammer arresters contained in a factory charged and sealed pressurized compression chamber. Chamber shall consist of a copper casing having sufficient displacement volume to dissipate the calculated kinetic energy generated in the piping system. Units shall have lifetime warranty and shall be assembled with lead free solder. Sioux Chief "Hydra-Rester" 65X- Series (Josam, Precision Plumbing Products, Watts or Wilkins/Zurn equal).

(1) Contractor shall be responsible for obtaining and installing the proper number and size of water hammer arresters, including all arresters where special requirements occur. Where fixture unit counts/totals exceed the scheduled ratings, provide factory engineered, rechargeable water hammer arrestors complete with pressure gauge and air valve.

(2) Water Hammer Arrester sizes shown on drawings are minimum size requirements only (quantities are partial requirements only). Water hammer arresters shall be of sufficient size and shall be installed throughout the water systems such that there will be no noise, movement in the piping system or damage to equipment due to water hammer. Adequately protect all equipment and fixtures requiring water hammer protection.

(3) Access Doors. Provide a 10-inch (minimum) square access door for single arrester installations and a 14-inch square (minimum) door for two arrester installations in walls. Provide minimum 14-inch square access door for all arresters located above ceilings except for arresters located directly above lay-in-place acoustic tile ceilings.

2.5 TRAP PRIMERS

a. Provide UPC/IAPMO listed and approved, pressure actuated, automatic trap primers with integral air gap/vacuum breaker ports (near outlet opening). Provide a trap primer that automatically maintains a constant water seal in one to four drain traps and operates on the principle of differential pressure. The trap primer shall be made of corrosion resistant brass and shall not rely on springs or diaphragms for activation. Precision Plumbing Products Inc. "PRIME-RITE".

(1) Equip primers with distribution units as required to provide an individual drain line to each hub drain or floor drain. Trap primers are required on all floor drains and hub drains.

(2) Provide a trap primer, water supply line (from nearest available domestic cold water supply line), ball valve, union, trap primer, distribution unit, connector fittings, drain line to floor or hub drain and access door (12-inch by 24-inch minimum) for each floor drain and hub drain whether or not shown on drawings.

(3) Unless otherwise noted, for each floor drain and hub drain provide a galvanized cast iron trap primer connector fitting with 1/2-inch or 3/4-inch female thread side inlet trap primer connection. Do not use threaded or No-Hub connections on trap primer connector fittings located below floors. J.R. Smith 2695-G series, Josam, Wade W-2430-39 series or Zurn ZG-1023 series.

(a) All galvanizing shall be factory applied and performed, field or shop galvanizing is not acceptable.

(b) Floor drains with trap primer connections may be provided in lieu of auxiliary inlet fittings (if available as an option on floor drains).

2.6 WATERPROOFING MEMBRANE

a. When a membrane is not provided in floor or roof construction, provide a membrane of size that extends a minimum of 12-inches on either side of floor drain, roof drain or cleanout.

b. Membrane shall be 4-pound per square foot sheet lead, Number 24 B & S gauge sheet copper or three layers of standard grade 15-pound asphalt impregnated roofing felt with each layer thoroughly hot mopped to ensure a completely watertight installation.

c. Coordinate waterproofing with appropriate trades.

3.0 EXECUTION

3.1 INSTALLATION

a. General.

(1) Install in accordance with manufacturer's recommendations and as shown on the drawings.

b. Floor Drains and Hub Drains.

(1) Coordinate flashing work with work of other trades. Coordinate with floor slab work to interface drains with concrete.

(2) Install floor drains at the low points of the surface areas to be drained. Set top of drains 1/2-inch below finished floor elevation unless otherwise shown on mechanical or structural drawings. Set floor drain grates such that top of grate is installed flush with surrounding floor elevation.

(3) Adequately grout around all floor drain tops. Fill in gaps between floor drain and floor with grout (or other rigid concrete-based material) that matches the surrounding finished flooring in both color and texture.

(4) Install drain flashing collar of flange such that no leakage occurs between drain and adjoining flooring. Maintain watertight integrity of penetrated waterproof membranes.

(5) Position drains such that installed drains are accessible and easy to maintain.

(6) All floor drains and hub drains shall be individually vented to outside or nearest vent of adequate size. Provide a vent line for each floor drain and hub drain whether or not shown on drawings. Provide a 2-inch diameter (minimum) individual vent line.

c. Cleanouts.

(1) Location

(a) Cleanouts shown on drawings are partial requirements only. Contractor shall provide and install all cleanouts shown on drawings, specified in this specification section as well as any additional cleanouts required by code authorities having jurisdiction.

(b) Provide cleanouts wherever necessary to make accessible all parts of the drainage soil or waste systems.

(c) Provide a line size cleanout on each horizontal drain line 5-feet or greater in length.

(d) Locate cleanouts in runs not more than 50 feet apart and provide all additional cleanouts required by local authority having jurisdiction. 50-foot spacing between cleanouts shall include length of vertical risers at cleanouts. All portions of the drain system shall be accessible to a 50-foot drain and sewer cleaning/rodding machine through cleanouts.

(e) Provide cleanouts where soil or waste lines change in direction of more than 90º as well as any other cleanouts required by local authority having jurisdiction.

(f) Provide cleanouts at the end of each continuous waste line and at the end or each battery of fixtures.

(g) Provide a line size wall cleanout at each sink and each urinal.

(h) Provide cleanouts at the base of each soil or waste stack.

(i) Provide a full size upper terminal cleanout at each run of piping which is more than 50 feet in total developed length or fraction thereof, except on horizontal drain lines less than five feet in length unless such line is serving sinks or urinals (cleanouts are required at all sinks and at all urinals).

(j) Provide a full size, cast iron, double, two-way cleanout with two exterior floor cleanouts extended to grade and casted into a 18-inch by 24-inch by 6-inch concrete pad for each drain line extending from building. Risers from double two way cleanout fitting to cleanouts shall be standard weight, cast iron, DWV, bell and spigot soil pipe and pipe fittings.

(2) Size. Install cleanouts the same size as the soil waste lines in which the cleanouts are placed; however, no cleanout should be larger than 4 inches in diameter.

(3) Installation.

(a) Set top of floor clean-outs such that top is flush with finished floor (including tile). Top of exterior floor cleanouts shall be installed flush with finished grade.

(b) Where cleanouts occur in pipe chases, bring the cleanouts through the walls and install covers. Wall cleanout plugs shall be installed within 3-inches (in depth) from access door and shall be centered in respect to access door opening for easy access.

(c) Install cleanout flashing collar of flange such that no leakage occur between cleanout and adjoining flooring. Maintain watertight integrity of penetrated waterproof membranes.

(d) Cleanouts shall be readily accessible and shall be located at a minimum of 18-inches from any wall, fixture, equipment or other obstruction.

(e) Adequately grout around all floor cleanout tops. Fill in gaps between cleanouts and floor with grout (or other rigid concrete-based material) that matches the surrounding finished flooring in both color and texture.

(4) Waterproofing. Coordinate flashing work with work of other trades.

d. Hydrants.

(1) Unless otherwise noted, install all hose bibbs at 16-inches above finished floor and all wall hydrants at 16-inches above finished grade.

e. Water Hammer Arresters

(1) Provide hydraulic water hammer arrestors in cold and hot water supply lines to each fixture, if single fixture, and to each battery of fixtures; and at each automatic, solenoid- operated or quick-closing valve serving mechanical, kitchen or laundry equipment.

(2) Hammer Arrestors shown on drawings are partial requirements only. Water hammer arrestors shall be installed throughout the water systems such that there will be no noise, movement in the piping system or damage to equipment due to water hammer. Adequately protect all equipment and fixtures requiring water hammer protection.

(3) All water hammer arrestors shall be installed directly behind such access doors and shall be readily accessible for easy replacement.

f. Trap Primers.

(1) Trap primers are required on all floor drains and hub drains. Install a trap primer, water supply line, ball valve, union, trap primer distribution unit, connector fittings, 1/2-inch copper drain line to floor or hub drain and access door (12-inch by 24-inch minimum) for each floor drain and hub drain whether or not shown on drawings.

(2) Trap primers may be omitted on floor drains located in toilet rooms if first approved by authorities having jurisdiction.

(3) Trap primers, trap primer drain lines and distribution units to floor drains or hub drains located in mechanical rooms may be installed exposed above the finished floor level. Auxiliary inlet fittings and access doors may be deleted. Provide a minimum 1-inch air gap between floor drain or hub drain and trap primer drain line.

(4) Equip primers with distribution units as required to provide an individual drain line to each hub drain or floor drain.

3.2 PROTECTION OF FINISH

a. All floor drains, cleanouts and wall hydrants shall be adequately protected from physical damage during construction. Grates, covers and tops that have been marred or damaged shall be replaced with new or equal design, material and finish at no cost to the Owner. Grates, covers and tops shall have a new and unmarred look at time of construction end.

3.3 COORDINATION

a. Making adjustments to field conditions is considered a part of the work required. Do not use contract drawings accompanying these specifications for rough-in locations but only for pipe sizing and general routing.

b. Contractor shall examine and familiarize himself with the Architectural, Structural, Electrical and Mechanical drawings to be knowledgeable of all plumbing connections required and space limitations.

c. The drawings are diagrammatic and are not intended to show all the fittings required. Contractor shall include in his bid, costs for items of material and labor which are not specifically called for in drawings or specifications, but which are required to make plumbing installation. Contractor shall make any necessary changes to avoid beams, footings, columns, piers, vents, ducts, equipment or other obstructions.

End of Section 22 1319.13

SECTION 22 3300

ELECTRIC DOMESTIC WATER HEATERS (LESS THAN 10 KW)

1.0 GENERAL

1.1 SCOPE

a. This section includes hot water heating systems complete as shown, including hot water heaters and pressure temperature relief valves as scheduled.

1.2 RELATED WORK

a. Division 22, Plumbing.

(1) Pipe and Pipe Fittings - General.

(2) High Temperature Piping Insulation.

(3) Domestic Water Piping and Appurtenances.

1.3 CERTIFICATION

a. Provide a water heater tested, listed and labeled by the Underwriters (U.L.) Laboratories for 150 PSI standard working pressure and shall comply with the National Electrical Manufacturers Association (NEMA) standards.

2.0 PRODUCTS

2.1 CAPACITY

a. Water heaters shall have the storage capacity, efficiencies and gallons per hour recovery at 100°F rise as scheduled on drawings. Water heaters shall meet energy efficiency standards of ASHRAE 90A- 1980 and the efficiency standards of the latest IECC.

2.2 TANK

a. Provide a glass-lined tank with an alkaline borosilicate composition that has been fused to steel by firing at a temperature range of 1400°F to 1600°F. Equip tank with extruded aluminum, sacrificial anode rods, required piping, piping connections, ASME rated ANSI Z 21.22 temperature and pressure relief valve, drain valve, thermometers and all other required openings. Tank shall be rated for 150 PSI working pressure.

2.3 INSULATION

a. Insulate the water heater with factory applied high density fiberglass (or similar product) and trim with a heavy-gauge, enameled steel jacket.

2.4 GUARANTEE

a. Provide a 1-year limited warranty on water heater as available from manufacturer.

2.5 INSTALLATION AND TESTING

a. Water heater shall be tested and installed according to the current installation instructions provided with the unit.

3.0 EXECUTION

3.1 INSTALLATION

a. Install a line size shut-off valve in the cold water supply close to each heater.

b. Provide approved dielectric couplings at all cold water and hot water connections to storage tank, and at pressure and temperature relief valve connection.

c. Check operation of safety controls and devices and proper settings of elements.

d. Have the authorized representative of the water heater available if requested.

e. Install according to manufacturer's specifications and pipe as shown.

3.2 DISCHARGE PIPING

a. Discharge piping from temperature and pressure relief valve shall be routed to nearest floor drain, hub drain or other approved point of safe discharge. Discharge piping shall be full size, in diameter, of relief opening of temperature and pressure relief valve.

End of Section 22 3300

SECTION 22 40 00

PLUMBING FIXTURES

1.0 GENERAL

1.1 SCOPE

a. This section provides requirements for furnishing and installing water closets, urinals, lavatories, sinks, mop sinks, drinking fountains, thermostatic mixing valves, and wall boxes.

1.2 APPLICABLE PROVISIONS

a. Refer to Section 22 00 00, Plumbing General Provisions.

1.3 JOB REQUIREMENTS

a. Furnish plumbing fixtures shown or specified with all necessary trimming. Furnish faucets, fittings, supply stops and similar devices of one manufacturer.

b. Unless otherwise specified, all sink faucets shall be washerless. Seats on faucets specified with renewable/replaceable seats shall be Monel.

c. Furnish chair carriers for all wall hung fixtures.

d. All porcelain enameled surfaces shall be acid resistant porcelain.

e. All plumbing fixtures shall be new and unused, free from imperfections, true as to line, angles, curves and color. Smooth, watertight and complete in every respect.

1.4 STANDARDS

a. Perform work in accordance with applicable statutes, ordinances, codes, and regulations of governmental authorities having jurisdiction.

b. Furnish and install required plumbing fixtures for use by handicapped as required by the latest edition of the Texas State Purchasing and General Services Commission Act or Elimination of Architectural Barriers and any other state or local code requirements.

c. Obtain and pay for all permits and inspections.

d. All fixtures shall comply with A112.19 and all subsections.

e. All faucets, valves, stops, etc. conveying water for human ingestion shall conform to NSF 61, Section 9.

2.0 PRODUCTS

2.1 WATER CLOSETS

a. Floor Mounted, Flush Valve Water Closets (WC-1) **(Standard Height Adult).**

(1) Fixture. Furnish and install a white vitreous china, siphon jet flushing action, elongated-front, floor-mounted measuring 15-inches high from finished to top of rim, flush valve water closet fixture with 1-1/2-inch top spud. Water closet fixture shall be designed to flush efficiently with a maximum 1.28-gallons per flush and shall be equipped with two (2) white bolt covers/caps. American Standard No. 3451.001 with two American Standard No. 481310-100 Bolt caps with retainer or equivalent.

(2) Trim. Equipment fixture with a diaphragm operated, quiet flush, exposed water closet flush valve made of brass with metal battery powered sensor flushometer valve, 1-inch IPS screw driver operated back check angle stop with protective cap, renewable main valve seat, adjustable threaded union tailpiece, vacuum breaker, 1-1/2 inch by 11-1/2 inch flush tube and connection with spud coupling for 1-1/2 inch top spud, spud securing nut, wall and spud flanges, 1.28 gallon flush regulator, solid ring pipe support all with polished chrome finish. Sloan No. 811-LH-MC or equivalent.

(3) Seat. Furnish and install a white, extra heavy duty/extra heavy weight, injection molded solid plastic, institutional/industrial grade toilet seat. Seat shall be manufactured of high impact resistant, polystyrene, or polypropylene plastic with open front, elongated toilet seat design, less cover. Toilet seat shall be equipped with series 300 stainless steel combination self-sustaining/concealed check hinges. Self-sustaining mechanisms and hinge posts in both hinges shall be series 300 stainless steel and shall be integrally molded into seat assembly. Hinge posts shall be fitted with Sta-Tite Fastening System. Toilet seats shall have integral bumpers permanently molded into the seat and shall be of color matched molded plastic. Church No. 9500 SSC or equivalent.

(4) Heavy duty Torque set cast iron flange with integral compression seal to waste line and test cap. Jonespec No. CF2982 and closet flange Jonespec No. 2980.

(5) Closet Bolt Assemblies. Furnish and install two solid brass water closet floor flange bolt assemblies (plated brass is not acceptable). Each bolt assembly shall consist of a solid brass slotted head bolt, two solid brass nuts, two heavy solid brass washers and two resilient rubber washers.

b. Floor Mounted Water Closets, Wheelchair (WC-2). (ADA/TAS)

(1) Fixture. Furnish and install a white vitreous china, siphon jet flushing action, elongated front, floor mounted measuring 16-1/2 inches high from finished floor to top of rim with 1-1/2-inch top spud. Water closet fixture shall be designed to flush efficiently with a maximum 1.28 gallons per flush and shall be equipped with two (2) white bolt covers/caps. American Standard No. 3461.001 with two American Standard No. 48310 100 bolt covers or approved equivalent.

(2) Trim. Equipment fixture with a diaphragm operated, quiet flush, exposed water closet flush valve made of brass with metal battery powered flushometer valve, 1-inch IPS screw driver operated back check angle stop with protective cap, renewable main valve seat, adjustable threaded union tailpiece, vacuum breaker, 1-1/2 inch by 11-1/2 inch flush tube and connection with spud coupling for 1-1/2 inch top spud, spud securing nut, wall and spud flanges, 1.28 gallon flush regulator, solid ring pipe support all with polished chrome finish. Sloan No. 811-LH-MC or equivalent.

(3) Seat. Furnish and install a white, extra heavy duty/extra heavy weight, injection molded solid plastic, institutional/industrial grade toilet seat. Seat shall be manufactured of high

impact resistant, polystyrene or polypropylene plastic with open front, elongated toilet seat design, less cover. Toilet seat shall be equipped with series 300 stainless steel combination self sustaining/concealed check hinges. Self sustaining mechanisms and hinge posts in both hinges shall be series 300 stainless steel and shall be integrally molded into seat assembly. Hinge posts shall be fitted Sta-Tite Fastening System. Toilet seats shall have integral bumpers permanently molded into the seat and shall be of color matched molded plastic. Church "MOLTEX" No. 9500SSC or approved equivalent.

(4) Heavy duty Torque set cast iron flange with integral compression seal to waste line and test cap. Jonespec No. CF2982 and closet flange Jonespec No. 2980.

(5) Closet Bolt Assemblies. Furnish and install two solid brass water closet floor flange bolt assemblies (plated brass is not acceptable). Each bolt assembly shall consist of a solid brass slotted head bolt, two solid brass nuts, two heavy solid brass washers and two resilient rubber washers.

2.2 WALL-HUNG URINALS (UR-1).

(1) Fixture. Furnish and install a white vitreous china, siphon jet flushing action, compact, space saving, wall hung, flush valve urinal fixture with 3/4-inch top spud. Urinal fixture shall measure a minimum of 14 inches from wall to front of flare and shall be designed to flush efficiently with a maximum of 0.5 gallon of water total per flush. American Standard No. 6550.005.

(2) Trim Equip fixture with a diaphragm operated, quiet flush, exposed urinal flush valve made of brass with metal beam deflector battery powered sensor flushometer valve, 1-inch IPS screw driver operated back check angle stop with protective cap, renewable main valve seat, adjustable threaded union tailpiece, vacuum breaker, 3/4-inch by 11-1/2 inch flush tube and connection with spud coupling for 3/4-inch top spud, spud securing nut, wall and spud flanges, 0.5 gallon flush regulator, solid ring pipe support all with polished chrome finish. Sloan Royal No. 8186-0.5-LH-MC-BD or equivalent.

(3) Wall Sealing Ring. Furnish and install resilient sponge rubber urinal sealing rings. Do not use wax ring gaskets. Install per manufacturer's recommendations.

2.3 LAVATORIES

a. Countertop Lavatories (LAV-1).

(1) Fixture. Furnish and install a white vitreous china, self rimming, countertop, lavatory. Lavatory fixture shall measure 20 3/8”-inches wide by 17 3/8”-inches deep. Furnish fixture with single faucet hole and front overflow ports. American Standard No. 0475.047 or approved equivalent.

(2) Trim. Furnish and install electronic faucet with dual-beam infrared sensor, traditional-style integral spout, chrome plated, Single-hole deck mount. 0.5 GPM (1.9 L/min) vandal-proof, pressure compensating, Econo-Flo, non-aerating spray. Includes optional 1.5 GPM (5.7 L/min) insert. Single supply for tempered water. 12-volt AC transformer. Stainless steel hose included. Multiple field-adjustable modes and ranges. Compatible with Chicago Faucets handheld programming unit. Construction with less than 0.25% lead content by weighted average. This product meets ADA ANSI/ICC A117.1 requirements and is tested and certified to industry standards: ASME A112.18.1/CSA B125.1, Certified

to NSF/ANSI 61, Section 9 by CSA, Low Lead Content. Chicago Faucet No. 116.101AB.1 or equivalent.

(3) Supplies. Furnish and install 1/2-inch IPS, all brass lavatory supply assembly with 1/2-inch x 3/8 inch loose key handle angle valve with 1/2-inch IPS female thread inlet, 3/8-inch O.D. by 12-inch-long flexible tube riser and brass pipe escutcheon all with polished chrome finish. Entire assembly shall be made of brass. Supply stops with plastic internal parts are not acceptable. McGuire No. 2165 LK, Specified Trim No. ST2165LK, or approved equivalent. Equip each supply stop with a polished chrome plated, ASTM B 43 80, threaded, red brass pipe nipple.

(4) Traps. Furnish and install 1 1/2-inch adjustable cast brass "P" trap with tubing drain to wall, 1 1/4-inch inlet, 1 1/2-inch outlet, ground swivel joint, cast brass nuts, cast brass clean out plug and brass escutcheon, all with polished chrome finish. McGuire No. 8902, Specified Trim No. 8902C, or approved equivalent.

(5) Mixing Valve. Furnish and install point of use valve, lead free, ASSE 1070 certified. Bradley S59-4016 or approved equivalent

(6) Insulate all exposed drainpipes and hot water supply piping as required by the latest edition of Texas State Purchasing and General Services Commission (Texas State Building Commission) Rules and Regulations on the Elimination of Architectural Barriers. with Dearborn safety series ADA compliant tubular covers

b. Wall Hung Lavatories (LAV-2).

(1) Fixture. Furnish and install a white vitreous china, wall hung, lavatory with back and side splash guards. Lavatory fixture shall measure 20 inches wide by 18 inches deep and shall be drilled for concealed arm carrier. Furnish fixture with single faucet holes and front overflow ports. American Standard No. 0356.041 or approved equivalent.

(2) Trim. Furnish and install electronic faucet with dual-beam infrared sensor, traditional-style integral spout, chrome plated, Single-hole deck mount. 0.5 GPM (1.9 L/min) vandal-proof, pressure compensating, Econo-Flo, non-aerating spray. Includes optional 1.5 GPM (5.7 L/min) insert. Single supply for tempered water. 12-volt AC transformer. Stainless steel hose included. Multiple field-adjustable modes and ranges. Compatible with Chicago Faucets handheld programming unit. Construction with less than 0.25% lead content by weighted average. This product meets ADA ANSI/ICC A117.1 requirements and is tested and certified to industry standards: ASME A112.18.1/CSA B125.1, Certified to NSF/ANSI 61, Section 9 by CSA, Low Lead Content. Chicago Faucet No. 116.101AB.1 or equivalent.

(3) Supplies. Furnish and install 1/2-inch IPS, all brass lavatory supply assembly with 1/2-inch x 3/8 inch loose key handle angle valve with 1/2-inch IPS female thread inlet, 3/8-inch O.D. by 12-inch-long flexible tube riser and brass pipe escutcheon all with polished chrome finish. Entire assembly shall be made of brass. Supply stops with plastic internal parts are not acceptable. McGuire No. 2165 LK, Specified Trim No. ST2165LK, or approved equivalent. Equip each supply stop with a polished chrome plated, ASTM B 43 80, threaded, red brass pipe nipple.

(4) Traps. Furnish and install 1 1/2-inch adjustable cast brass "P" trap with tubing drain to wall, 1 1/4-inch inlet, 1 1/2-inch outlet, ground swivel joint, cast brass nuts, cast brass

clean out plug and brass escutcheon, all with polished chrome finish. McGuire No. 8902, Specified Trim No. 8902C, or approved equivalent.

(5) Mixing Valve. Furnish and install point of use valve, lead free, ASSE 1070 certified. Bradley S59-4016 or approved equivalent

(6) Insulate all exposed drainpipes and hot water supply piping as required by the latest edition of Texas State Purchasing and General Services Commission (Texas State Building Commission) Rules and Regulations on the Elimination of Architectural Barriers. with Dearborn safety series ADA compliant tubular covers

2.4 SINKS

a. Double Compartment Sinks (SK-1) (ADA/TAS compliant).

(1) Fixture. Furnish and install self-rimming, double compartment, 18-gauge Type 302 stainless steel sink with 3-faucet holes and fully undercoated underside. Elkay “LUSTERTONE” No. LRAD-3319-4 33-inch x 19-1/2-inch x 5-1/2 inch deep or approved equivalent.

(2) Faucet. Furnish and install a concealed mount, dual handle, washerless swing spout faucet with 1/2-inch inlets, removable/replaceable cartridges, stainless steel cartridge stem, 2.2 GPM flow restrictor, forged brass wing handles, swing and aerator, all with polished chrome finish. Chicago Faucet No. 201-A317VPAABCP or equivalent.

(3) Trim. Furnish and install sink complete with a stainless-steel strainer fitting with stainless steel conical strainer basket, neoprene stopper and stainless steel 1-1/2-inch tailpiece. Elkay “DUO-STRAINER” No. LK-35B or approved equivalent.

(4) Supplies. Furnish and install a 1/2-inch IPS angle stops with 1/2 –inch O.D. by 12-inch flexible tube riser, escutcheon and loose key control all with polished chrome finish. McGuire No. 2167-LK, Specified Trim No. ST2167LK, or approved equivalent.

(5) Traps. Furnish and install 1-1/2-inch adjustable cast brass “P” trap with tubing drain to wall, ground swivel joint, clean-out plus and cast brass escutcheon, all with polished chrome finish. McGuire No. 8912, Specified Trim No. ST8912C, or approved equivalent.

(6) Equip trap complete with 1-1/2-inch polished chrome plated, brass, continuous waste or drain connection tubing, with end outlet for double compartment sink interconnections. Elkay No. LK-53 or approved equivalent.

(7) Mixing Valve. Furnish and install point of use valve, lead free, ASSE 1070 certified. Bradley S59-4016 or approved equivalent

2.5 MOP SINKS (MS-1)

a. Fixture. Furnish and install a terrazzo mop sink with continuous stainless-steel cap on all four sides and tilting flange on two sides. Stern Williams "SERVICEPTOR" No. SB 702 BP2 32-inch x 32-inch x 12 inch deep or approved equivalent.

b. Equip fixture complete with nickel bronze strainer and Stern Williams "BP" stainless steel splash catcher panels on two sides.

c. Trim. Furnish and install a Stern Williams No. T 15 VB, or Moen No. 8230 mop service sink faucet with integral stops, spout with bucket hook, 3/4-inch hose thread end, vacuum breaker, adjustable top brace, inlets on 8-inch centers, all with polished chrome finish. Furnish a Stern Williams No. T 35 36-inch-long hose with 3/4 inch polished chrome coupling and stainless steel wall bracket with rubber grip and T 40, 24 inch long stainless steel mop hanger with three rubber spring loaded grips.

2.6 ELECTRIC DRINKING FOUNTAINS

a. Wall Hung Two Level Electric Drinking Fountain (EDF-1)

(1) Fixture. Furnish and install wall mounted two level ADA duel height electric water cooler with all stainless steel basin, stainless steel cabinet, with bottle filler pressbar, 8 GPH capacity and combination self-closing stop and regulator. Furnish an air-cooled unit and motor that is 1/5 HP, 115 volt, single phase, 60 HZ. Elkay No. LZSTL8WSSP with cane apron No. LKAPREZL or approved equivalent.

(2) Supplies. Furnish and install straight screwdriver stop with 1/2-inch IPS inlet and outlet. Elkay No. LK 2680 or approved equivalent.

(3) Trap. Furnish and install 1 1/4-inch adjustable cast brass "P" trap with tubing drain to wall, ground swivel joint, clean out plug and cast brass escutcheon, all with polished chrome finish. McGuire No. 8872 or approved equivalent.

2.7 WALL BOXES

a. Wall Boxes, Refrigerator (WB 1). Furnish and install Oatey MODA ice maker box with brass angle valve with water hammer arrestor or approved equivalent. Use fire rated boxes where installed in fire rated walls.

2.8 FIXTURE CARRIERS

a. Urinal Carriers. Furnish and install ZURN ZR 1221 or 1222 series, or approved equivalent, concealed carrier with bearing plate or approved equivalent.

2.9 PROTECTIVE DEVICES

a. Approved backflow preventers shall be used to connect piping to plumbing fixtures or equipment that do not have an approved integral device for cross connection protection.

b. Reduced Pressure Principle Type. Furnish a Watts Number U 909 S HW QT Reduced Pressure Principle backflow preventer. Equip complete with bronze strainer, stainless steel check modules, quarter turn ball valves and integral body unions.

(1) For each backflow preventer valve, furnish a Watts 909 AG Fixed Air Gap Fitting with inlet compatible with outlet of backflow preventer relief valve opening. Furnish a full size drain line from air gap fitting to floor drain or hub drain.

2.10 FLOW RESTRICTORS AND TEMPERING VALVES

a. Furnish and install flow restrictors and tempering valves to all fixtures requiring water flow and/or

temperature regulation as required to meet local code requirements and to regulate water flow for instantaneous water heaters. Furnish either in line or faucet end type flow restrictors (Use of either type is acceptable). Furnish access to all in line flow restrictors located in walls or above ceilings.

2.11 CHROME FINISH

a. All exposed fixture trim, including (but not limited to) p traps, supplies, riser supports, flex tube risers, etc. shall have a polished chrome finish. Furnish all polished chrome finished nipples, extension pieces, escutcheons, etc. required to meet this requirement.

3.0 EXECUTION

3.1 INSTALLATION

a. Set fixtures at heights as directed and approved by Architect.

b. Rigidly secure all water supply piping to wall structure. The piping in the wall shall be secured to wall such that flush valve or supply piping will not have any movement during valve activation or when jarred (typical for all plumbing fixtures).

c. Furnish and install adequate pipe supports in walls at all supply and drain lines extending through walls to rigidly secure all supply lines to all fixtures with special concentration on water closet and urinal supply lines. Contractor shall install additional pipe supports, metal framing, Unistrut, nuts, bolts, clamps and metal channels as required to adequately and rigidly secure all valves and supply piping in pipe chases and to prevent damage to plumbing fixtures. Movement of piping within wall due to valve activation or jarring will not be acceptable.

d. At each water supply stop serving lavatories and sinks, furnish and install a plastic support bracket as manufactured by P & M Company to adequately secure piping in wall. In lieu of such brackets, cast brass drop ear elbow fittings may be used when adequate blocking is installed in wall and brass elbow is rigidly secured to blocking in wall (secure to wall with brass screws or copper nails). In either case install an additional copper tubing strap located not more than 1 inch from elbow at supply stop and adequately secure to blocking in wall with brass screws or copper nails. Connect supply stop to elbow in wall using ASTM B 43 80, threaded, red brass pipe nipples. Conceal pipe nipples in wall. Where pipe nipples cannot be concealed, install polished chrome plated, threaded, red brass pipe nipples. Under no circumstances shall steel nipples be used.

e. All escutcheons shall be installed flush to wall (no gap between wall and escutcheon plate). Caulk all wall penetrations behind pipe escutcheons. Air tight with Dow Corning No. 2000 Fire Stop Sealant or approved equivalent. Wall penetrations shall not be larger than the escutcheon installed. All escutcheons of same type service shall be of same physical size. Reference the section on Pipe and Pipe Fittings General for additional requirements on pipe escutcheons.

f. All plumbing trim shall be installed in a neat and well organized manner with services running parallel with the primary lines of the building construction.

g. Install all appurtenances required for a complete and working system.

h. Install all fixtures and trim in accordance with the manufacturer’s recommendations and as shown on drawings.

3.2 ROUGH-IN AND FINAL CONNECTIONS

a. Make rough in and final connection of all services to all fixtures requiring plumbing connections. Contractor shall be responsible for installing fixtures at locations shown on the Architectural drawings and providing all service connections at required locations.

b. Rough in and final connection of services to all equipment shall be installed in accordance with the latest edition of the manufacturer's rough in measurements manual. Contractor shall obtain all such documents.

c. Install service connections to all plumbing fixtures specified and to all equipment furnished by others. Reference Section 15060 for rough in requirements of equipment furnished by others.

3.3 QUALITY AND PROTECTION

a. All plumbing fixtures shall be free from imperfections, true as to line, angles, curves and color, smooth, watertight and complete in every respect. Chipped, scratched, marred or disfigured fixtures shall be replaced with new fixtures. Contractor shall replace all fixtures found to be damaged or defective.

3.4 COORDINATION

a. Making adjustments to field conditions is considered a part of the work required. Do not use contract drawings accompanying these specifications for rough in locations but only for pipe sizing and general routing.

b. Contractor shall examine and familiarize himself with the Architectural, Structural, Electrical and Mechanical drawings to be knowledgeable of all plumbing connections required and space limitations

c. The Drawings are diagrammatic and are not intended to show all the fittings required. Contractor shall include in his bid, costs for items of material and labor which are not specifically called for in drawings or specifications, but which are required to make plumbing installation. Contractor shall make any necessary changes to avoid beams, footings, columns, piers, vents, ducts, equipment or other obstructions.

d. Contractor shall coordinate physical requirements of all countertop fixtures with all other trades. Prior to submittal on these fixtures, the contractor shall verify space limitations.

3.5 CLEANING AND ADJUSTING

a. Thoroughly clean and disinfect all plumbing fixtures, including all exposed trim. At work completion all plumbing fixtures and trim shall be clean and free from any stains, sediment, waterspouts, oils, factory shipping wrapping/protective covers, installation instruction stickers/labels, etc. Disinfect all plumbing fixtures using commercial disinfecting agents.

b. Properly flush all water systems, clean and service all strainers and plumbing connections to facilitate proper operation of fixture valves. Install servicing until all water systems and appurtenances prove to be clean, free of debris and operating properly.

c. Adjust all flush valves and self-closing valves for proper flushing or operation, but without excess use of water. Water closets shall not exceed 1.28 gallons per flush, urinals shall not exceed 1 gallon per

flush and lavatory faucets shall remain open for a minimum of 10 seconds, and a maximum of 20 seconds. Demonstrate to the Architect (or representative) that the entire system and all components thereof are functioning properly.

d. Install such equipment and personnel as required to conduct tests and demonstrate the acceptability of the various plumbing systems.

e. Have the authorized representatives of the various manufacturers available if requested

End of Section 22 40 00 -

SECTION 23 0000

MECHANICAL GENERAL PROVISIONS

1.0 GENERAL

1.1 SUMMARY

a. Except as modified in this section, General Conditions, Supplementary Conditions, applicable provisions of Division 01, General Requirements, and other provisions and requirements of the contract documents apply to work of Division 23, HVAC, Division 22, Plumbing, and Division 21, Fire Protection.

b. Applicable provisions of this section apply to all sections of Division 23, HVAC.

c. It is the intent of the Contract Documents to provide an installation complete in every respect. In the event that additional details of special construction may be required for work indicated or specified in this section or work specified in other sections, it shall be the responsibility of the Contractor to provide same as well as to provide material and equipment usually furnished with such systems or required to complete the installation, whether mentioned or not.

1.2 CODE REQUIREMENTS AND PERMITS

a. Perform work in accordance with applicable statutes, ordinances, codes, and regulations of governmental authorities having jurisdiction.

b. Resolve any code violation discovered in contract documents with the Engineer prior to award of the contract. After award of the contract, make any correction or additions necessary for compliance with applicable codes at no additional cost to Owner.

c. Obtain and pay for all permits and inspections.

1.3 REFERENCE SPECIFICATIONS AND STANDARDS

a. Materials which are specified by reference to Federal Specifications; ASTM, ASME, ANSI, or AWWA Specifications; Federal Standards; or other standard specifications must comply with latest editions, revisions, amendments or supplements in effect on date bids are received. Requirements in reference specifications and standards are minimum for all equipment, material, and work. In instances where capacities, size or other feature of equipment, devices or materials exceed these minimums, meet listed or shown capacities.

1.4 CONTRACTOR QUALIFICATIONS

a. An acceptable contractor for the work under this division shall be a specialist in this field and have the personal experience, training, skill and the organization to provide a practical working system. If required, he shall be able to furnish acceptable evidence of having contracted for and installed not less than three systems of comparable size and type to this one, that have served their owners satisfactorily for not less than three years.

b. The foreman for this work shall have had experience in installing not less than three such systems and shall be approved before the work is begun. Adequate and competent supervision shall be provided to ensure first class workmanship and installation.

c. Work shall be executed and all materials installed in accordance with the best practice of the trades in a thorough, substantial, workmanlike manner by competent workmen, presenting a neat appearance when completed. Work shall be performed by mechanics skilled in the trade.

d. The Contractor shall be responsible for all construction techniques required for all mechanical systems specified and shown on the drawings.

1.5 REQUEST FOR INFORMATION

a. The Contractor may, after exercising due diligence to locate required information, request from the Consultant clarification or interpretation of the requirements of the Contract Documents. The consultant shall respond to such Contractor's requests for clarification or interpretation. However, if the information requested by the Contractor is apparent from field observations, is contained in the Contract documents or is reasonably inferable from them, the Contractor shall be responsible to the Owner for all reasonable costs charged by the consultant to the Owner for the Additional Services required to provide such information.

1.6 CONTRACT DRAWINGS

a. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements of work or show all offsets or required fittings. Determine exact locations from field measurements. Making adjustments to field conditions is considered a part of the work required.

b. When the mechanical and electrical Contract Documents do not give exact details to the elevation of pipe, conduit and ducts, the Contractor shall physically arrange the systems to fit in the space available at the elevations intended with proper grade for the functioning of the system involved. Piping, exposed conduit and the duct systems are generally intended to be installed true and square to the building construction, and located as high as possible against the structure in a neat and workmanlike manner. The Contract Documents do not show all required offsets, control lines, pilot lines and other location details. Work shall be concealed in all finished areas.

c. Prior to locating mechanical equipment, plumbing fixtures, water heaters, water coolers and other plumbing or mechanical items, obtain approval as to exact method and exact placement and location of equipment in the various areas shown on the drawings. In no case shall the locations be determined by scaling the drawings. Plumbing fixtures shall be mounted at the heights directed by the Architect and local code authorities. Relocate equipment and devices and pay all costs of modifying work of all trades necessitated by failure to comply with this requirement.

d. These specifications are accompanied by drawings of the building and details of the installation indicating the locations of equipment, piping, ductwork, outlets, switch controls, circuits, lines, etc. The drawings and these specifications are complementary to each other, and what is required by one shall be as binding as if required by both.

e. It is the Contractor's responsibility to properly use all information found on the Architectural, Structural, Mechanical and Electrical Drawings where such information affects his work.

f. The drawings show diagrammatically the location of the various outlets and apparatus. Exact locations of these outlets and apparatus shall be determined by reference to the general drawings and to all detail drawings, equipment drawings, rough-in drawings, etc., by measurements at the building, and in cooperation with the other trades. The Owner reserves the right to make any reasonable change in location of any outlet or apparatus before installation, without additional cost to the Owner.

g. Should the drawings or specifications disagree within themselves, or with each other, the better quality or greater quantity of work or materials shall be estimated upon, and unless otherwise directed by the Architect in writing, shall be performed or furnished.

1.7 OFFSETS

a. The Contract Documents are diagrammatic as stated above. Not all offsets are shown. This applies to all ductwork, piping, flues, or any other component that is routed underground or throughout the structure. The Contractor shall be responsible to layout all piping in a manner that allows for complete maintenance access. Contractor shall provide and install, without additional costs, all offsets necessary to complete this project and to provide a complete, working, accessible, and maintainable system.

2.0 PRODUCTS

2.1 Per Senate Bill 1289 passed in 2017, all state entities are required to provide all iron and steel products to be manufactured in the United States.

3.0 EXECUTION

3.1 Consider space limitations imposed by contiguous work in selection and location of equipment and material. Do not provide equipment or material which is not suitable in this respect.

3.2 OBSTRUCTIONS

a. The drawings indicate certain information pertaining to surface and subsurface obstructions which have been taken from available drawings. Such information is not guaranteed, however, as to accuracy of location or complete information.

b. Before any cutting or trenching operations are begun, verify with Owner's representative, utility company, municipalities, and other interested parties that all available information has been provided. Verify locations given.

c. Should obstruction be encountered, whether shown or not, alter routing of new work, reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.

d. Assume total responsibility for and repair any damage to existing utilities or construction, whether or not such existing facilities are shown.

3.3 CUTTING AND PATCHING

a. The Contractor shall be responsible for timely placing of all equipment and piping to avoid cutting new construction.

3.4 OPENINGS

a. Framed, cast or masonry openings for piping or equipment is specified under other divisions. However, drawings and layout work for exact size and location of all such openings are included under this division.

3.5 COORDINATION

a. Contract Documents are diagrammatic in showing certain physical relationships to other trades. Interface and coordination with other work including utilities and electrical work is the exclusive responsibility of the contractor.

b. Contractor shall coordinate with Division 26 and other divisions as required. This is to include but not be limited to verification of power, voltage, phase and other characteristics as being compatible with that called for on the electrical drawings and Division 26 specifications, as well as that called for in Division 23 drawings and specifications or other divisions requiring electrical connections or interface with this division. This shall be done prior to placing orders for equipment. Controls contractor to coordinate with electrical contractor for all required 120 volt power for all DDC panels, 120 volt motor actuators, 120 volt motorized dampers, etc. prior to bids. If it is not coordinated prior to bid, mechanical is responsible for all 120 volt conduit, breakers, conductors, etc.

c. Arrange mechanical work in a neat, well organized manner with services running parallel with primary lines of the building construction, and with the maximum overhead clearance possible.

d. Locate operating and control equipment properly to provide easy access. Arrange entire mechanical work with adequate access for operation and maintenance.

e. Advise other trades of openings required in their work for the subsequent move-in of large units of mechanical work.

f. Verify exact locations of existing equipment and determine exact requirements for connections prior to routing services to equipment.

3.6 CONCEALED WORK

a. Where the word "concealed" is used in connection with insulating, painting, piping, ducts and the like, the word is understood to mean hidden from sight as in chases, furred spaces or suspended ceilings. "Exposed" is understood to mean open to view.

3.7 PROTECTION

a. The Contractor shall be responsible for the protection of all materials and equipment to be installed under this Division from physical and weather damage.

b. Provide all hoisting and scaffolding equipment required for proper installation of equipment. The contractor shall take full responsibility for the safety of the materials and equipment using such hoisting equipment and scaffolding.

c. Adequately protect work, equipment, fixtures, and materials. At work completion, all work shall be clean and in good condition.

3.8 AIR FILTERS AND PIPE STRAINERS

a. Immediately prior to final acceptance of project replace disposable type air filters. If air handling units are operating during construction, install high efficiency filters in units and replace at end of construction. High Efficiency filters in the air handling units consist of minimum 2" pleat Farr 30/30 prefilter and final filter of 12" thick (if air unit frame is for 6" filter than use 6" thick) and minimum 85% efficient. However, if the air units, and fans operated during construction, and if the fan wheels, fan housings, coils, etc. are fouled by dust or debris, the Contractor, at his expense, shall clean all fouled components.

3.9 GUARANTEE

a. Guarantee work for 1 year from the date of final acceptance of the project and during that period make good any faults or imperfections that may arise due to defects or omissions in materials or workmanship.

3.10 MATERIALS AND EQUIPMENT

a. Furnish new and unused materials and equipment of Domestic Manufacturers meeting requirements of the paragraph specifying acceptable manufacturers. Where two or more units of same type or class of equipment are required, provide units of a single manufacture.

3.11 ACCEPTABLE MANUFACTURERS

a. The following is a list of acceptable manufacturers for items of equipment specified under Division 23, Mechanical. Manufacturers names and catalog numbers specified under sections of Division 23 are used to establish standards of design, performance, quality and serviceability and not to limit competition. Equipment of similar design, equal to that specified, manufactured by a manufacturer named below will be acceptable on approval.

b. A request for prior approval of equipment not listed must be submitted 14 days before bid due date. Only manufacturers specified in sections of Division 23, on drawings or listed below (including subsequent addenda) will be acceptable. There will be no exceptions to this requirement. Submit complete design and performance data to the Architect.

Item	Manufacturer
Wall Penetration Seals	Link Seal
Access Doors	Inryco/Milicor, Karp
Grooved Pipe Fittings	Grinnell, Gustin-Bacon, Stockham, Victaulic
Valves	Hammond, Nibco, Powell, Stockham, Walworth
Backflow Preventer Valves	Beeco/Hersey, Febco, Watts

Insulation	Certainteed, Johns-Manville, Knauf, Owens-Corning, Kingspan
Controls	JCI, Trane, Honeywell
DX Split Systems	JCI, Trane, Lennox, Fraser-Johnston
100% OA DX Split Systems	Aaon, Trane
Filters	American Air Filter, Farr
Air Devices	Krueger, Envirotec, Titus, Price, Metalaire, Nailor
Vibration Isolation	Amber-Booth, Mason Industries
Fans	Greenheck, Cook
Flexible Duct	Flexmaster (only)

c. Manufacturers listed in schedules, on the drawings or in a specific section of the specifications for a specific product is the basis of design. Any other submitted product will be construed to be a proposed substitute, even if listed in the acceptable manufacturers list, and must comply with the following paragraphs.

d. Acceptance of materials and equipment will be based on manufacturer's published data and will be tentative subject to the submission of complete shop drawings indicating compliance with the contract documents and that adequate and acceptable clearances for entry, servicing, and maintenance will exist. Acceptance of materials and equipment under this provision shall not be construed as authorizing any deviations from the contract documents, unless the attention of the Architect has been directed in writing to the deviations.

e. Each proposed substitute shall be referenced to the trade name of the specified product, and the paragraph and page number of the specifications where the specified items occur. Each proposed substitute shall be accompanied by adequate supporting information including catalog cuts, diagrams, representative samples, published ratings, drawings, and other such descriptive information as may be required to properly illustrate the complete characteristics of materials and equipment. In addition, a detailed statement indicating item-by-item and paragraph-by-paragraph wherein the product to be offered deviates from the specification shall be submitted for each proposed alternate. Any such alternate proposal must include all necessary changes and additions to other work occasioned by such substitution. In addition, each alternate proposal must stipulate that the substituted product will fit the space allotted the specified product and provide the same or greater clearances for maintenance, removal and/or access.

f. When requested by the Architect, the Contractor shall provide a sample of the proposed substitute item. In some cases, samples of both the specified item and the proposed item shall be provided for comparison purposes.

g. Should a substitution be accepted, and should the substitute material prove defective, or otherwise unsatisfactorily for the service intended within the guarantee period, this material or equipment shall be replaced with the material or equipment specified at no additional cost to the Owner.

3.12 SUBMITTAL DATA AND SHOP DRAWINGS

The submittals shall include a specification compliance analysis for review and approval before work shall begin. The compliance document shall address each paragraph of the specification by indicating COMPLY, EXCEED, or EXCEPTION. Do not indicate COMPLY unless the proposed system exactly meets the paragraph requirement. If EXCEED or EXCEPTION is indicated, then provide a clear and concise explanation of the variance from the specifications and the net effect this would have on the specified system performance. This is to be included with each submittal.

a. Submittal data. Submit descriptive literature, physical data, and performance data by the appropriate specification section or the specific sheet where products are shown on the contract drawings that are not referenced by the specification for review. All specification sections require a submittal. Submit each spec section separately but at one time. Submittals can be contained in one binder or binders, however, each specification section must be submitted as a single submittal and each section must be clearly marked or tagged with the specification section number. Each submittal shall bear the specification section number it is related to. Any submittal received without referring to the appropriate specification section number will be returned without review. Include identifying symbols and equipment numbers used in plans and specifications, with reference to specification paragraphs, and drawing numbers of all equipment and material submitted. Submittal data shall specifically list all proposed deviations from the contract documents. Submittals that are not clearly marked will be rejected for that reason.

b. Contractor's Check. Shop drawings and submittal data will be submitted only by the Contractor. Indicate by signed stamp that the drawings and submittal data have been checked, that the work shown on the drawings and submittal data is in accordance with contract requirements and that dimensions and relationship with work of other trades have been checked. If drawings and submittal data are submitted for approval that have not been checked and signed by the Contractor, they will be returned for checking before being considered by the Architect.

c. Coordination Drawings: Coordination Drawings in electronic media and hard copy shall be prepared by the Contractor indicating Mechanical, Plumbing, Fire Protection, Electrical work, low voltage cable management systems (or cable tray, as applicable) miscellaneous steel for the general work, lights, air devices, speakers, ceiling heights, etc., drawings shall indicate all duct work, mechanical lines 2" and greater (except all lines that require gravity draining are to be shown), all plumbing lines 2" and greater, trunk lines of fire protection system, and all sprinkler heads. Electrical conduit 2" and greater as well as pull boxes or other elements over 6" x 6" shall be shown. Major pieces of equipment by all trades are to be indicated.

Coordination drawings shall depict the routing of all above ceiling items and shall identify elevations of these items as necessary to fit above specified ceiling systems. Preparation of section details at certain congested corridor locations will be required. The Contractor shall identify which, if any, above ceiling items cannot be installed as schematically shown on the Contract Documents and shall timely notify the Designer of these items with proposed resolution. Contractor shall submit to the designer a complete set of coordination drawings for all of this project, showing non-conflicting routing of all above-ceiling items. No above-ceiling installations shall proceed in any project area until the coordination drawing for that area is completed. These drawings shall bear the original signature of all Contractor (trade) superintendents, indicating that they agree with the routing of above-ceiling items shown. Dimensions are not required and will not be reviewed. Spool drawings are not required. Showing pipe joints and duct joints is not required or desired and will not be reviewed.

It is preferred that the Contractor provide these services with in-house personnel. If this is not possible, Contractor must submit at least two (2) firms or individuals proposed to provide these documents. The Engineer will advise the Contractor which firm or individual is acceptable, prior to services being procured. The Contractor's bid shall include all costs for those services noted herein.

The Contractor may obtain Revit files (if available) or AutoCAD files from the Engineer after signing the Engineer's release and receipt of $250 paid to the Engineer. In addition, the Contractor cannot produce submittals and shop drawings by copying sealed engineering plans in whole or in part. The Contractor must produce their own shop drawings, no exceptions.

The Revit files from the Engineer will contain some clashes and it is important to note the engineers Revit files will not include fire sprinkler, electrical conduit, miscellaneous steel, etc. that may require the Contractor to modify routing/sizing of MEP systems to account for these additional systems. It is the Contractor's responsibility to recommend any required changes and update their Revit/Navisworks/AutoCAD 3-D models. At the completion of construction, Contractor shall provide the updated Revit file which shall include all changes/modifications due to RFI's, ASI's, change orders, etc. and will serve as as-built files (also provide 3 sets of full size prints). If 3-D drawings are not required by the Engineer, AutoCAD drawings must be provided by the Contractor for coordination and as-builts.

(1) Drawings shall be produced in CAD at 1/4" scale, except that mechanical rooms, air handling equipment rooms, and the like, shall be produced in 1/2" scale.

(a) Single line drawing shall not be acceptable.

(2) The suggested production of Drawings is as follows, however, the Contractor is solely responsible for the means, methods and sequences used:

(a) Mechanical trade shall initiate these drawings including furnishing of floor plan backgrounds. Sequence of preparation shall be:

i) Ductwork
ii) Remainder of mechanical work including equipment and piping.

(b) Plumbing trade shall show piping (supply, waste, vent, etc.) overlaid on the floor plan furnished by mechanical trade.

(c) Fire protection work shall be shown on the same floor plan after completion of plumbing work drawings.

(d) Electrical trade work shall be shown on the same floor plan after completion of the above.

(e) General trade work shall be shown on the same floor plan after completion of the above.

(3) Upon completion of coordination drawings, the project manager or superintendent for the HVAC, Plumbing, Fire Protection, Electrical, and General trades shall be required to sign each sheet of the coordination drawings. Signature shall attest to a diligent review and

agreement to alleviate future space conflicts at no cost to the Owner. Any trade that installs elements of its work in locations other than those indicated on the coordination drawings that impacts the work of other trades, or installs elements of its work that is not shown on the coordination drawings, the trade in violation of the coordination drawings shall be required to either:

(a) Move his work to resolve the conflict, or

(b) Reimburse the affected trade(s) to move his work to resolve the conflict, or

(c) Reimburse the Owner to move his work to resolve the conflict.

For record only, Coordination Drawings must be complete and submitted to the Designer within 90 days of award of contract. No review or approval will be forthcoming. Coordination drawings are required for the benefit of the Contractor and all trades as an aid to coordination of their work so as to eliminate or reduce conflicts that may arise during the installation of their work.

Copies of the project coordination drawings shall be submitted as part of the required closeout document package.

Owner:	1 copy
Architect:	1 copy
MEP Engineers:	1 copy

d. Engineer's approval of submitted material constitutes an acknowledgment only and in no way relieves the contractor of full responsibility for providing all systems complete in accordance with the intent of the drawings and specifications. Contractor is responsible for confirming and correlating dimensions at job site, for information which pertains to fabrication processes or construction techniques and for coordination of work with all other trades. Any materials or equipment provided by this contractor without approved shop drawings constitutes the contractor's agreement to comply with the engineer's intent whether specified, shown or implied.

3.13 OPERATING AND MAINTENANCE INSTRUCTIONS

a. Secure three copies of operating and maintenance instructions, service manuals, and parts listed applicable to each item of equipment furnished. Deliver three bound sets for the Owner's use. Include nameplate data and design parameters in operation and maintenance manuals. Clearly distinguish between information which applies to the equipment and information which does not apply. Also include all approved submitted data, all warranties on equipment, contractor's warranty and all test and balance reports. Delivery of required documents is a condition of final acceptance.

b. Upon completion of work, and at time designated by Architect, provide services of a competent representative of the contractor for a period of at least 24 hours to instruct the owner's representative in the operation and maintenance of the entire system.

3.14 PROJECT RECORD DOCUMENTS

a. Preparation. Maintain at the job site a separate set of white prints of the contract drawings for the sole purpose of recording the "as built" changes and diagrams of those portions of work in which actual

construction is significantly at variance with the contract drawings. Mark the drawings with a colored pencil. Prepare, as the work progresses and upon completion of work, drawings clearly indicating locations of various lines, valves, traps, equipment, and other pertinent items, as installed. Include flow- line elevation of sewer lines. Record underground and underslab piping installed, dimensioning exact location and elevation of such piping.

b. Deliver. At conclusion of project, obtain without cost to Owner, sepias of original mechanical drawings and transfer as-built changes to these. Delivery of as-built prints and reproducibles is a condition of final acceptance.

c. Throughout progress of the work of this Contract, maintain an accurate record of all changes in the Contract Documents. Upon completion of the Work of this Contract, transfer the recorded changes the AutoCAD drawing files and specification word processing files. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff. Thoroughly coordinate all changes within the Record Documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other Documents where such entry is required to properly show the change. Include all addenda items, request for information Architect's Supplemental Instructions and any other document that causes a change in the Construction Documents. Accuracy of records shall be such that future search for items shown in the Contract Documents may reasonably rely on information obtained from the approved Record Documents.

d. The Contractor shall mark any deviations on a daily basis. The Architect will visit the site and will require to see the "As-Built" documentation periodically. If the Contractor does not keep an accurate set of as-built drawings, the pay request may be altered or delayed at the request of the Architect. Mark the drawings with a colored pencil. Record installed feeder conduits. Dimension the location and elevation of the conduit.

e. Record Documents shall consist of the following:

(1) Job Set: Promptly following award of Contract, secure from the Architect, at no charge to the Architect, one complete set of all mechanical documents comprising the Contract.

(2) Final Record Documents: Obtain the AutoCAD drawings files at the Contractor's expense ($200 and signed release form).

(a) The Contractor shall transfer all change data shown on the job set of to the corresponding electronic files, coordinating the changes as required, and clearly indicating at each affected detail and other drawing the full description of all changes made during construction and the actual location of items. Call attention to each entry by drawing a "cloud" around the area or areas affected.

(3) Submit the completed total set of Record Documents to the Engineer as described above. Participate in review meeting or meetings as required by the Engineer, make all required changes in the Record Documents, and promptly deliver the final Record Documents to the Architect. Upon completion of Work, the Contractor shall certify the "Record Drawings" for correctness by signing the following certification:

CERTIFIED CORRECT (3/8" high letters)

(Name of the Contractor)

By
Date

(Name of the Sub-Contractor)

By

Date

f. Deliver record drawings to the Architect in the number and manner specified in Division 01 - General Requirements.

3.15 NOISE AND VIBRATION

a. Select equipment to operate with minimum noise and vibration. If objectionable noise or vibration is produced or transmitted to or through the building structure by equipment, piping, ducts or other parts of work, rectify such conditions without cost to the Owner.

3.16 OPERATING TESTS

a. After all mechanical systems have been completed and put into operation, subject each system to an operating test under design conditions to ensure proper sequence and operation throughout the range of operation. Make adjustments as required to ensure proper functioning of all systems. Special tests on individual systems are specified under individual sections.

3.17 LUBRICATION, REFRIGERANT AND OIL

a. Provide a complete charge of correct lubricant for each item of equipment requiring lubrication.

b. Provide complete and working charge of proper refrigerant, free of contaminants, into each refrigerant system. After each system has been in operation long enough to ensure completely balanced conditions, check the charge and modify it for proper operation as required.

3.18 EQUIPMENT NAMEPLATES

a. All air handling units, fan-coil units, air terminal boxes, VAV boxes, condensing units, chillers and furnaces shall have an engraved Setonply Nameplate, black background, white letters, 1-1/2" x 4". Nameplate shall have equipment mark (same as indicated on drawings) in white. Plate shall be attached to equipment mark (same as indicated on drawings) in white. Plate shall be attached to equipment without using screws, per manufacturer's recommendations. All fans shall have an engraved aluminum plate with fan number, black background, white letters, 3/4" x 2-1/2". Fan nameplate shall also list rooms served by fan on one line and the service on the third line. Attach to fan per manufacturer's recommendations.

3.19 SUBSTITUTIONS REQUIRING CHANGES

a. Manufacturers and power requirements indicated on the mechanical and electrical drawings are the basis of design. If changes are required for the equipment submitted, such as changes in conduit size, conductors, breakers, disconnects, panels, etc., it shall be made at no additional cost to the Owner.

3.20 PIPE SLEEVES

a. Fit with sleeves all pipes passing through masonry and concrete construction. Fabricate sleeves of schedule 40 galvanized steel pipe. Size sleeve for minimum clearance between pipe or insulation and sleeve.

b. Extend each sleeve through the floor or wall. Cut the sleeve flush with each surface, except that in exposed locations, extend floor sleeves 3 inches from finished wall or above finished floor line.

c. Caulk all sleeves water and airtight. Seal annular space between pipes and sleeves with fire stop material, see specification on fire stopping found elsewhere in this specification. Install per manufacturer's recommendations to meet or exceed fire rating of penetrated wall (minimum 1-1/2 hour). Reference architectural drawings for wall fire ratings.

d. Sleeve pipe through concrete foundations, below grade with Thunderline Link-Seal wall penetration seals. Equip seals with stainless steel nuts , bolts and pressure plate.

3.21 FIRESTOPPING

a. All piping, tubing, ductwork, conduit, etc. passing through fire rated floors and/or walls shall have the void area between the material passing through floor and/or wall sealed with an approved fire- stop material to maintain the fire rating of the floor and/or wall. Depending on the particular installation, the contractor shall use FS900 series fire stop caulk or FS500/600 series fire-stop components as manufactured by International Protective Coatings or approved equivalent.

b. All fire stop systems shall be installed as required by the manufacturer and U.L. requirements for each application.

c. The Contractor shall procure the services of an independent inspection service to review and provide a certified letter to the Contractor, Engineer and the City of Austin, stating all firestopping has been installed per UL listing and the manufacturer’s recommendations. Independent service shall have experience in the inspection of firestopping materials and methods installed.

3.22 EXISTING FACILITIES

a. The Contractor shall be responsible for loss or damage to the existing facilities as used by his workmen, and shall be responsible for repairing or replacing such loss or damage. The Contractor shall send proper notices and receive written permission from the Owner to enter existing areas. Before beginning work in existing areas, make the necessary arrangements and perform other services required for the care, protection, and in service maintenance of all electrical, communication, plumbing, heating, air conditioning, and ventilating services for existing facilities. The Contractor shall erect temporary barricades with necessary safety devices, as required to protect personnel from injury, removing all such temporary protection upon completion of the work.

b. The Contractor shall provide temporary or new services to all existing facilities as required to maintain their proper operation when normal services are disrupted as a result of the work being accomplished under this project.

c. Where existing construction is removed to provide working and extension access to existing utilities, the Contractor shall remove doors, piping, conduit, outlet boxes, wiring, light fixtures, air

conditioning ductwork, and equipment, etc., to provide this access and shall reinstall same upon completion of work in the areas affected.

d. Where partitions, walls, floors, or ceilings of existing construction are indicated to be removed and equipment located in these areas is required to remain in operation, the Contractor shall remove and reinstall all equipment required for the operation of the remaining electrical systems. This is to include but is not limited to electrical switches, relays, fixtures, conduit, etc.

3.23 OUTAGES

a. Outages of services as required by the project will be permitted but only at time approved by the Owner. The Contractor shall notify the Owner in writing two weeks in advance of the requested outage in order to schedule required outages. No outages shall be taken unless written approval has first been received from the Owner. The time allowed for outages will not be during normal working hours unless otherwise approved by the Owner. All costs of outages, including overtime charges, shall be included in the contract amount.

3.24 PRECEDENCE OF MATERIALS

a. The specifications determine the nature and setting of materials and equipment. The drawings establish quantities, dimensions and details.

b. The installation precedence of materials shall be as follows. Note that if an interference is encountered, this shall guide the Contractor in the determination of which trade shall be given the "Right-of-Way".

Building lines
Structural Members
Soil and Drain Piping
Condensate Drains
Vent Piping
Supply, Return, and Outside Air Ductwork
Exhaust Ductwork
Fire Protection Piping
Domestic Water (Cold and Hot)
Refrigerant Piping
Electrical Conduit

3.25 EQUIPMENT SUPPORTS

In addition, when equipment is not mounted on a curb, secure the equipment in place to comply with IBC, wind restraint requirements. Secure the services of a licensed engineer to provide the required design services.

3.26 THIRD PARTY INSPECTIONS

a. Where a project is outside a municipal justification where there are not city inspectors, the mechanical and plumbing subcontractor shall include in their bids the cost to hire a third party inspector for the mechanical and plumbing systems.

End of Section 23 0000

SECTION 23 0529

EQUIPMENT SUPPORT

1.0 GENERAL

1.1 WORK INCLUDED

a. This section specifies furnishing and installation of concrete equipment pads for all direct and isolated floor mounted equipment, and structural equipment supports for horizontal tanks, heat exchangers and similar equipment, where required.

1.2 RELATED WORK

a. Division 05 - Miscellaneous Metals.

b. Division 09 - Painting.

c. Division 23 - HVAC. Inertia blocks are specified in the section on Vibration Isolation.

1.3 SUBMITTALS

a. Submit shop drawings on all structural supports in accordance with Division 01 - General Requirements.

2.0 PRODUCTS

2.1 CONCRETE

a. Provide Class A concrete as specified in Division 03 - Concrete.

2.2 STRUCTURAL METAL

a. Furnish structural metal as specified in Division 05 - Metals.

3.0 EXECUTION

3.1 STRUCTURAL SUPPORTS

a. Install ceiling-mounted equipment from suitable brackets, platform framing or similar supports fabricated of structural members.

b. Paint all steel with minimum two coats of primer. Finish coats shall be in accordance with Division 09.

End of Section 23 0529

SECTION 23 0548

VIBRATION ISOLATION

1.1 GENERAL

Refer to Section 23 00 00 for General Requirements for Mechanical Work.

1.2 SCOPE OF WORK

a. Unless otherwise noted on the equipment schedule, all mechanical equipment shall be mounted on vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the building structure.

b. Vibration isolators shall be selected in accordance with weight distribution so as to produce reasonably uniform deflection. Deflections shall be as noted on the equipment isolator schedule noted here in.

c. All vibration isolation devices, including steel bases/forms shall be designed and furnished by a single manufacturer or his qualified representative.

d. All equipment is to be externally isolated to ensure that all paths of vibration have been addressed. **Internal Factory Isolation Is Unacceptable.**

1.3 RELATED WORK

a. Division 23 - HVAC.

(1) Refer to the section on Ductwork for flexible connections between fans and ducts.

(2) Refer to the section on equipment Supports for equipment foundation pads.

1.4 SUBMITTALS

a. Submit product data showing type, size, load, deflection and other information required. Include clearly outlined procedures for installing and adjusting isolators.

b. Completely detail concrete bases including the 6-inch-thick foundation pad.

2.0 PRODUCTS

2.1 ISOLATOR DESIGN

a. Materials. Design and treat vibration isolators for resistance to corrosion. Furnished phosphatized steel components with industrial-grade, corrosion-resistant material. Coat components exposed to the weather with PVC coating or fabricate of galvanized steel. Furnish zinc electroplated nuts, bolts and washers. Clean steel bases thoroughly of welding slag and prime with zinc-chromate or metal

etching primer.

b. Design.

(1) Unless otherwise instructed, use spring-type vibration isolators for all equipment driven by motors of 3 horsepower and larger. The isolator manufacturer must calculate the amount of spring deflection required for each isolator to achieve optimum performance and to prevent the transmission of objectionable vibration and noise.

(2) All spring isolators must be completely stable in operation and must be designed for not less than 30% reserve deflection beyond actual operating condition.

(3) Design isolators for equipment installed outdoors to provide adequate restraint due to normal wind conditions. The isolators must withstand wind loads of 30 pounds per square foot applied to any exposed surface of the isolated equipment.

(4) Air handling equipment subjected to excessive horizontal air thrust shall be furnished with isolated thrust resisters to limit displacement to 1/4 inch.

(5) Height saving brackets used with isolators having 2-1/2-inch deflection or greater shall be of the precompression type to limit exposed bolt length.

2.2 ISOLATOR TYPES

a. Type MH-1 Mountings

(1) Neoprene mountings shall have a minimum static deflection of 0.35". All metal surfaces shall be neoprene covered and have friction pads both top and bottom. Bolt holes shall be provided on the bottom and a tapped hole and cap screw on top. Steel rails shall be used above the mountings under equipment such as small vent sets to compensate for the Overhang. Mountings shall be type ND or rails type DNR as furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.

b. Type MH-2 Mountings

(1) Spring isolators shall be free standing and laterally stable without any housing and complete with a molded neoprene cap or ¼" neoprene acoustical friction pad between the base plate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Installed and operating heights shall be equal. The ratio of the spring diameter divided by the compressed spring height shall be no less than 0.8. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include spring diameters, deflection, compressed spring height and solid spring height. Mountings shall be type SLF, as furnished by Mason- Dallas, Inc. or equivalent product by Kinetics.

c. Type MH-2 Hangers

(1) Vibration hangers shall contain a steel spring and 0.2" deflection neoprene element is

series. The neoprene element shall be molded with a rod isolation bushing that passes through the hanger box. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Hangers shall be type **DNHS** as furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.

d. Type RSC-1 Rooftop Spring Curb

(1) Curb mounted rooftop equipment shall be mounted on spring isolation curbs. The lower member shall consist of a sheet metal Z section containing adjustable and removal steel springs that support the upper floating section. The upper frame must provide continuous support for the equipment and must be captive so as to resiliently resist wind forces. All directional neoprene snubber bushings shall be a minimum of ¼" thick. Steel springs shall be laterally stable and rest on ¼" thick neoprene acoustical pads. Hardware m.ust be plated and the springs provided with a rust resistant finish. The curbs waterproofing shall consist of a continuous galvanized flexible counter flashing nailed over the lower curbs waterproofing and joined at the corners by EPDM bellows. All spring locations shall have access ports with removable waterproof covers. Lower curbs shall have provision for 2" of insulation. Curb shall be type RSC as furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.

a. Type FC-3 – (Copper Lines)

(1) Flexible bronze hose shall have bronze braid with sweat connections for copper piping up to 3" diameter. Above 3" diameter, both hose and braid shall be stainless steel with brass sweat ends.

(1)2.

1.2 ISOLATOR APPLICATIONS

EQUIPMENT	BASE TYPE	FLEX TYPE	ISOLATOR TYPE	DEFLECTION
Packaged AHU:				
Rooftop (Curb Mounted)	RSC-1	* FC-1	MH-2	2.50"
Condensing Units/Condensers (Slab on grade or basement)	—	* FC-1/2	MH-1	0.35"
Piping	(Refer to Specification Paragraph for Requirements)			

* Note Location, Temperature and Pressure Limitations noted in Specification Paragraphs listed above.

** If System Static Pressure is 3.5 inches or greater, install Horizontal Thrust Restraints MH-4.

*** Where necessary, unit manufacturer shall provide base rail assembly to allow attachment of external isolators.

2.0 EXECUTION

a. Stock Requirements. The isolation manufacturer's representative must maintain an adequate stock of springs and isolators of type used so that changes made during construction and installation can be made.

b. Factory Representation. After installation, furnish factory-trained representative of the isolation manufacturer to check various isolators and report measured versus anticipated deflection on all isolators. Have the representative certify that isolators have been installed in accordance with manufacturer's recommendations and approved submittals.

End of Section 23 0548

SECTION 23 0700

INSULATION GENERAL

1.0 GENERAL

1.1 SCOPE

a. This section specifies the general requirements for furnishing and installing insulation. These requirements apply to all other Mechanical Division sections specifying insulation.

1.2 INTENT

a. The intent of insulation specifications is to obtain superior quality workmanship resulting in an installation which is satisfactory in both function and appearance. Provide insulation in strict accordance with the specifications for each type of service and apply as recommended by the manufacturer.

1.3 RELATED WORK

a. Division 09, Finishes. Painting and color coding.

b. Division 23, HVAC.

(1) Air Handling Units. Internal insulation for air units is specified in the sections on air handling units. The units do not require external insulation.

(2) Insulation. Refer to specific sections on individual insulation types.

1.4 APPROVALS

a. Submittals. Submit product data on each insulation type, adhesive, and finish to be used in the work. Make the submittal as specified in Division 01, General Requirements and obtain approval before beginning installation.

b. Sample Application. Make an application of each type of insulation to display the material, quality and application method. Obtain approval of the sample application before proceeding with the work.

1.5 FIRE HAZARD RATING

a. All duct and piping insulation used on the project must have a flame spread rating not exceeding 25 and a smoke developed rating not exceeding 50 as determined by test procedures ASTM E 84, NFPA 255 and UL 723. These ratings must be as tested on the Composite of insulation, jacket or facing, and adhesive. Components such as adhesives, mastics and cements must meet the same individual ratings as the minimum requirements.

1.6 INSULATION

a. Insulate valves, fittings, flanges, and special items to the full thickness required for corresponding piping.

b. Replace insulation damaged by either moisture or other means. Insulation which has been wet, whether dried or not, is considered damaged. Make repairs where condensation is caused by improper installation of insulation. Also repair any damage caused by the condensation.

c. Do not insulate any piping until all pressure tests have been performed in accordance with specifications.

d. Where existing insulated piping, ductwork or other surfaces are tapped or damaged, remove existing insulation back to undamaged sections and replace with new insulation of the same type and thickness as existing insulation. Apply as specified for insulation of the same service.

End of Section 23 0700

SECTION 23 0713

EXTERNAL DUCT INSULATION

1.0 GENERAL

1.1 WORK INCLUDED

a. This section provides for the furnishing and installation of external insulation on low-velocity supply, return and outside air ducts, and all round low-velocity supply ductwork.

b. External insulation of concealed and exposed ducts is included in this section.

c. External fire rated wrapping for ductwork is included in this section.

1.2 RELATED WORK

a. Division 23 - HVAC. Insulation - General.

2.0 PRODUCTS

2.1 INSULATION

a. Concealed Duct, Round, Flat Oval, or Rectangular. Insulation R-values shall comply with the current International Energy Conservation Code requirements. Provide flexible glass fiber insulation with factory-applied, reinforced Foil-Kraft vapor retarder facing. A minimum thermal resistance of 6.0 (sq.ft. x degrees F x hrs. per BTU) at 75°F is required, after installation (not in bag). Provide minimum 1-pound density insulation, which complies with ASTM C1290, C1136, C553.

b. Exposed Round and Flat Oval Duct. Provide flexible fiberglass insulation with glass cloth vapor barrier. A minimum thermal resistance of 6.0 (sq. ft. x degrees F x hrs. BTU) at 75°F is required.

c. Exposed Rectangular Duct. Provide rigid board duct insulation with minimum R = 6.0. A minimum density of three pounds per cubic foot and minimum 1 ½" thick insulation is required. Provide an integral, UL labeled, reinforced Foil-Kraft facing on the outside surface.

d. Standing Seams. Insulate standing seams and stiffeners that protrude through the insulation with 0.6-pound-per-cubic-foot density, 1 ½ inch thick, unfaced, flexible blanket insulation. As a vapor seal, use 8-ounce canvas with vapor barrier coating. Insulation should not prevent adjustment of damper operators.

2.2 COATING AND ADHESIVE

a. Coating. Provide Foster 30-65 or Childers CP-34 vapor barrier coating.

b. Adhesive. Provide Foster 85-60 or Childers CP-127 vapor barrier adhesive.

3.0 EXECUTION

3.1 FIRE SAFETY REQUIREMENTS

a. Do not extend duct coverings through walls or floors required to be firestopped or required to have a fire resistance rating. Interrupt duct coverings in the immediate vicinity of heat sources, such as electric resistance or fuel-burning heaters.

3.2 CONCEALED DUCT, ROUND, FLAT OVAL OR RECTANGULAR

a. Insulation shall be wrapped tightly on the ductwork with all circumferential joints butted and longitudinal joints overlapped a minimum of 2 inches. In addition, secure insulation to the bottom of rectangular ductwork over 24 inches wide by the use of mechanical fasteners at no more than 18 inches on center.

b. On circumferential joints, the 2-inch flange on the facing shall be stapled with 9/16-inch flare- door staples on 6-inch centers, and taped with a minimum 3-inch-wide strip of glass fabric and coating, or a 3-inch-wide strip of 8-ounce canvas adhered with adhesive. Cover all seams, joints, pin penetrations and other breaks with coating reinforced with glass fabric.

c. On circumferential joints, the 2-inch flange on the facing shall be stapled with 9/16-inch flare- door staples on 6-inch centers, and taped with a minimum 3-inch-wide strip of glass fabric and coating, or a 3-inch-wide strip of 8-ounce canvas adhered with adhesive. Adhesive systems employing release paper will not be acceptable.

End of Section 23 0713

SECTION 23 0719.01

LOW TEMPERATURE PIPING INSULATION

1.0 GENERAL

1.1 SCOPE

a. This section provides for installing and furnishing low temperature piping insulation of Fiberglass, Armaflex AP or Koolphen-K or as noted below. The insulation will be used for low temperature application including refrigerant, and condensate drain piping from air handling units or evaporators.

1.2 RELATED WORK

a. Division 23, HVAC. Insulation - General.

2.0 PRODUCTS

2.1 PIPE INSULATION

Use one of the following as noted in the schedule below:

a. Fiberglass premolded pipe insulation, 4 PCF density, k-value 0.23 btu· in/hr· ft^2·℉ at 75℉, R- value = 4.3/inch, with factory-applied reinforced All Service Jacket having integral laminated aluminum vapor barrier.

b. Armaflex AP flexible closed cell elastomeric pipe insulation, 4 PCF density, k-value 0.27 btu· in/hr· ft^2·℉.

c. Premolded Phenolic Foam, closed cell pipe insulation, 2.5 PCF density, k-value 0.13 btu· in/hr· ft^2·℉ at 75℉, R-value = 7.6/inch, with factory-applied reinforced All Service Jacket having integral laminated aluminum vapor barrier. Koolphen-K, Insul-phen by Resol Co. or equal. Insulation shall be free of all CFC or HCFC. Material to comply with ASTM C1126 Type II and III grade 1, and comply with 25/50 flame smoke spread.

All above materials shall have Flame spread/Smoke developed rating less than 25/50 in accordance with ASTM E 84.

All materials to be installed and vapor sealed in accordance with the manufacturer's recommendations.

Thickness (Inches)

Insulated Unit	Fiberglass	Koolphen-K	Armaflex AP
Condensate Drain Lines	—	—	1/2
Refrigerant Suction Piping	—	—	1 (1)
(1) Pipe 1-1/2" and less - 1" insulation; larger than 1-1/2" - 1-1/2" insulation			

2.2 FLANGE, VALVE AND FITTING INSULATION

a. Provide molded or mitered covers for flanges, valves and fittings. Refer to paragraph 3.2 for method of fabrication.

2.3 INSULATION SHIELD

a. Field Fabricated. Use sections of high density Koolphen-K, fiberglass, or foamglass insulation that will support the bearing area at hangers and supports. Further support insulation at hangers and supports with a shield of galvanized metal extending not less than 4 inches on either side of the support bearing area, covering at least half of the pipe circumference, and conforming to the schedule below.

Adhere metal shield to insulation so that metal will not slide with respect to insulation.

Pipe Diameter	Insulated Section Length in Inches	Minimum U.S. Standard Gauge of Metal Shield
3" and smaller	12	18
4" to 6"	12	16
8" to 18"	18	14
18" and larger	24	12

2.4 SEALANT, ADHESIVE AND FINISH

a. Sealant. Use Foster 95-44 or Childers CP-76 to be used at valve covers and vapor stops.

b. Adhesive. Furnish Foster 85-60 or Childers CP-127 to seal longitudinal laps of the vapor barrier jacket and to adhere butt joint covers. Self-sealing laps and butt strips are not allowed.

c. Finish. Use Foster 30-65 or Childers CP-34 with glass fabric reinforcement.

2.5 ALUMINUM JACKETING

a. Apply aluminum jacketing to all insulated pipe located outdoors, no exceptions.

(1) Piping. Furnish for finishing insulated pipe, a self-fastening jacket of type 3003-H14 aluminum alloy, 0.016-inch thick.

(2) Valves, Fittings and Flanges. For finishing all valves, fittings and flanges, and smaller installations, provide formed aluminum covers, 0.024-inches thick, Type 3003-H14 aluminum alloy.

(3) Straps and seals. Provide aluminum strapping seals for jackets and covers according to manufacturer's recommendations.

(4) Acceptable manufacturers. Jacketing as manufactured by Preformed Metal Products Company, Childers or Johns-Manville will be acceptable.

3.0 EXECUTION

3.1 PIPE

a. Apply insulation to clean, dry pipes. Butt insulation joints firmly together. Seal longitudinal laps and butt strips with adhesive.

b. Where piping is interrupted by fittings, flanges, valves or hangers and at intervals not to exceed 25 feet on straight runs, an isolating seal (vapor stop) shall be formed between the vapor barrier jacket and the bare pipe by liberal application of the sealant to the exposed joint faces carried continuously down to and along 4 inches of pipe and up to and along 2 inches of the jacket. This shall be provided only for chilled water service. In areas with high ambient temperature and humidity conditions, seal all butt joints with vapor stop sealant in accordance with recommendations of the insulation manufacturer.

3.2 VALVES, FLANGES AND FITTINGS

a. Insulate all valves, flanges and fittings with factory molded or mitered fitting covers secured with wire. Thickness of insulation shall be equal to that of adjoining piping. Mitered covers for pipe 2" and smaller shall be minimum 3-piece to the side, and pipe 2-1/2" and larger shall be minimum 6 pieces to the side. The fitting shall then be rasped or otherwise formed to have a smooth appearance.

b. Finish with 1/4-inch layer of Foster 30-65 or Childers CP-34 reinforced with glass fabric.

3.3 SHIELDS AND HANGERS

a. When the insulation is jacketed in aluminum, install a length of 40-pound roofing felt 1/2 inch longer than the insulation shield between shield and jacket.

End of Section 23 0719.01

SECTION 23 0800

AIR AND WATER BALANCE

1.0 GENERAL

1.1 SCOPE

This section covers final air balance operations after construction of the air system.

a. Testing Agency. The contractor shall secure the services of an independent air balance and testing agency to perform complete balance, adjustment and testing of air moving equipment and air distribution systems, including terminal units. Agency shall have on its staff at least one certified member of NEBB or AABC, who has been a member in good standing for at least 3 years, and the balancing agency shall be NEBB or AABC certified for a period of at least three years. Approved firms to provide this work are PHI Service Agency, Texas Energy Planners, Engineered Air Balance, and TAB Technologies.

b. Equipment. Instruments used shall be accurately calibrated and maintained in good working condition. Equipment shall be as listed by the Associated Air Balance Council or NEBB for this type work.

c. The items requiring testing, adjusting and balancing include the following:

AIR SYSTEMS:
Supply Fan AHU
Exhaust Fans
Zone branch and main ducts
Diffusers, Registers and Grilles
Coils (Air Temperatures)

d. The balancing contractor shall provide tests to demonstrate the specified capacities and operation of all equipment and materials comprising the systems. Such tests other than as described herein, which are deemed necessary by the Engineer to indicate the fulfillment of the contract, shall be made. The Balancing (HVAC) Contractor shall then make available to the Engineer such instruments and technicians as are required for spot checks of the system.

e. The drawings and specifications indicate valves, dampers, sheaves and miscellaneous adjustment devices for the purpose of adjustment to obtain optimum operating conditions, and it will be the responsibility of the Mechanical Subcontractor to install these devices in a manner that will leave them accessible and readily adjustable. The Balancing (HVAC) Contractor may be consulted if there is a questionable arrangement of a control or adjustable device.

f. The balancing contractor shall be responsible for inspecting, balancing, adjusting, testing and logging the data of the performance of fans, all dampers in the duct systems and all air distribution devices. The General Contractor, the Mechanical Subcontractor and the suppliers of the equipment installed shall all cooperate with the Balancing (HVAC) Contractor to provide all necessary equipment cutsheets.

g. The Balancing (HVAC) Contractor shall provide the following services:

(1) During construction, inspect the installation of heating and cooling pipe systems, sheet metal work, temperature controls and other component parts of the heating, air conditioning and ventilating systems. The inspection of the work will cover that part relating to proper arrangement and adequate provisions for the testing and balancing. The inspections shall be performed periodically as the work progresses. A minimum of three inspections are required as follows:

(a) When 60% of ductwork is installed.

(b) When 90% of ductwork is installed.

(2) Submit brief written report of each inspection to A/E, with copies to Contractor, Mechanical Engineer, Inspector, and Owner's Representative.

(3) Upon completion of the installation and start-up of the mechanical equipment by the Mechanical Subcontractor, the Balancing (HVAC) Contractor will balance, test and adjust the systemic components to obtain optimum conditions in each conditioned space in the building. If construction deficiencies are encountered which preclude obtaining optimum conditions, and the deficiencies cannot be corrected by the Contractor within a reasonable period of time, cease TAB services and advise the Architect in writing with an information copy to the Owner's Representative. The Balancing (HVAC) Contractor is advised that deficiencies in HVAC construction are often encountered during final TAB services and he should include in his bid an amount he deems advisable to compensate for his time in identifying the deficiencies to the Mechanical Contractor and awaiting their correction.

(4) Fourteen (14) days, or earlier, prior to the Owner's Final Inspection, as requested by the General Contractor, the TAB shall prepare seven (7) copies of the completed Balancing (HVAC) Test and Balance Report. The Report shall be complete with logs, data, and records as required herein and all logs, data, and records shall be typed, produced on white bond paper, and bound with plastic spiral. The Reports shall be certified accurate and complete by a principal Engineer of the Balancing (HVAC) Contractor. Transmit one (1) copy direct to the Owner's Representative and the remaining six (6) copies to the Architect. The Architect will, in coordination with the Engineer, review the report. Upon approval, two (2) copies will be submitted to the Owner's Representative and two (2) copies transmitted to the Contractor.

(5) The Report shall contain the following general data in a format selected by the TAB Agency for clarity and ease of reference.

Project No.
Contract No.
Project Title:
Project Location:
Project Mechanical Engineer: (Name)
TAB Field Test Engineer: (Name)
TAB Testing Diagnosis and Analysis by : (Name)
TAB Agency: (Firm name and address)
Mechanical Subcontractor: (Name and address)
General Contractor: (Name and address)
Inclusive dates tests were performed and date of Report
Test Certification Number:
Certification by principal engineer
The TAB Report shall normally contain the following sections:
Table of Contents
General data and certification
Brief Description of Tests and Test Procedures (including instruments used)
Summary of Test Results (note deficiencies, if any, and action taken for correction)
Logs, Data, and Records

h. REPORTS

(l) Final TAB Report - The TAB agency shall submit the final TAB report for review by the engineer. All outlets, devices, HVAC equipment, etc., shall be identified, along with a numbering system corresponding to report unit identification. The TAB agency shall submit an AABC "National Project Performance Guaranty" assuring the project systems were tested, adjusted and balanced in accordance with the project specifications and AABC National Standards or NEBB procedures.

1.2 RELATED WORK

a. Division 23 - Mechanical.

(1) Ductwork.

(2) Fans.

(3) Air Devices.

1.3 PROCEDURES

a. Operating Tests. After all mechanical systems have been completed, and prior to air balance, subject each system to an operating test under design conditions to ensure proper sequence of operation in all operating modes. Make adjustments as required to ensure proper functioning of all systems.

b. Certified Data. The contractor shall provide the balance and testing agency the certified data on fans, grilles, coils, filters and other equipment required for proper balancing of the system.

c. Adjustment. The balance and testing agency shall provide necessary adjustments to air flow dampers, fans, sheaves, extractors, splitters, and other controls as required to properly balance the system. TAB firm to include in his bid, all belts and sheaves, and labor to replace and adjust all sheaves to obtain scheduled air flow.

d. Balancing. The balance agency shall follow balancing and testing procedures published by the Associated Air Balance Council, or NEBB.

e. Reports. Compile the test data on report forms as listed in the AABC "National Standards for Total System Balance". Include data on air volume at supply and return grilles and diffusers. Include exhaust air volume. Contractor's forms are not acceptable unless all data included is in the latest "National Standards" by AABC.

f. The specified systems shall be reviewed and inspected for conformance to design documents. Testing, adjusting and balancing on each identified system shall be performed. The accuracy of measurements shall be in accordance with AABC National Standards. Adjustment tolerances shall be + or - 10% unless otherwise stated.

g. Equipment settings, including manual damper quadrant positions, manual valve indicators, fan speed control levels, and similar controls and devices shall be marked to show final settings.

2.0 EXECUTION

2.1 AIR BALANCE (BY AIR BALANCE AGENCY)

a. General Requirements.

(1) Do all work required for complete testing and adjusting of all HVAC systems.

(2) Provide all instruments and equipment required to accomplish necessary testing, adjusting, and as required by the engineer to verify performance. All instruments shall be in accurate calibration and shall be calibrated in ranges that will be expected.

(3) Prior to final observation, submit to the owner a letter certifying:

(a) That all balancing is complete.

(b) That all controls are calibrated and functioning properly.

(c) That all parts of the various systems are complete and ready to be turned over to the owner for continuous operation. Submit with letter a report tabulating data requested by the Engineer.

b. Design Conditions. The HVAC systems have been designed to maintain the inside conditions indicated below when operating with the outside conditions stated. Install, test and adjust the systems so that they will produce the inside conditions for design; however, contractor must be prepared to provide a suitable test to prove that equipment is producing capacities scheduled.

(1) Inside Conditions.

Summer: 75 F.D.B. 50% R.H.
Winter: 72 F.D.B.

(2) Outside Conditions.

Summer: 98 F.D.B. 78 F.W.B.
Winter: 20 F.D.B.

c. Adjust all air system dampers and volume controllers to obtain proper air balance throughout the conditioned area. The air quantities shown on the drawings for individual outlets may be changed to obtain uniform temperature within each zone, but the total air quantity shown for each zone must be obtained. Maximum temperature variation within a zone to be 2°F.

d. Adjust all blower drives to obtain proper total amounts of air. Change drive if necessary to accomplish proper air flow. Costs for drive changes, including belts and sheaves will be borne by the TAB contractor.

e. AIR SYSTEMS

The TAB agency shall verify that all ductwork, dampers, grilles, registers, and diffusers have been installed per design and set in the full open position. The TAB agency shall perform the following TAB procedures in accordance with the AABC National Standards:

(1) For supply fans:

(a) Fan speeds - test and adjust fan RPM to achieve maximum or design cfm.

(b) Current and voltage - test and record motor voltage and amperage, and compare data with the nameplate limits to ensure fan motor is not in or above the service factor.

(c) Pitot-Tube traverse - perform a Pitot-tube traverse of main supply and return ducts, as applicable to obtain total cfm.

(d) Outside air - test and adjust the outside air on applicable equipment using a pitot-traverse. If a traverse is not practical use the mixed air temperature method if the inside and outside temperature difference is at least 20 degrees Fahrenheit or use the difference between pitot-tube traverses of the supply and return air ducts.

(e) Static pressure - test and record system static profile of each supply fan.

(2) For exhaust fans:

(a) Fan speeds - test and adjust fan RPM to achieve maximum or design cfm.

(b) Current and voltage - test and record motor voltage and amperage, and compare data with the nameplate limits to ensure motor is not in or above the service factor.

(c) Pitot-tube traverse - perform a pitot-tube traverse of main exhaust ducts to obtain total cfm.

(d) Static pressure - test and record system static profile of each exhaust fan.

(3) For zone, branch and main ducts:

(a) Adjust ducts to within design cfm requirements. As applicable, at least one zone balancing damper shall be completely open. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.

(4) For diffusers, registers and grilles:

(a) Tolerances - test, adjust and balance each diffuser, grille, and register to within 10% of design requirements. Minimize drafts.

(b) Identification - identify the type, location and size of each grille, diffuser, and register. This information shall be recorded on air outlet data sheets.

(5) For coils:

(a) Air temperature - once air flows are set to acceptable limits, 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.

f. SOUND TESTING. The TAB agency shall conduct sound testing in the following areas per AABC National Standards and to the criteria listed, using sound meter with octave band analyzer:

TEST AREA	NUMBER OF LOCATIONS	NC LEVEL ACCEPTABLE
General Offices	0	30-35
Executive Offices	0	25-30
Computer/Equipment Rooms	0	40-45

Libraries	0	35-40
Schools/Classrooms	0	25-30

g. VIBRATION TESTING. The TAB agency shall conduct vibration testing on the following equipment per AABC National Standards. Test deflection in mils and velocity in inches per second shall be measured and the results compared to requirements in equipment specification sections.

EQUIPMENT
Fans over 3.0 horsepower

h. INDOOR AIR QUALITY VERIFICATION

(1) The TAB agency shall take measurements at design outside air. It shall measure temperature and humidity uniformity throughout the space, check filter installation for proper fit, seal, and operation, and verify condensate drain operation. The TAB agency shall note any water damage or obvious contamination sources from inside or outside.

(2) The TAB agency shall conduct the following air sampling tests for every 2,500 square feet of space:

Chemical Name	Chemical Symbol	TLV-TWA (1) (PPM)	C-STEL (2) (PPM)	Dreager Tube Range (PPM)
Carbon Dioxide	CO^2	5000	-	100-3000
Carbon Monoxide	CO	25	-	2-300
Ozone	O^3	0.10	-	0.005-1.4
Nitric Oxide	NO	25	-	0.5-25
Nitrogen Dioxide	NO^2	3	-	0.5-25
Formaldehyde	HCHO	-	0.3	0.2-5

[1] TWA - Time Weighted Average: Compound concentrations to be controlled during a continuous 8-hour period to within this TWA value, measured in parts per million (PPM).
[2] C-STEL - Ceiling-short Term Exposure Limit: Compound conc

(3) The TAB agency shall prepare a report showing the results, location, time and date of each test. A summary of the HVAC operating conditions, and a listing of any discrepancies shall be provided.

(4) All IAQ readings are applicable only to the date and time noted above.

i. DUCT LEAKAGE TESTING. The installing contractor shall isolate and seal sections of ductwork for testing. The test pressures required and the amount of duct to be tested shall be described by the engineer in the appropriate duct classification section. All testing shall be based on one test per section only unless otherwise noted.

j. VERIFICATION OF HVAC CONTROLS. The TAB agency shall be assisted by the building control systems contractor in verifying the operation and calibration of all HVAC and temperature control systems. The following tests shall be conducted:

(1) Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water resets, fire and freeze stats, and other safety devices.

(2) Verify that all controlling instruments are calibrated and set for design operating conditions.

k. TEMPERATURE TESTING. To verify system control and operation, a series of three temperature tests shall be taken at approximately two-hour intervals in each separately controlled zone. The resulting temperatures shall not vary more than two degrees Fahrenheit form the thermostat or control setpoint during the tests. Outside temperature and humidity shall also be recorded during the testing periods.

l. TAB REPORT VERIFICATION. At the time of final inspection, the TAB agency may be required to recheck, in the presence of the Owner's representative, specific or random selections of data recorded in the certified report. Points and areas for recheck shall be selected by the Owner's representative. Measurements and test procedures shall be the same as approved for the initial work for the certified report. Selections for recheck, specific plus random, will not exceed 10% of the total number tabulated in the report.

m. BUILDING/ZONE PRESSURIZATION. The TAB agency shall test and adjust building/zone pressurization by setting the design flows to meet the required flow direction and pressure differential. For positive pressure areas, it shall set the supply air to design flow, and gradually reduce the exhaust air rate to obtain the required flow or pressure difference. For negative pressure areas, it shall set the supply air to design flow, and gradually increase the exhaust air rate to obtain the required flow or pressure difference.

n. FIRE AND SMOKE TESTING. The TAB agency shall test fire/smoke dampers to assure operation. It shall verify that an access door has been installed for each fire and smoke damper. For fire dampers, the TAB agency shall open the access door, disconnect the fusible link, and allow the damper to close. Operation should be smooth and all dampers must close completely. The TAB agency shall then reset the damper. For the smoke damper, the TAB agency shall open the access door, activate the damper, and observe operation. The damper must close quickly and completely. The TAB agency shall then reset the damper and observe its complete opening.

o. LIFE SAFETY CONTROLS. The TAB agency shall test and record life safety control operation on the HVAC equipment. It shall verify the installation of required smoke detectors in air handling equipment (AHE), and shall verify operation of the smoke detector by activating the smoke detector and observing air handler shutdown. With the controls and alarm contractors, the TAB agency shall verify the

operation of interconnected systems such as the AHE smoke detector's activation of the fire alarm system and the alarm system's activation of the life safety control sequences.

(1) After balancing is complete and before calling for final observation, record, and submit for record reports as noted herein and per recommendations of AABC or NEBB.

(2) For each air unit:

(a) Suction and discharge static pressure, and total static.

(b) Fan rpm, measured by tachometer; verify rotation.

(c) Motor nameplate F.L.A., actual amps, voltage.

(d) Measured cfm for total supply, return and outside air.

(e) Entering and leaving air temperature for each coil.

(3) Each condenser unit:

(a) Ambient air temperature, condenser discharge temperature.

(b) Motor nameplate F.L.A., actual amp, voltage.

(c) Suction and discharge pressures, temperature.

(4) Other reports and forms to be completed and submitted. Provide instrument list, air moving test sheet, exhaust fan data sheet, static pressure profile, return air/outside air data, fan and motor pulley, duct traverse readings, duct traverse zone totals, air monitoring station data, air distribution test sheet, terminal units, pump data sheet, chillers, air cooled condensers, cooling coil data, heating coil data, flow measuring station, duct leak test. All forms shall be as listed in the latest "National Standards for Total System Balance", or shall be similar, but must note same information.

p. After Owner Occupancy. After owner has occupied and is using the building, make three additional inspections of the system (at 1 month intervals) to:

(1) Correct any owner observed temperature imbalances.

(2) Check correct operation of equipment and verify by letter to the engineer on each trip. List in the letter corrections made.

q. At Time of Job Completion.

(1) Provide such tools, equipment and personnel as required to conduct tests and demonstrate the acceptability of the various systems.

(2) Have the authorized representatives of the various manufacturers available if requested.

End of Section 23 0800

SECTION 23 2113.02

PIPING AND PIPING APPURTENANCES FOR COLD WATER MAKEUP AND EQUIPMENT DRAINS

1.0 GENERAL

1.1 SCOPE

a. This section provides for furnishing and installing piping and piping appurtenances to drain air handlers, and other equipment requiring drains.

1.2 RELATED WORK

a. Division 23 - HVAC.

(1) Valves, Strainers and Vents.

(2) Pipe and Pipe Fittings.

(3) Insulation.

2.0 PRODUCTS

2.1 PIPE AND FITTINGS

a. Provide Schedule 40, galvanized steel pipe conforming to ASTM A 120, and galvanized class-150 malleable iron fittings.

2.2 PIPE AND FITTINGS

a. Provide seamless, hard-drawn, Type L, copper water tube conforming to ASTM B 88, and wrought copper fittings.

2.3 VALVES AND STRAINERS

a. For pressure-reducing and relief valves, provide Bell & Gossett dual unit No. D-250.

2.4 TRAPS

a. On each air handling unit condensate drain, provide a trap deep enough to overcome pressure of the unit.

3.0 EXECUTION

a. Install according to manufacturer's recommendations.

End of Section 23 21 13.02

SECTION 23 2300

REFRIGERANT PIPING AND APPURTENANCES

1.0 GENERAL

1.1 WORK INCLUDED

a. This section specifies the furnishing and installation of copper tubing, valves, strainers, and sight glass for refrigerant piping.

1.2 RELATED WORK

a. Division 23 - HVAC.

(1) Pipe and Pipe Fittings.

(2) Valves, Strainers, and Vents.

(3) Low Temperature Piping Insulation.

2.0 PRODUCTS

2.1 PIPE AND FITTINGS

a. Furnish refrigerant piping of Type L-ACR, hard-drawn copper tubing with sweat-type, wrought copper fittings. Cast fittings are not permitted.

2.2 SERVICE VALVES

a. Provide angle or globe service valves, with sweat connections. Use packed-type valves with gasketed seal cap and back seat feature. Valves must be wrench operated. Furnish valves especially designed for refrigerant service, in conformance with the ARI code.

b. Place service valves at the inlet and outlet of each compressor, on both sides of each strainer and solenoid valve, and as otherwise shown and specified.

2.3 SIGHT GLASSES

a. Provide suitable double-window sight glass in the liquid line leaving the condenser.

2.4 SOLENOID VALVES

a. Furnish pilot-operated, floating piston solenoid valves suitable for operation with refrigerant.

b. Use valves with a bronze body and sweat-type connections.

c. Provide stainless steel stem and plunger assembly, and a stainless steel piston.

d. Furnish solenoid coils which are sealed and moisture proof.
e. Use electrical characteristics of 115-volt, 60 hertz.

3.0 EXECUTION

3.1 PRESSURE TEST

After all refrigerant equipment and piping are installed, charge the system with the proper refrigerant and dry nitrogen to 300 psig.

a. Test all joints with a Halide torch or an electronic leak detector.

b. Repair all leaks and retest each system until proved absolutely tight.

3.2 EVACUATION AND DRYING

After refrigerant system has been pressure tested, connect a suitable vacuum pump, and evacuate piping system, including all lines and equipment. Verify all equipment, gauges, hoses, hose gaskets, etc., are air tight and leak free. Using a calibrated micron gauge (Bacharach, J.B., Ronaire) triple evacuate refrigerant system as follows:

a. Evacuate refrigerant to 1500 microns, break vacuum using dry nitrogen. Do not allow any air to enter system.

b. Evacuate refrigerant system for the 2nd time to 1500 microns. Break vacuum using dry nitrogen. Do not allow any air to enter system.

c. Evacuate refrigerant system for the 3rd time to 500 microns. Maintain vacuum for a minimum of four hours at 500 microns.

d. Document all stages of evacuation and submit a brief written report to the Engineer.

e. Charge refrigerant system with the proper refrigerant. Do not allow any air or nitrogen to enter the system.

End of Section 23 2300

SECTION 23 3000

DUCTWORK

1.0 GENERAL

1.1 WORK INCLUDED

a. This section provides for furnishing and installing low pressure ductwork and includes duct construction and accessories.

1.2 RELATED WORK

a. Division 23 - HVAC.

(1) Air Devices

(2) Air Balance

(3) Fans

(4) Insulation

1.3 GUARANTEE

a. Guarantee all ductwork for one year from the date of final acceptance. The guarantee will cover workmanship. noise, chatter, whistling, or vibration. Ductwork must be free from pulsation under all conditions of operation.

1.4 CONTRACTOR COORDINATION

a. Erect all ducts in the general locations shown but conform to all structural and finish conditions of the building. Before fabricating any ductwork, check the physical conditions at the job site and make all necessary changes in cross sections, offsets, aspect ratio, areas, and similar items, whether they are specifically indicated or not at no additional cost.

1.5 STANDARD AND CODES

a. Except as otherwise indicated, sheet metal ductwork material and installation shall comply with the latest edition of the SMACNA HVAC Duct Construction Standards. Fiberglass ductwork material and installation shall comply with the latest edition of SMACNA Fibrous Glass Duct Construction Standards and NFPA Bulletin 90A. All air distribution devices (such as dampers) included in this specification shall comply with the latest applicable SMACNA manual and NFPA 90A.

2.0 PRODUCTS

2.1 DUCT MATERIAL

a. Except for the special ducts specified elsewhere, use prime galvanized steel sheets or coils up to 60 inches wide. Stencil each sheet with proper gauge and manufacturer's name. Stencil coils of sheet steel throughout on 10-foot centers with gauge and manufacturer's name. Contractor shall be cautioned that Engineer may random check duct and strap gauges with a micrometer to verify compliance with the specifications.

2.2 SEALING OF SEAMS AND JOINTS (LOW VOC)

a. The entire duct system shall be sealed. The seams and joints shall be sealed by use of low VOC Hardcast DT tape with FTA-20 (indoor) adhesive or low VOC RTA-50 adhesive for outdoor applications. Duct shall be thoroughly cleaned prior to application.

b. Provide Seal Class A to all transverse and longitudinal joints and all openings for all locations. Joints includes additional sealing of TDF, duct-mate or other mechanical/gasketed joints. Spiral lock seams in round and flat oval duct need not be sealed.

2.3 LOW PRESSURE DUCTWORK (LESS THAN 2 INCHES STATIC PRESSURE)

Low pressure ductwork is defined as all exhaust ductwork downstream of fans and supply ductwork downstream of terminal units and fan-coil units.

a. Rectangular. Provide rectangular, low-pressure duct construction, gauges and reinforcing in accordance with the latest edition of the SMACNA HVAC Duct Construction Standards for 2" w.g. static pressure class (positive or negative), however, the gauges listed below are the minimum gauges to be used. Internal rod reinforcement will not be allowed for any ductwork with a largest dimension of less than 84".

Largest Dimension	U.S. Gauge
12" and less	No. 26
13" to 30"	No. 24

b. Round. Furnish round, low-pressure ducts which are spiral wound, such as manufactured by United McGill Sheet Metal Company, or shop fabricated round ducts with Pittsburgh lock longitudinal seams. Use the following minimum gauges for shop fabricated spiral wound ducts under positive pressure, however, the gauges listed below are the minimum gauges to be used. Internal rod reinforcement will not be allowed for any ductwork with a largest dimension of less than 84".

Diameter	U.S. Gauge
26 " and less	No. 26

c. Flexible Ducts. Low pressure insulated flexible duct may be used where shown on the drawings. Duct shall be made with factory preinsulated duct, covered with a minimum of 2" thick, R6 fiberglass blanket sheathed in a vapor barrier of fiberglass reinforced aluminized polyester laminate. The insulation shall have a minimum "K" factor of 0.29 at 60 degrees F mean and a vapor barrier permeability rating of 0.05 per ASTM method E96-66, Procedure A. The C factor shall be 0.24 to meet HUD requirements. The duct shall be rated for a positive working pressure of 6" w.g. and a temperature of up to 250 degrees F. The duct must comply with the latest NFPA Bulletin 90A and be listed and labeled by Underwriters™ Laboratories, Inc., as Class I Air Duct, Standard 181, and meet GSA, FHA and other U.S. Government standards; flame spread, not over 25; smoke developed, not over 50. Provide Flexmaster 1M, 8M or PeppertreeAir Solutions Type HM only (no substitutions) for flex duct at air devices, and Flexmaster Type TLM or PeppertreeAir Solutions Type TFT-M for medium and high pressure applications i.e., connection to VAV boxes.

Low Pressure Acoustic Performance:

(1) The straight duct insertion loss (db) of a 10 foot length of duct when tested in accordance with ASTM E 477 at a velocity of 2500 feet per minute shall be at least:

		125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
(a)	8" dia.	12	29	36	35	38	22
(b)	12" dia	21	28	29	33	26	12

(2) The radiated noise reduction (db) of a 10 foot length of duct when tested in accordance with ASTM E 477 at a velocity of 2500 feet per minute shall be at least:

		125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
(a)	8" dia.	10	7	7	8	10	13
(b)	12" dia	9	6	6	5	9	13

(3) The terminal ends of the duct core shall be secured by stainless steel worm gear type clamp equal to Ideal Series 56 Snaplock. The fittings on air mixing devices and on sheet metal duct shall be coated with the sealant specified for low pressure ductwork, then flexible duct core slipped over duct and coupling or clamp tightened, then connection sealed with more sealant. Insulation of flexible duct shall be slipped over connection to point where insulation abuts mixing box or insulation on duct. These insulation connections shall be sealed by imbedding fiberglass tape in the sealant specified for medium pressure ductwork and coating with more sealant to provide a vapor barrier. (This applies to all flex connections to diffusers, grilles, etc., when allowed on the drawings.)

d. Support flexible ductwork such that there is no more than 1/2" per foot deflection of duct between support points.

2.4 WALL LOUVERS

a. Shall be specified under a separate division.

2.5 TEST OPENINGS:

a. Furnish and install in the return air duct and in the discharge duct of each fan unit Ventlok No. 699 instrument test holes. The test holes shall be installed in locations as required to measure pressure drops across each item in the system, e.g., O.A. louvers, filters, fans, coils, intermediate points in duct runs, etc.

3.0 EXECUTION

3.1 INSTALLATION

a. Construction Standards. Use construction methods which follow the requirements outlined in paragraph 1.5, as well as SMACNA Balancing and Adjusting publications, unless otherwise indicated in these specifications or accompanying drawings.

b. Reinforcement. Reinforce ducts having one side equal to 25 inches or more in accordance with recommended construction practice of SMACNA.

c. Plenum Construction. Construct Plenum chambers of not less than No. 20 U.S. gauge metal reinforced with galvanized structural angles.

d. Cross Breaking or Beading. Cross break or bead sheet metal for rigidity, except ducts which are 12 inches or less in the longest dimension.

e. Wall Penetrations. Where ducts pass through walls in exposed areas, Install suitable escutcheons made of sheet metal angles as closers. At all locations where ductwork passes through floors, provide watertight sleeves projecting 3 inches above finished floor and flush with bottom of floor slab. Fabricate sleeves of 1/8-inch thick steel, galvanized after fabrication. Anchor into adjacent floor slab as required. Sleeves are required inside as well as outside chases. Support ducts where passing through floors with steel structural angles of adequate bearing surface, galvanized after fabrication and resting on top of the sleeve.
f. Interior Painting. Interior painting of metal ductwork exposed to view through grilles, registers, and other openings is specified in the section on painting. Do not Install grilles, registers, or similar items until painting is complete.

3.2 LOW PRESSURE DUCTWORK

a. Construction. Construct rectangular ducts in accordance with the SMACNA Duct Manual.

b. Splitters. Provide adjustable, galvanized splitter-dampers pivoted at the downstream end with appropriate control device at each supply duct split, in accordance with SMACNA Duct Manual. Provide a splitter for each duct branch to two or more outlets.

c. Extractors. Provide Titus AG225 or equal extractors with an appropriate control device at each rectangular zone or branch supply duct connection in accordance with SMACNA Duct Manual.

d. Volume Dampers. Provide opposed-blade volume dampers with an appropriate control device in each return air, outside air and exhaust branch duct, in exhaust connections to hoods or equipment, in each zone at multizone unit discharge, and where otherwise indicated, in accordance with SMACNA Duct Manual. Manual balancing damper to be similar to Greenheck Model MBD-15, multi-blade, 6" maximum blade height, 16-gauge galvanized steel reinforced blades, 20-gauge frame, manual hand quadrant with standoff for externally insulated ductwork, synthetic sleeve. Dampers suitable for service to 4" w.c. for 12" width, 3" w.c. for 24" width, 2" w.c. for 36" width, 2" w.c. for 48" width and rated for 2000 fpm. Dampers larger than 96" x 96" to be similar to Greenheck Model VCD-20 series.

e. Manual low-leakage volume dampers shall be similar to Greenheck Model VCD-33, ultra lowl-leakage damper, rated for 6 cfm per s.f. at 4" w.c. and rated for up to 4000 fpm and up to 8" w.c. Frame to be 16-gauge galvanized, blades to be 14-gauge airfoil. Seals to be silicone-rubber for blades and flexible metal compression jamb seals. Bearings to be synthetic type. Maximum blade height is 6". Provide with manual hand quadrant with 1 ½" standoff. All volume dampers used for stairwell and vestibule pressurization shall be low leakage with blade and jamb seals.

f. Elbows.

(1) Rectangular. Where square elbows are shown, or are required for good air flow, provide and Install Barber-Colman or equal double-wall air foil turning vanes. Job-fabricated turning vanes, if used, must be double thickness vanes of galvanized steel sheets of the same gauge metal as the duct in which they are installed. Furnish vanes fabricated for the same angle as the duct offset. Use radius elbows with a center line radius of not less than 1-1/2 times the duct width. Radius elbows may be provided in lieu of vaned elbows where space and air flow requirements permit.

(2) Round and Oval Duct. Provide elbows with a centerline radius of 1-1/2 times the duct diameter or duct width. For round ducts, furnish smooth elbows or 5-piece, 90º elbows and 3-piece, 45º elbows.

g. Controls. For control devices concealed by ceilings, furring, or in other inaccessible locations, furnish extension rods and appropriate recessed-type Young regulators, mounted on the surface of the ceiling or the furring, unless specified, or shown otherwise. For ducts which are not concealed, or ducts which are above lay-in ceiling but accessible, provide heavy-duty, quadrant-type, adjustable regulators having wing nuts for locking in position. Saw-mark the ends of all operating rods for dampers and air control devices to indicate damper position.

h. Obstruction. Install streamline deflectors at any point where dividing a sheet metal duct around piping or where other such obstruction is permitted. Where such obstructions occur in insulated ducts, fill space inside streamliner and around obstructions with glass fiber insulation.

i. Remote Operated Dampers. Provide factory-fabricated volume dampers for remote, manual volume control. Use opposed-blade, balanced type, pivoted in bronze bearings and mounted in a channel frame. Operate damper through a flexible-drive cable from a wall-mounted operating knob. Remote operated dampers to be ultra low-leakage dampers similar to Greenheck VCD-33.

j. Low Pressure Insulated Flexible Duct. Do not exceed 6 feet in length with any flexible duct. Support duct independently of lights, ceiling and piping.

k. Low Pressure Duct Supports.

(1) Horizontal Ducts Up To 40 Inch. Support horizontal ducts up to and including 40 inches in their greater dimension by means of No. 22 U.S. gauge band iron hangers attached to the ducts by means of screws, rivets or clamps, and fastened to inserts with toggle bolts, beamclamps or other approved means. Place supports on at least 8'-0" centers. Use clamps to fasten hangers to reinforcing on sealed ducts.

(2) Horizontal Ducts Larger Than 40 Inch. Support horizontal ducts larger than 40 inches in their greatest dimension by means of hanger rods bolted to angle iron trapeze hangers. Place supports on at least 8'-0" centers according to the following:

Angle Length	Angle	Rod Diameter
4'-0"	1-1/2" x 1-1/2" x 1/8"	1/4"
6'-0"	1-1/2" x 1-1/2" X 1/8"	1/4"
8'-0"	2" X 2" X 1/8"	5/16"
10'-0"	3" X 3" X 1/8"	3/8"

(3) Vertical Ducts. Support vertical ducts where they pass through the floor lines with 1-1/2" x 1-1/2" x 1/4" angles for ducts up to 60 inches. Above 60 inches the angles must be increased in strength and sized on and individual basis considering space requirements.

3.3 FLEXIBLE CONNECTIONS

a. Where ducts connect to fans or air handling units, make flexible airtight connections using "Ventglas" fabric. The fabric must be fire-resistant, waterproof and mildew resistant with a weight of approximately 30 ounces per square yard. Provide a minimum of 1/2-inch slack in the connections, and a minimum of 2-1/2-inches distance between the edges of the ducts. Also provide a minimum of 1-inch slack for each inch of static pressure on the fan system. Securely fasten fabric to apparatus and to adjacent ductwork by means of galvanized flats or draw bands. Where rectangular connections are made in outdoor locations, seal fabric to metal with mastic. For connections to belted vent sets outdoors, provide Duall fan connector, Koroseal, black with UV inhibitors. Secure with stainless steel bands.

3.4 ACCESS DOORS

a. Install ductwork access doors in structural angle frames and provide with sash locks and hinges arranged for convenient access. Construct doors which occur in insulated ducts with an insulation filler.

3.5 FLASHING

a. Where ducts pass through roofs or exterior walls, provide suitable flashing to prevent rain or air currents from entering the building. Provide flashing not less than No. 26 gauge stainless steel or 16- ounce copper.

3.6 DUCT LEAKAGE TESTS

a. Unless noted otherwise in paragraph below, all ductwork operating less than 2'in. w.c., to be less than 5% leakage, per SMACNA Duct Leakage Test Manual 1985. Document all tests, and forward to Engineer.

b. For ductwork operating in excess of 2-in. w.c., and all ductwork from air units/fans to VAV boxes, and from exhaust air valves to exhaust fans, it shall be tested at 1 1/2 times operating pressure, minimum 3" w.c. and shall be leak tested per sections 5 and 6, SMACNA HVAC Air Duct Leakage Test Manual, 1985. Tests must be performed only for representative sections of ductwork, minimum 33% of the installed ductwork areas for the tested pressure class. Document all tests, and forward to Engineer. Maximum leakage to be Lmax per below:

$Lmax = C_L P^{0.65}$

Where Lmax = maximum permitted leakage in CFM per 100 s.f. duct surface area.

Where CL = 6 for rectangular sheet metal or fireglass duct and round flex ducts.

Where CL = 3 for round/flat oval sheetmetal ducts.

Where P = test pressure (design class pressure rating in in. w.c., min. 3")

c. Mains. Test mains after risers and branches are tied in and all equipment set. Close runout connections and place fan in operation. Provide pressure in mains above design pressure. Visually inspect joints. Repair leaks detected by sound or touch. Release mains for completion after joints are tight.

End of Section 23 3000

SECTION 23 3300

AIR DEVICES

1.0 GENERAL

1.1 WORK INCLUDED

a. This section provides for the furnishing and installation of air distribution devices, including grilles, diffusers, registers, dampers, extractors, and sound attenuators.

1.2 RELATED WORK

a. Division 23 - HVAC.

(1) Ductwork.

(2) Air Balance.

1.3 COOPERATION WITH OTHER TRADES

a. Coordinate this work with work under Division 26 Electrical, to ensure that intended functions of lighting and air systems are achieved.

1.4 SUBMITTALS

a. Submit product data for outlets, grilles, registers, control devices, sound attenuators, and similar equipment for review prior to placement of purchase order.

1.5 FINISHES

a. Paint devices with factory standard white enamel finish.

2.0 PRODUCTS

2.1 DIFFUSERS

a. Louvered. Provide louvered, fixed-pattern, multiple cone diffusers with removable center cone, frames and white factory finish.

(1) Select faces and necks that are circular, rectangular or square, of the size and configuration indicated.

(2) Construct diffusers and frames of aluminum.

(3) Use a frame compatible with the type of ceiling in which the diffuser is installed.

b. Perforated. Provide adjustable-pattern, aluminum diffusers and frames with white factory finish. Frame the diffuser face with a mitered and welded frame fitted with controllers of adjustable pattern.

2.2 GRILLES

a. Supply. Use double-deflection supply grilles made of aluminum.

(1) Install vertical face blades and horizontal rear blades. Provide solid, extruded aluminum blades which are individually adjustable. Space at not more than 3/4-inch centers for rear blades and 1/2-inch centers for face blades and not less than 5/8-inch deep.

(2) Employ grille frames of extruded aluminum with welded and mitered corners and mounting gaskets.

b. Return.

(1) For ceiling return, provide aluminum egg-crate or louvered type as scheduled, with white factory finish. Use construction and frame styles as specified for ceiling diffusers. Use neck sizes as shown.

(2) For wall return, provide a fixed-blade, aluminum grille, essentially sightproof, having curved or angular break, inclined blades. Space the blades at 1/2-inch centers to achieve sightproof feature. Furnish hemmed or fully rounded leading edges. Provide extruded aluminum grille frames with welded and mitered corners. Include mounting gaskets.

3.0 EXECUTION

3.1 INSTALLATION

a. Diffusers. Attach the frame assembly by a concealed hinge assembly to an outer frame compatible with the type of ceiling on which the diffuser is installed.

End of Section 23 3300

SECTION 23 33 33

ACCESS DOORS

1.0 GENERAL

1.1 SCOPE

a. This section provides for furnishing and installing access doors in all wall or ceiling locations as required or shown for access to valves, controls, regulating devices, and other equipment requiring maintenance, adjustment or operation. Provide access doors to provide access to all mechanical items requiring service or maintenance, whether shown on drawings or not.

1.2 WORK NOT INCLUDED

a. Doors or panels required in acoustical ceilings are provided for under Division 09. However doors required in plaster, gypboard, masonry, or other solid wall or ceiling are included under this section.

2.0 PRODUCTS

2.1 NON-FIRE-RATED ACCESS DOORS

a. Furnish INRYCO/MILCOR approved equal with 16- frames, 14- panels, and 22- casing bead. Provide continuous concealed hinges and flush screwdriver cam lock. Use Style K access doors for plastered surfaces, Style M for masonry or gypboard surfaces, and Style AP for acoustical plaster ceilings, with 18-panel and all galvanized construction.

2.2 FIRE-RATED ACCESS DOORS (1-1/2 HOUR LABEL DOORS)

a. Furnish INRYCO/MILCOR or approved equal UL-listed 1-1/2 HR Label "B". Access doors with 16-steel frames, and 20- insulated sandwich type door panel. Provide door with an automatic closing and latching mechanism. Fire-rated access doors are required.

3.0 EXECUTION

a. Doors furnished by this contractor will be installed by this contractor. Not all required access doors are shown. The contractor will be responsible for proper coordination in locating access doors for ease of operation and maintenance of concealed equipment.

End of Section 23 33 33

SECTION 23 3400

FANS

1.0 GENERAL

a. This section provides for furnishing and installing fans, including centrifugal types, with all supplemental equipment.

1.2 RELATED WORK

a. Division 23 - HVAC.

(1) Ductwork.

(2) Vibration Isolation.

(3) Air Balance.

1.3 PERFORMANCE

a. Provide fan type, arrangement, rotation, capacity, size, motor horsepower, and motor voltage as shown. Fan capacities and characteristics are scheduled on the drawings.

b. Rate fans according to appropriate Air Moving and Conditioning Association, Inc. (AMCA), approved test codes and procedures. Supply fans with sound ratings below the maximums permitted by AMCA standards. All fans provided must be licensed to bear the Certified Ratings Seal.

c. Statically and dynamically balance all fans.

2.0 PRODUCTS

2.1 PROTECTIVE COATINGS

a. Manufacturer's Standard. Apply to all fans, motors and accessories, the manufacturer's standard prime coat and finish, except on aluminum surfaces or where special coatings are required.

b. Galvanizing. After fabrication of the parts, hot-dip all surfaces which require galvanizing. Where galvanizing is specified, a zinc coating may be used. After fabrication, apply the zinc coating and air-dry the coating to 95% pure zinc. Acceptable zinc coatings include Zincilate, Sealube, Amercoat, Diametcoat, or an approved equal.

2.2 SUPPLEMENTAL EQUIPMENT

a. Motor Covers. Provide weatherproof motor covers for installation out of doors. Apply the same finish as used on the fan.

b. Variable speed direct drive fan.

c. Safety Disconnect Switch. Provide a factory-wired, safety disconnect switch on each unit equipped with a 115/1/60 motor.

d. Relief Vents and Air Inlets. Provide vents and inlets with aluminum frames and ½-inch mesh, galvanized bird screens. Include with dampers.

e. Sound Attenuating Bases. Construct sound attenuating bases of No. 18 U.S. standard gauge galvanized steel or 0.063-inch aluminum. Include a built-in cant strip for curb mounting and a resilient pad for equipment mounting on the top flange. Line the base with two inches of glass fiber insulation and fit internally with glass fiber acoustical baffles.

2.3 CABINET-ENCLOSED FAN

a. Fan Section.

(1) Casing. Fabricate a casing from galvanized steel sheets reinforced as required with structural members. Provide access panels to permit inspection and maintenance.

(2) Fan. Supply double-inlet, squirrel-cage, centrifugal fans with die-formed impeller blades. Use rigid galvanized steel or aluminum fan wheels which are statically and dynamically balanced. Mount the wheels on a common shaft and fasten the wheels mechanically to the shaft. Provide galvanized steel fan scrolls in a secured casing to prevent vibration. Design fans for quiet, slow speed operation at specified rating conditions.

(3) Shaft. Provide a shaft with adequate stiffness to prevent deflection and vibration. Rate the shaft at maximum rpm 10% below the first critical speed. Make a tachometer groove in the drive end of the shaft.

(4) Bearings. Install antifriction ball bearings, selected for 200,000 hours minimum average life under actual load and speed conditions. Locate the bearing to be adjustable for accurate alignment of fan wheels in scrolls. Provide remote grease fittings on the accessible side of the unit for ease of lubrication.

b. Motors. Furnish motors in accordance with the section on Motors and Motor Starters. Motors must have grease lubricated ball bearings with alemite fittings. Mount the fan drive motor on a vibration isolating adjustable base, arranged for positive adjustment of drive alinement and belt tension. Select fan motors to be nonoverloading at design rpm and at static pressure 15% under design.

c. Belt Guard. Provide a substantial, removable belt guard for drives on the unit exterior. Leave a hole over the tachometer groove.

d. Filter Section.

(1) Slide Racks. Provide and arrange suitable galvanized filter slide racks to permit easy removal of filters from the accessible side of unit.

(2) Glass Fiber Filter. Furnish a replaceable, high-velocity filter of glass fiber with gradient density, 2-inches thick.

(a) Make frames of channel construction, rigid and square with a nominal 2-inch thickness.

(b) Design filtering element for low pressure drop and high efficiency at net face velocity of 500 feet per minute. The element must also have a high dust load capacity.

(c) Fabricate filters using dimensions to suit the arrangement and size of filter slides or racks in which filters are installed.

(3) Low Velocity Glass Media Filter. Furnish filters 2-inches thick. Design the filtering element for a low pressure drop and high efficiency at net face velocity of 300 feet per minute. The filter must have a high dust load capacity. Fabricate filters using dimensions to suit the arrangement of the filter slides or rack in which they are installed.

(4) Permanent, Cleanable. High-Velocity Filters. Provide filters 2-inches thick. Construct the filter throughout of galvanized or other equivalent corrosion-resistant materials and parts.

(a) Make frames of channel construction, rigid and square.

(b) Design the filtering element for low pressure drop and high efficiency at net face velocity of 500 feet per minute. The element must have a high dust load capacity. Fabricate filters using dimensions to suit the arrangement and size of the filter slides or racks in which they are to be installed.

(5) High Efficiency Particulate Air Type. Provide a filter with a steel holding frame, separators to support and hold the filter open, a sealer frame, and a disposable, glass fiber filter cartridge. Select a cartridge with an average efficiency of 95% by Discoloration Test (NBS type) and with 500 feet per minute face velocity. Supply a high velocity prefilter of 2-inch replaceable media. House the filter assembly in a filter box constructed of heavy galvanized steel. Use hinged access doors at each end, extruded aluminum filter tracks, and woven pile gasketed on track.

(6) Replacement Filters. Furnish one spare set of all air conditioning system filters or filter media. Cut media to required size.

3.0 **EXECUTION**

a. Install fans according to the manufacturer's instructions and in the locations shown on the drawings.

End of Section 23 3400

SECTION 23 74 33

INDOOR AIR HANDLING UNITS

1.0 GENERAL

1.1 GENERAL DESCRIPTION

a. This section includes the design, controls and installation requirements for indoor air handling units.

1.2 QUALITY ASSURANCE

a. Unit shall be certified in accordance with UL Standard 1995/CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment.

b. Unit and refrigeration system shall comply with ASHRAE 15, Safety Standard for Mechanical Refrigeration.

c. Unit shall be safety certified by ETL and be ETL US and ETL Canada listed. Unit nameplate shall include the ETL/ETL Canada label.

1.3 SUBMITTALS

a. Product Data: Literature shall be provided that indicates dimensions, operating and shipping weights, capacities, ratings, fan performance, filter information, factory supplied accessories, electrical characteristics, and connection requirements. Installation, Operation and Maintenance manual with startup requirements shall be provided. Run test report shall be supplied with the unit in the control compartment's literature packet, and also available electronically after the unit ships.

b. Shop Drawings: Unit drawings shall be provided that indicate assembly, unit dimensions, clearances, and connection details. Computer generated fan curves for each blower shall be submitted with specific design operation point noted. Wiring diagram shall be provided with detail for power and control systems and differentiate between factory installed and field installed wiring.

1.4 DELIVERY, STORAGE, AND HANDLING

a. Unit shall be on a wooden pallet with skeleton crating prior to shipment to prevent damage during transport and thereafter while in storage awaiting installation.

b. Follow Installation, Operation and Maintenance manual instructions for rigging, moving, and unloading the unit at its final location.

c. Unit shall be handled carefully to avoid damage to components, enclosures and finish.

d. Unit shall be stored in a clean, dry place protected from weather and construction traffic in accordance with Installation, Operation and Maintenance manual instructions.

Options:

1. Unit shall be plastic shrink-wrapped prior to shipment to prevent damage during transport and thereafter while in storage awaiting installation.

2. Unit shall be crated for overseas shipment. Crate shall be fabricated of dimensional lumber and plywood.

1.5 WARRANTY

a. Manufacturer shall provide a limited "parts only" warranty for a period of 12 months from the date of equipment start up or 18 months from the date of original equipment shipment from the factory, whichever is less. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided manufacturer's written instructions for installation, operation, and maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts and air filters.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Products shall be provided by the following manufacturers:

1. AAON Trane, York, Daikin, Lennox

2. Substitute equipment may be considered for approval that includes at a minimum:

a. R-410A refrigerant

b. Double wall cabinet construction

c. Insulation with a minimum R-value of 6.25

d. Double sloped stainless steel drain pans

e. Hinged access doors with lockable handles

f. ECM driven direct drive backward curved plenum supply fans

g. Control compartment LED service lights

h. Designed, engineered, and manufactured in the United States of America

i. All other provisions of the specifications must be satisfactorily addressed

2.02 AIR HANDLING UNITS

A. General Description

1. Indoor air handling units shall include filters, supply fan, DX evaporator coil, reheat coil, electric heater, mixing box, and unit controls.

2. Unit shall have a draw-through supply fan configuration and discharge air horizontally.

3. Unit shall be factory assembled and tested including leak testing of the coils and run testing of the supply fans and factory wired electrical system. Run test report shall be supplied with the unit in the control compartment's literature packet, and also available electronically after the unit ships.

4. Unit shall have decals and tags to indicate lifting and rigging, service areas, and caution areas for safety and to assist service personnel.

5. Unit components shall be labeled, including pipe stub outs, refrigeration system components and electrical and controls components.

6. Installation, Operation and Maintenance manual shall be supplied within the unit.

7. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's access door.

8. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's access door.

B. Construction

1. All cabinet walls and access doors shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.

2. Unit insulation shall have a minimum thermal resistance R-value of 6.25. Foam insulation shall have a density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D-1929-11 for a minimum flash ignition temperature of 610°F.

3. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, prevents heat transfer through the panel and prevents exterior condensation on the panel.

4. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Sealing shall be included between panels and between access doors and openings to reduce air leakage. Piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.

5. All access doors shall be flush mounted to cabinetry.

6. Units with cooling coils shall include double-sloped 304 stainless steel drain pan. Drain pan connection handedness shall be field coordinated and supplied with a 1" MPT fitting.

7. Cooling coils shall be mechanically supported above the drain pan by multiple supports that allow drain pan cleaning and coil removal.

8. Unit shall include factory wired control panel compartment LED service lights.

Options:

a. Unit shall include interior corrosion protection which shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure. Interior ceiling, floor, service doors, damper rack, and filter rack in the air stream shall be coated. The coils, coil casings, condensate drain pans, damper blades and gears, fan inlet cone, fan wheel, fan motor, control panel, and energy recovery wheel casing shall not be coated. Option is intended for use in coastal saltwater conditions under the stress of heat, salt, sand and wind and is applicable to all corrosive environments where a polyurethane coating is acceptable.

b. Unit shall include an exterior corrosion protection which shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.

C. Electrical

1. Unit shall be provided with standard power block for connecting power to the unit.

2. Unit shall include a factory installed 24V control circuit transformer.

3. Unit shall have a 5kAIC SCCR.

Options:

a. Unit shall be provided with an internal control panel with separated low and high voltage control wiring. Access to internal control panel shall be through service access door with removable pin hinges and lockable quarter turn handle.

b. Unit shall be provided with remote safety shutdown terminals for wiring to a field installed smoke detector, firestat, or building safety automatic shutdown system.

D. Supply Fans

1. Unit shall include direct drive unhoused, backward curved, plenum supply fans.

2. Motor shall be a high efficiency electronically commutated motor.

3. Blower and motor assembly shall be dynamically balanced.

4. Blower and motor assembly shall utilize neoprene gasket.

5. Access to (supply fan with external control box) shall be through service access door with removable pin hinges and lockable quarter turn handle.

6. ECM driven supply fan speed shall be controlled by the AAON Orion (AAON Touchscreen) Controller.

E. Cooling Coil

1. Evaporator Coil

a. Coil shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and aluminum end casings. Fin design shall be sine wave rippled.

b. Coil shall have (a single circuit) (two circuits with interlaced circuitry).

c. Coil shall have (4 rows and 14 fins per inch) (6 rows and 12 fins per inch).

d. Coil shall be hydrogen leak tested.

e. Coil shall be furnished with a factory installed thermostatic expansion valves. The sensing bulbs shall be field installed on the suction line immediately outside the cabinet.

f. Coil shall have field coordinated handedness external piping connections. Liquid and suction connections shall be sweat connection. Coil connections shall be labeled, extend beyond the unit casing and be factory sealed on both the interior and exterior of the unit casing, to minimize air leakage.

g. Coil access shall be through service access door with piano hinges and lockable quarter turn handle.

F. Refrigeration System

1. Air handling unit and matching condensing unit shall be capable of operation as an R-410A split system air conditioner.

2. Each refrigeration circuit shall be equipped with thermostatic expansion valve type refrigerant flow control.

3. Modulating hot gas reheat shall be provided on the lead refrigeration circuit. For 100% OA application air handling unit shall be provided with hot gas reheat coil, a check valve on the liquid line [not include on heat pump units], and a check valve on the hot gas reheat line. The matching condensing unit must include modulating 3- way reheat valve, liquid line receiver, electronic controller, supply air temperature sensor and a dehumidification control signal terminal. This allows the system to

have a dehumidification mode of operation and includes supply air temperature control to prevent supply air temperature swings and overcooling of the space. Reheat line connections shall be labeled, extend beyond the unit casing and be located near the suction and liquid line connections for ease of field connection. Connections shall be factory sealed on both the interior and exterior of the unit casing to minimize air leakage.

4. Lead (All) (Lag) refrigerant circuit shall be provided with external hot gas bypass to protect against evaporator frosting at low suction pressure and to prevent excessive compressor cycling. For 100% OA application air handling unit shall be provided with check valve on the hot gas bypass line. Hot gas bypass valves shall be factory installed in the matching AAON condensing unit. Hot gas bypass line connections shall be labeled, extend beyond the unit casing and be located near the suction and liquid line connections for ease of field connection. Connections shall be factory sealed on both the interior and exterior of the unit casing to minimize air leakage.

5. Unit shall be configured as heat pump. Refrigeration circuit shall be equipped with thermal expansion and check valve on the indoor coil.

G. Electric Heating

1. Unit shall include an include electric heater consisting of electric heating coils, fuses, contactors, and a high temperature limit switch, with capacities as shown on the plans.

2. Electric heat shall have fully modulating capacity controlled by an SCR (Silicon Controlled Rectifier).

3. Electric heating coils shall be located in the reheat position downstream of the supply fans.

4. Electric heating access shall be through service access door with piano hinges and lockable quarter turn handle.

H. Filters

1. Unit filter access shall be through service access door with piano hinges and quarter turn button fasteners.

2. Unit shall include 4 inch thick, pleated panel filters with a MERV rating of 14, upstream of the cooling coil. (Unit shall also include 2 inch thick, pleated panel pre filters with a MERV rating of 8, upstream of the 4 inch standard filters.)

3. Unit shall include a clogged filter switch that senses the pressure drop across the unit filter bank and cooling coil.

I. Mixing Box

1. Outside air opening shall contain an adjustable, motor operated outside air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge and end seals. Damper blades shall be gear driven and designed to have no more than 20 cfm of leakage per sq ft. at 4 in. w.g. air pressure differential across the damper. Low leakage dampers shall be Class 2 AMCA certified, in accordance with AMCA Standard 511. Dampers shall be controlled by a 2-position actuator.

J. Controls

1. Unit shall be provided with a proof of airflow switch. When airflow is not detected, the supply fans will shut down.

2. Factory Installed Controller

a. Unit controller shall be capable of controlling all features and options of the unit. Controller shall be factory installed in the unit controls compartment and factory tested.

b. Controller shall be capable of stand-alone operation with unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling available without dependence on a building management system.

c. Controller shall have an onboard clock and calendar functions that allow for occupancy scheduling.

d. Controller shall include non-volatile memory to retain all programmed values, without the use of an external battery, in the event of a power failure.

e. Make Up Air Controller

1. Unit shall modulate cooling with constant airflow to meet ventilation outside air loads. Cooling capacity shall modulate based on supply air temperature.

2. Hot gas bypass shall be required on the lead refrigeration circuits of systems without variable capacity compressors.

3. With modulating hot gas reheat, unit shall modulate cooling and hot gas reheat as efficiently as possible, to meet outside air humidity loads and prevent supply air temperature swings and overcooling of the space.

4. Unit shall modulate heating with constant airflow to meet ventilation outside air loads. Heating capacity shall modulate based on supply air temperature.

5. Unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling shall be accomplished with connection to interface module with LCD screen and input keypad, interface module with touch screen, or with connection to PC with free configuration software. Controller shall be capable of connection with other factory installed and factory provided unit controllers with individual unit configuration, setpoint adjustment, sensor status viewing, and occupancy scheduling available from

a single unit. Connection between unit controllers shall be with a modular cable. Controller shall be capable of communicating and integrating with a LonWorks or BACnet network. [AAON Orion Controls System]

K. Accessories

1. Unit shall be provided with a factory installed return air smoke detector.

2. Unit shall be provided with factory installed return air and supply air firestats.

PART 3 - EXECUTION

3.01 INSTALLATION, OPERATION, AND MAINTENANCE

A. Installation, Operation and Maintenance manual shall be supplied with the unit.

B. Installing contractor shall install unit, including field installed components, in accordance with Installation, Operation and Maintenance manual instructions.

C. Start up and maintenance requirements shall be complied with to ensure safe and correct operation of the unit.

END OF SECTION

SECTION 23 74 33

MAKE-UP AIR UNIT

1.0 GENERAL

1.1 SCOPE

a. Provide packaged system for outdoor air dehumidification.

1.2 QUALITY AND SAFETY ASSURANCE

a. Coils shall be UL listed.

b. Blower motor, fan motor and compressor shall be UL listed.

c. Piping in accordance with BOCA code P-308.2 for corrosion resistant coating of copper tubing and M-702.0 for joints and connections. All refrigerant pipes shall be copper type "L" and vinyl-coated for corrosion prevention.

d. Units shall be completely factory assembled, wired, piped, charged with R-22 and fully tested in all modes of operation. All controls shall be factory adjusted and preset to the design conditions. Test report shall be provided with the unit. Engineer reserves the right to witness factory performance testing.

e. Manufacturer of the packaged system for outdoor air dehumidification shall have a minimum of five years experience in the production of dehumidification systems.

f. The system shall have a warranty for one full year from start-up.

g. The entire cabinet shall be painted internally and externally.

h. submit with bid, fan curve and noise criteria, P & ID diagram, sequence of operations.

i. Equipment submitted shall meet all requirements of controls specifications, and be fully pre- wired.

1.3 SUBMITTALS

a. Submit overall dimension drawings, field wiring diagram, and product data including air flow, static pressures, total power consumption, total cooling capacity, moisture removal capacity at design and off peak conditions per performance schedule, compressor(s) EER, air leaving conditions under all operating modes and total refrigerant charge.

1.4 OPERATING AND MAINTENANCE DATA

a. Electrical wiring diagrams, installation and maintenance instructions and an owner's manual shall be supplied with each unit.

2.0 PRODUCTS

2.1 GENERAL

a. Furnish and install a 100% outdoor air dehumidification and air-conditioning system. Performance and specifications shall meet or exceed that shown on the equipment schedule.

b. The 100% outdoor air dehumidifier(s) shall be completely factory assembled, piped, fully charged with 410a, wired, tested and shipped in one piece with a single point power supply. Each unit shall include two compressors, two refrigerant circuits, evaporator (dehumidifying coil), hot gas reheat coil, supply air blower, blower motor, variable frequency drive, condenser coil, condenser fans, fan guard filters, motor starters and controls all in one complete enclosure. All controls shall be factory adjusted and preset to the design conditions, ready for start-up. Refer to controls section for controls requirements.

c. The unit shall be specifically designed for outdoor application and include a weatherproof cabinet.

d. Provide 5-year warranty.

2.2 OPERATION

a. The unit shall be designed to treat make-up air by removing moisture and reducing the relative humidity level of the discharge air.

b. The unit shall operate according to the following sequence. The warm humid outdoor air passes through the cooling and dehumidifying coil and is cooled below its dew point, thereby condensing moisture. The heat captured by this process and the heat generated by the compressor(s) power consumption are absorbed by a mechanical refrigeration system. In the dehumdification mode this recovered heat is then used to reheat the air. The excess heat is then rejected to an air cooled condenser. When only cooling is required, all the recovered heat shall be rejected to the air cooled condenser.

c. Adjustable Reheat. The supply air temperature shall be reheated continuously to 70℉ (adjustable) through the DDC system. The unit shall be configured to the specified supply air temperature by the factory during the testing of the unit. On cooling demand the supply air temperature shall be remotely adjustable through DDC controls between 0-100% of the reheat coil capacity.

2.3 CABINET

a. The unit shall be constructed of minimum 14-gauge satin coated sheet metal, reinforced for maximum rigidity with a 12-gauge base.

b. Hinged access doors shall be 2" double wall construction. Access to all internal parts from both sides and in all sections shall be provided.

c. Access doors shall be provided with flush mounted cam latch mechanisms and shall be equipped with safety door holders. The latches shall be secured to unit frame and shall prevent entrance to the unit without tools.

d. Unit shall be weatherproof, all seams shall be bolted with stainless steel hardware and sealed to prevent air or moisture leakage. Access doors shall be sealed against the unit frame with a raised compression gasket.

e. Entire cabinet shall be painted internally and externally with two coats of Sicopoxy primer and two coats of Acrythane finish, color grey.

f. The unit shall have a built-in hinged double door electrical control panel (single door shall not be acceptable) in a separate compartment in order not to disturb the air flow within the dehumidifier during servicing of control components. Enclosure to be rated NEMA 4 for direct water spray protection.

g. Roof and access doors shall include a minimum of 22 gauge galvanized steel liners to form a double wall construction.

h. The unit shall have a built-in air filter assembly as specified in paragraphs 2.17..

i. The make-up air inlet shall be provided with storm proof louvers constructed of extruded aluminum. Blades shall be inclined 45°, design for minimum water penetration. Protected with ½" bird screen.

j. Lifting holes shall be provided on the unit base to accept cable or chain hooks.

k. The unit base shall have a positive weather tight seal consisting of a roof curb with continuous surface for seating on a roof curb gasket.

l. Double Skin Enclosure. Entire cabinet shall include a minimum of 22 gauge galvanized steel liners with a minimum of 2 inch thick fiberglass duct liner insulation to form a double wall construction. The insulation shall comply with the requirements listed under "Insulation".

m. Casing shall be galvanized and painted internally and externally with two coats of primer and two coats of Acrythane finish.

2.4 INSULATION

a. Units' entire cabinet shall be insulated with 2 inch, 3 pound density fiberglass duct liner insulation, approved for 250°F operating temperature. Fire resistance rating to conform with NFPA Standard 90A. Sound attenuation coefficient shall be not less than 0.86 at a frequency of 1000 Hz as per ASTM Standard C423. Thermal conductivity shall be not more than 0.232 BTU/in-h-sq ft-F at 75 F. Insulation shall be securely fastened with approved adhesive.

2.5 EVAPORATOR (DEHUMIDIFIER COIL)

a. Shall not be less than six rows deep for maximum moisture removal capacity with air velocity not to exceed 500 fpm, with minimum ½ inch OD seamless copper tubing mechanically expanded to assure high heat transfer with maximum sine-wave aluminum fins, not exceeding 10 fins per inch. Provide dual circuit, row split or intertwined coil.

b. Shall be specially designed for heavy moisture removal. Coil design shall be such, that at design condition system performance does not change due to overloading with condensate.

c. Aluminum fins shall be coated with "HyPoxy®" for protection against common acids, salt and gases. Coating shall comply with ASTM B117/D1654 and ASTM D2126 for corrosion resistance. Coated aluminum fins shall allow the condensate to sheet off reducing bacterial growth and odor formation.

d. Corrugated or facetized fins shall not be acceptable. Possible system performance reduction from coated coils must be fully disclosed.

e. Coil shall be factory leak tested at air pressure not less than 400 psig in a water bath.

f. Coil shall have a 5-year extended warranty.

g. Coil shall have a 16-gauge type 316 stainless steel casing and end plates with stainless steel hardware.

h. Provide drain in outside air intake plenum and drain to outside.

2.6 HOT GAS REHEAT COIL

a. Shall be designed to reheat the air off the evaporator. Coil shall be factory installed and tested. Field installed reheat coil shall not be acceptable. Coil shall be fabricated from minimum ½ inch OD seamless copper tubing mechanically expanded to assure high heat transfer with maximum twelve sine- wave aluminum fins per inch.

b. Aluminum fins shall be coated with "HyPoxy®" for protection against common acids, salt and gases. Coating shall comply with ASTM B117/D1654 and ASTM D2126 for corrosion resistance.

c. Possible system performance reduction from coated coils must be fully disclosed.

d. Coil shall have a 16-gauge galvanized casing and end plates with plated hardware for corrosion free assembly.

e. Coil shall be factory leak tested at air pressure not less than 400 psig in a water bath.

f. Coil shall have a 5-year extended warranty.

2.7 CONDENSER COIL

a. Shall be designed for variable heat transfer into the air with seamless deoxidized heavy wall smooth copper tubing mechanically expanded in self-spaced full collared aluminum plate fins for permanent bond to assure high heat transfer with maximum twelve corrugated aluminum fins per inch.

b. Possible system performance reduction from coated coils must be fully disclosed.

c. Coil shall have a 16-gauge galvanized casing and end plates with plated hardware.

d. Coil shall be factory leak tested at air pressure not less than 400 psig in a water bath.

2.8 DRAIN PAN

a. Each unit shall be equipped with a sloped self-draining pan under the entire evaporator coil to comply with ASHRAE IAQ Standards and shall prevent condensate carry-over. Flat drain pans susceptible to water pooling and subsequent bacteria growth shall not be acceptable.

b. The drain pan shall be made of 12-gauge grey Noryl plastic with hair cell finish, temperature resistant to 200F complete with sanitary round corners.

c. The drain pan shall have an external trap and condensate drain connection of rubber construction.

2.9 BELT DRIVE UTILITY FANS

a. Fans shall be of the belt driven utility fan type with a double width, double inlet housing in rotation as noted.

b. The housing shall be constructed of heavy gauge steel with lock formed seams permitting no air leakage. Housing and bearing supports shall be constructed of welded steel members to prevent vibration and rigidly support the shaft and bearings.

c. The fan wheel shall be of the non-overloading backward inclined air-foil, centrifugal fan type and constructed of heavy gauge steel, to one class heavier construction than normal selection (minimum Class II). Submit fan product data, fan curve, and noise ratings with proposal.

d. Wheels shall be statically and dynamically balanced. The wheel cone and fan inlet cone shall be carefully matched for maximum performance and operating efficiency.

e. Motors shall be permanently lubricated, heavy duty, ball bearing type carefully matched to the fan load and furnished at the specified voltage, phase and enclosure. The fan shaft shall be grounded and polished solid steel mounted in heavy duty permanently sealed, pillow block ball bearings. Bearings shall be selected for a minimum L10 life in excess of 100,000 hours at maximum cataloged operating speed. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts. The motor pulley shall be adjustable for final system balancing.

f. Fan performance shall be based on tests conducted in accordance with AMCA Standard 210 test code for air moving devices. Fans shall be licensed to bear the AMCA Certified Ratings Seal for air performance.

2.10 BLOWER MOTOR

a. Shall be open drip-proof, class B insulation, induction type, 40°C rise, pre-lubricated ball bearings mounted on an adjustable base.

b. Shall have a service factor rating of 1.15 or higher and must be stamped or marked: high efficiency (Motors 7-1/2 HP and up).

2.11 CONDENSER FANS

a. Shall be direct drive, propeller type designed for low tip speed and vertical air discharge. Fan blades shall be constructed of aluminum and riveted to dipped steel center hub. Fan diameter shall not exceed 20 inches with 1100 rpm and 30 inches with 825 rpm.

2.12 CONDENSER FAN MOTORS

a. Shall be permanently lubricated sealed ball bearings with built-in overload protection.

b. Shall be resilient mounted to heavy gauge galvanized steel rails.

c. All motors shall be factory wired to the units weatherproof main control panel.
d. All fans shall be protected with heavy gauge, welded steel wire fan guards with baked on powder epoxy coating.

2.13 COMPRESSORS

a. Shall be hermetic compressors, Scroll type suction gas cooled, suitable for refrigerant R-22, equipped with internal thermal protection and resilient type external mounting.

b. Compressor manufacturer must have a wholesale outlet for replacement parts in Austin, Texas.

c. Compressor(s) shall have 5-year extended warranty.

2.14 REFRIGERATION CIRCUITS (TWO TO BE PROVIDED)

a. Shall have an in-line solder type liquid line filter drier, liquid and moisture indicator, hot gas bypass, suction accumulator, receiver with pressure relief valve set at 400 psig thermostatic expansion valve and adjustable low pressure control.

b. Tamper proof, hermetically sealed non-adjustable high pressure control and refrigeration service valve shall be installed using Schraeder type valve for easy replacement.

c. Refrigeration service valves shall be located outside of the air stream.

d. Suction line shall be fully insulated with not less than ½ inch closed cell insulation.

e. Shall be factory charged with R-22. Field piping and field refrigerant charging are not acceptable.

f. A three way valve shall be placed on the hot gas reheat coil to direct the hot gas refrigerant around the coil when cooling is required.

2.15 CONTROL PANEL

a. Shall be built-in within a separate compartment in order not to disturb the air flow during servicing.

b. Blower motor, condenser fan motors and compressor(s) shall be controlled by contactors.

c. Blower motor and compressor(s) shall be protected with solid state adjustable trip overloads.

d. Built-in controls shall include:

(1) All DDC devices for monitoring and control of the OSA system shown on the P & ID diagram and/or mentioned in the control specification shall be furnished by the OSA unit manufacturer. All devices shall be mounted, calibrated, and tested at the OSA unit factory. The OSA manufacturer shall be responsible for all specific internal control of the OSA unit. The controls contractor and the OSA unit manufacturer shall coordinate with each other to assure that all devices communicating with the onboard microprocessor and the DDC control system are compatible and appear seamless in the

project DDC control system architecture. The controls contractor shall be responsible for the software and programming of the onboard microprocessor to manage the control functions of the project and integration with the project DDC system. The control contractor shall supply a technician to participate in the unit functional test at the factory and shall demonstrate proper control of the OSA unit in all modes during the test(s).

(2) Condenser fan motors low ambient fan cycling control.

e. Voltage monitor shall be provided to shut down electrical system to prevent damage in the event of temporary voltage fluctuation or phase loss. Voltage monitor shall be auto reset.

f. Power block terminal shall be provided for proper wire size.

g. Dry contacts shall be provided for blower interlock.

h. Connections shall be provided for remote ON-OFF control and firestat.

i. Color coding and wire numbering shall be provided for easy troubleshooting. All wires shall be in a wire duct.

j. Compressor(s) shall have a time delay start to prevent short cycling.

k. All wiring shall be installed in accordance with UL or CSA safety electrical code regulation, and shall be in accordance with UL or CSA safety electrical code regulation, and shall be in accordance with NFPA. All components used shall be UL or CSA listed.

2.16 MAKE-UP AIR MOTORIZED DAMPER

a. The make-up air or discharge damper shall be fail-safe damper operator type. The motor shall shut the damper tightly when power is not applied or blower motor is not running. Damper shall be parallel type with overlapping blades, edge seals to minimize leakage, which operates from 0% to 100% open position. Damper blades shall be mounted on steel rods, which rotate on rust-proof nylon bushings. The damper motor shall be controlled in conjunction with unit blower operation. End switch to start blower motor when damper is min. 80% open.

2.17 PARTICULATE AND GAS PHASE AIR FILTERS

a. Unit shall be constructed of Satin Coated steel with Penta-Post frame. Non-access panels shall be bolted and gasketed to frame, joints shall be dealed. Access panels shall be gasketed with stainless steel hinges and quick release locking devices. Contaminants removal section provides for side access servicing. Chemical filter tracks shall be of extruded aluminum with nylon coated pile seals. Particualtes filter shall be rated to ASHRAE Standard 52-76, for indicated efficiencies. Unit shall be coated with polyurethane enamel paint, color grey. From air entering side, section includes:

Penta post frame is 2 in. zinc coated steel support base.

b. Filter Sequence

(1) Roughing pre-filters shall be 2" deep, cleanable.

(2) Module designation MM-18, with MM-1355 media. All media is shipped loose in 1 ft^3 containers, loaded by the Contractor. The chemical medium shall be a specially blended combination of solid matrix and activated impregnate, individually selected but working singularly to control specific gaseous contaminants. It shall be produced in the form of spherical pellets, nominally 3/16" in diameter. The media shall remove chemical contaminants by absorption, followed by a series of controlled chemical reactions. The chemical media shall be type MM-1355; a blend of MM-1000 activated aluminum impregnated with MM-3000, coal based activated carbon.

(3) Rough in after-filters shall be 2" deep, 30% pleated filters

(4) Final filter shall be 6" deep, 60% Particle board frame, pleated filters with aluminum separators.

c. Pressure Drop

Design filter static pressure: 1.11
Final filter static pressure: 1.5

d. Additional Components

(1) Differential Pressure Monitoring Sensors (DPMS) shall contain unit mounted gauges monitoring across filters as shown on the P & ID diagrams..

(2) Units shall be insulated with 3 lb/ft^3 insulation minimum.

(3) Weatherization Kit, unit shall be weatherized for outdoor use.

2.18 VARIABLE FREQUENCY DRIVES

a. Provide to meet the requirements of Section 26 29 23.

3.0 EXECUTION

3.1 PRODUCT DELIVERY, STORAGE AND HANDLING

a. Handle unit carefully to prevent damage, breaking, denting and scoring. Damaged units or damaged components shall not be installed. Replace all damaged parts with new parts from the manufacturer. Repair all damaged finished to match existing finish.

b. If unit is to be stored prior to installation store in a clean, dry place. Protect from weather, dirt, fumes, water construction and physical damage.

c. Comply with manufacturer's rigging and installation instructions for unloading the unit and moving it to the final location.

d. Submittal data shall include the specifics of performance, handling, testing, maintenance, operation, and safety information for the gas phase filter media.

3.2 INSTALLATION

a. Execute the work in accordance with the specifications and in accordance with the manufacturer's instructions and only by workmen experienced in this type of work.

b. Start-up and instructions to Owner to be by factory trained service personnel.

c. Provide complete start-up, operation, verification of controls and equipment operation at factory, fully tested in all modes of operation, and certify the units are operating properly in all modes.

d. Provide for trip to factory for two people from Austin, Texas, to witness testing. Include room, air travel, ground travel, meals.

End of Section 23 7433

SECTION 23 7433.01

CONDENSING UNITS FOR USE WITH 100% OUTSIDE AIR HANDLERS

1.0 General

Related Documents

General Description

A. This section includes the design, controls and installation requirements for air-cooled condensers / condensing units.

Quality Assurance

A. Unit shall be certified in accordance with UL Standard 1995/CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment.

B. Unit and refrigeration system shall comply with ASHRAE 15, Safety Standard for Mechanical Refrigeration.

C. Energy Efficiency Ratio (EER) shall be equal to or greater than prescribed by ASHRAE 90.1, Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.

D. Unit shall be safety certified by ETL and be ETL US and ETL Canada listed. Unit nameplate shall include the ETL label.

Submittals

A. Product Data: Literature shall be provided that indicates dimensions, operating and shipping weights, capacities, ratings, factory supplied accessories, electrical characteristics, and connection requirements. Installation, Operation and Maintenance manual with startup requirements shall be provided.

B. Shop Drawings: Unit drawings shall be provided that indicate assembly, unit dimensions, clearances, and connection details. Wiring diagram shall be provided with details for both power and control systems and differentiate between factory installed and field installed wiring.

Delivery, Storage, and Handling

A. Unit shall be shipped on a wooden pallet with skeleton crating prior to shipment with doors bolted shut to prevent damage during transport and thereafter while in storage awaiting installation.

B. Follow Installation, Operation and Maintenance manual instructions for rigging, moving, and unloading the unit at its final location.

C. Unit shall be stored in a clean, dry place protected from construction traffic in accordance with the Installation, Operation and Maintenance manual.

Warranty

A. Manufacturer shall provide a limited “parts only” warranty for a period of 12 months from

the date of equipment startup or 18 months from the date of original equipment shipment from the factory, whichever is less. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided manufacturer's written instructions for installation, operation and maintenance have been followed. Warranty excludes parts associated with routine maintenance and refrigerant.

B. Compressors shall carry a 5 year warranty from date of original equipment shipment from the factory.

2.0 Products

Manufacturer

A. Products shall be provided by the following manufacturers:

1. AAON
2. TRANE
3. Substitute equipment may be considered for approval that includes at a minimum:
   a. R-410A refrigerant
   b. Hinged access doors with lockable handles
   c. Variable capacity compressor with 10-100% capacity
   d. 2,500 hour salt spray tested exterior corrosion protection
   e. Designed, engineered, and manufactured in the United States of America
   f. All other provisions of the specifications must be satisfactorily addressed

Condensing Units

A. General Description

1. Air-Cooled condensing unit shall include compressors, air-cooled condenser coils, condenser fans, filter driers, and suction and liquid connection valves.
2. Unit shall be factory assembled and tested including leak testing of the coil and run testing of the completed unit. Run test report shall be supplied with the unit in the control compartment.
3. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.
4. Unit components shall be labeled, including pipe stub outs, refrigeration system components and electrical and controls components.
5. Installation, Operation and Maintenance manual shall be supplied within the unit.
6. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's access door.

7. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's access door.

B. Construction

1. Unit shall be completely factory assembled, piped, and wired and shipped in one section.

2. All cabinet walls, access doors, and roof shall be fabricated of G90 galvanized steel panels.

3. Unit shall be specifically designed for outdoor application.

4. Access to compressors and control components shall be through hinged access doors with quarter turn, lockable handles.

5. Exterior paint finish shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.

6. Unit shall include forklift slots.

7. Unit shall include factory installed, painted galvanized steel condenser coil guards on the face of the condenser coil.

C. Electrical

1. Unit shall be provided with standard power block for connecting power to the unit.

2. Control circuit transformer and wiring shall provide 24 VAC control voltage from the line voltage provided to the unit.

3. Unit shall have a 5kAIC SCCR.

D. Refrigeration System

1. Unit shall be provided with one independently circuited R-410A variable capacity scroll compressor with thermal overload protection. Variable capacity scroll compressor shall be capable of modulation from 10-100% of its capacity.

2. Each compressor shall be furnished with a crankcase heater.

3. Compressors shall be mounted in an isolated service compartment which can be accessed without affecting unit operation. Lockable hinged access doors shall provide access to the compressors.

4. Compressors shall be isolated from the base pan with the compressor manufacturer's recommended rubber vibration isolators, to reduce any transmission of noise from the compressors into the building area.

5. Each refrigeration circuit shall be equipped with automatic reset low pressure and

manual reset high pressure refrigerant safety controls, Schrader type service fittings on both the high pressure and low pressure sides, and service valves for liquid and suction connections. Liquid line filter driers shall be factory provided and installed. Field installed refrigerant circuits shall include the low side cooling components, refrigerant, thermal expansion valve, liquid line, insulated hot gas reheat line, and insulated suction line.

6. Unit shall include a factory holding charge of R-410A refrigerant and oil. Adjusting the charge of the system will be required during installation.

7. The unit shall be capable of stable cooling operation to a minimum of 55°F outdoor temperature.

8. Refrigeration circuit shall be provided with modulating hot gas reheat valve, electronic controller, liquid line receiver, supply air temperature sensor and a dehumidification control signal terminal that enables the dehumidification mode of operation, and includes supply air temperature control to prevent supply air temperature swings and overcooling of the space. The matching indoor air handler must include a hot gas reheat coil, a check valve on the hot gas reheat line, and a check valve on the liquid line.

9. Units shall be provided with a suction pressure transducer on the refrigeration circuit.

E. Fans

1. Condenser fan shall be horizontal discharge, axial flow, direct drive fans.

2. Condensing unit shall be provided with an electrically commutated motor (ECM) condenser fan, condenser head pressure controller, and discharge pressure transducers for modulating head pressure control to allow cooling operation down to 35°F.Fan motor shall be weather protected, single phase, direct drive, and totally enclosed air over (TEAO) with electronic protection.

F. Coils

1. Coils shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and aluminum end casings. Fin design shall be sine wave rippled.

2. Coils shall be designed for a minimum of 10°F of refrigerant sub-cooling.

3. Coils shall be hydrogen leak tested.

G. Controls

1. Unit shall be provided with factory supplied and factory installed MUA AAON Orion controller in the matching AAON air handling unit.

3.0 Execution

Installation, Operation, and Maintenance

A. Installation, Operation and Maintenance manual shall be supplied with the unit.

B. Installing contractor shall install unit, including field installed components, in accordance with Installation, Operation and Maintenance manual instructions.

C. Start up and maintenance requirements shall be complied with to ensure safe and correct operation of the unit.

SECTION 23 81 26

AIR COOLED CONDENSING UNITS

1.0 GENERAL

1.1 WORK INCLUDED

a. This section specifies air-cooled condensing units complete with casing, compressor, condenser coil, condenser fan and controls required for a split air conditioning system.

1.2 RELATED WORK

a. Division 23 - HVAC. Refrigerant Piping.

b. Division 26 - Electrical. Motors.

1.3 PERFORMANCE

a. Provide high efficiency performance as scheduled on drawings, and head pressure control to enable unit to operate in temperatures as low as 20°F.

2.0 PRODUCTS

2.1 COMPRESSOR

a. Provide a hermetic or semi-hermetic compressor with crankcase heaters, inherently protected motors, spring mounts and capacity modulation. Provide with a 5-year warranty.

b. For outside air application provide multi-speed compressors with capacity compressor with 10-100% capacity.

2.2 CONDENSER COILS

a. Provide copper tubes with mechanically bonded aluminum fins.

2.3 FANS AND MOTORS

a. Provide propeller-type fans with direct drive or belt drive and vertical discharge. Protect fan with a heavy-gauge wire guard. Provide motors which are inherently protected, permanently lubricated, and weatherproof.

2.4 CASING

a. Furnish a unit designed for outdoor mounting. Fabricate the casing of heavy gauge steel which is zinc coated and finished with enamel. Provide removable access panels.

2.5 CONTROLS

a. Provide safety and operating controls factory wired and mounted in a separate enclosure. Include high and low pressure switches and compressor motor overload devices. Furnish a time delay device to prevent short cycling. Suction and service valves so unit can be manually pumped down.

b. Thermostat. Low voltage programmable thermostat with separate heat/cool set point, fan-on-off-auto, dead-band, after hours set points, 0-4 hr. manual override, heat-cool-off-auto.

3.0 EXECUTION

a. Mount condensing units on 6-inch foundation pads and pipe as shown on drawing.

END OF SECTION

SECTION 26 0000

ELECTRICAL GENERAL PROVISIONS

1.0 GENERAL

1.1 RELATED DOCUMENTS

a. The Architectural Plans and Specifications, the General Conditions, Supplementary General Conditions and other requirements of Division 01, the Structural Plans and Specifications, the Mechanical Plans and Specifications, and the Electrical Plans apply to the work specified in the Electrical Sections, and shall be complied with in every respect. The Contractor shall examine all of these documents, which make up the Contract Documents, and shall coordinate them with all electrical work on the Electrical plans and in the Electrical Sections of these Specifications.

1.2 SUMMARY

a. The work covered by the electrical specifications shall include the furnishing of all materials, labor, transportation, tools, permits, fees, utilities, and incidentals necessary for the complete installation of all electrical work required in the contract documents and specified herein. The intent of the contract documents is to provide an installation complete in every respect. In the event that additional details or special construction may be required for the work indicated or specified in this section or work specified in other sections, it shall be the responsibility of the Contractor to provide all material and labor which is usually furnished with such systems in order to make the installation complete and operative.

b. The Contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of other trades. The Contractor shall visit the site and thoroughly familiarize himself with the existing conditions that affect the work and to verify all dimensions. The Contractor shall advise the Architect of any discrepancy prior to bidding. The submission of a bid shall be deemed evidence of the Contractors site visit, the coordination of all existing conditions, and the inclusion of all consideration for existing conditions.

c. Electrical services and connections to motors and appliances furnished by others including, but not limited to, heating ventilation and air conditioning equipment, plumbing equipment and associated controls, and equipment specified by other specification divisions included in the Construction Documents.

1.3 DRAWINGS AND SPECIFICATIONS

a. These Specifications are accompanied by Drawings of the building and details of the installations indicating the locations of equipment, piping, ductwork, outlets, light fixtures, switch controls, receptacles, etc. The Drawings and these Specifications are complementary to each other, and what is required by one shall be as binding as if required by both. Phase, neutral and switch leg indications are shown only where it is considered that clarification is required to indicate typical wiring methods required.

b. If any departures from the contract documents are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted in writing to the Architect for review. No departures shall be made without prior written approval of the Architect.

c. The interrelation of the Specifications, the Drawings, and the Schedules is as follows: The Specifications determine the nature and quality of the materials, the Drawings establish the quantities, dimensions and details, and the Schedules give the performance characteristics. Should the Drawings disagree in themselves, or with the Specifications, the better quality or greater quantity of work or materials shall be estimated upon, and unless otherwise directed by the Architect in writing, shall be performed or furnished. In case the Specifications should not fully agree with the Schedules, the latter shall govern. Figures indicated on Drawings govern scale measurements and large scale details govern small scale Drawings. In case of disagreement between Specifications and Drawings, see Division 1 of these Specifications for clarification.

d. Items specifically mentioned in the specifications but not shown on the contract drawings and/or items shown on the contract drawings but not specifically mentioned in the specifications shall be installed by the Contractor under the appropriate section of work as if they were both specified and shown.

1.4 CODES AND STANDARDS

a. All work shall comply with the applicable rules and regulations of the National Electrical Code, the National Electrical Safety Code, the National Fire Codes (published by National Fire Protection Association), American with Disabilities Act Regulations, the Local Authority Having Jurisdiction, the terms and conditions of services of the electrical utility, as well as any other authorities that may have lawful jurisdiction pertaining to the work specified. None of the terms or provisions of this specification shall be construed as waiving any of the rules, regulations, or requirements of these authorities.

b. The Contractor shall resolve any code violation discovered in the contract documents with the Architect prior to award of the contract.

c. In any instance where these Specifications call for materials of a better quality or larger size than required by the codes, the provisions of these Specifications shall take precedence. The codes shall govern in case of direct conflict between the codes and the specifications.

1.5 REQUEST FOR INFORMATION

a. The Contractor may, after exercising due diligence to locate required information, request from the Consultant clarification or interpretation of the requirements of the Contract Documents. The consultant shall respond to such Contractor's requests for clarification or interpretation. However, if the information requested by the Contractor is apparent from field observations, is contained in the Contract documents or is reasonably discernable from them, the Contractor shall be responsible to the Owner for all reasonable costs charged by the consultant to the Owner for the additional services required to provide such information.

1.6 CONTRACT CHANGES

a. When submitting proposed changes, both additive and deductive, the Contractor shall include and set forth in clear and precise detail, a breakdown of labor and materials along with estimated impact on the construction schedule. Contractor shall furnish spreadsheets that include quantities, unit costs and extensions. Any special equipment, i.e., fixtures, switchgear, special systems included in change proposal, shall be listed separately on vendor-supplied quote with detailed itemization and unit costs, with additions and deletions listed separately.

1.7 ELECTRICAL UTILITIES

a. The contract documents reflect the general location, voltage, ampacity, size and manner of routing for all utilities known to be required on this project. It shall be the responsibility of the Contractor to visit the site, meet with the local Electrical and Telephone Company personnel in order to coordinate and confirm the exact requirements for all electrical and telephone utilities. The bid submitted by the Contractor shall include costs for all such coordination work as well as any and all utility and telephone company charges and/or fees.

1.8 TEMPORARY SERVICES

a. At present, no electrical service exists on this site which may be used for temporary construction power. It shall be the responsibility of the Contractor to provide a complete system for temporary electrical power service and distribution. The Electrical Contractor shall provide the necessary wiring, connections, service switches, poles, wiring protective devices, lighting fixtures, lamps, outlet devices, disconnect switches, etc., as required for temporary lighting. In addition, a similar system shall be provided for the distribution of single and three phase power of voltage levels and adequate ampacity as required to facilitate the construction of the project. These services shall be installed in accordance with requirements of the National Electrical Code (NEC), the Occupational Safety and Health Administration (OSHA), and the National Electrical Safety Code (NESC).

b. The General Contractor shall pay the cost of all electrical energy consumed on the job site throughout the entire construction period.

c. Remove all temporary wiring upon completion of the work.

1.9 BUILDING CONSTRUCTION

a. It shall be the responsibility of the Contractor to consult the Architectural and Engineering Drawings and Details so as to thoroughly familiarize himself with the type and quality of construction to be provided on this project.

b. The electrical drawings are diagrammatic in character and cannot show every connection in detail or every line or conduit in its exact location. These details are subject to the requirements of local ordinances and also structural and Architectural conditions. The Contractor shall carefully investigate structural and finish conditions and shall coordinate with all other trades in order to avoid interference between the various phases of work.

c. The approximate location of electrical items is indicated on the electrical drawings. These drawings are not intended to give complete and exact details in regard to location of outlets, apparatus, etc. Exact locations are to be determined by actual measurements at the job site and will in all cases be subject to the approval of the Architect. The Architect reserves the right to make any reasonable changes in the location indicated without additional cost.

1.10 BUILDING DEMOLITION

a. Unless noted otherwise, remove all electrical materials and equipment from areas designated for demolition.

b. Where electrical equipment is indicated for removal, the Contractor shall remove all associated wiring back to the last active outlet or to the panelboard. If all electrical equipment on the circuit is scheduled for removal, the Contractor shall remove the associated conduit system where run exposed or accessible in ceilings or floor plenums. Where conduit is concealed in walls, floors or ceilings the exposed portion of the conduit shall be cut off flush with the building surface and the concealed portion shall be capped and abandoned in place. All voids left by the removal of electrical equipment shall be filled with grout and finished to match existing adjacent surfaces. Removal of any electrical equipment shall be performed in such a way not to interfere with ongoing daily building operations.

c. All salvage shall remain the property of the Owner and be delivered to a location, on site, as designated by the Owner. In the event the Owner does not desire to retain the salvage material, the material becomes the property of the Contractor and shall be disposed of by the Contractor.

d. Existing electrical services and controls to items being removed by others must be disconnected as a requirement of this section.

e. Wherever a new to existing electrical connection is required, the Contractor shall provide all materials (e.g., junction boxes, conduit, fittings, wiring and wiring connections) and labor required to make the connections.

f. The Contractor shall be responsible to maintain all branch circuits, in an operational condition, in all areas not included under this contract that may be affected during the demolition.

g. The Contractor shall field verify power connection points of devices not scheduled for removal, by means of circuit tracing, prior to any rewiring. Equipment and devices not scheduled for removal and their associated branch circuitry shall remain in their original operating condition.

h. The Contractor shall provide new wiring for all branch circuits and feeders. Splicing new wiring to old wiring is not acceptable. Existing conduit system may be reused and extended as required unless visible conduit damage is noted, in which case the existing conduit system shall be replaced with a new conduit system.

1.11 CONTRACTOR QUALIFICATIONS

a. An acceptable contractor for the work under this division shall be a specialist in this field and

have the personal experience, training, skill and the organization to provide a practical working system. If required, he shall be able to furnish acceptable evidence of having contracted for and installed not less than three systems of comparable size and type to this one, that have served their owners satisfactorily for not less than three years.

b. The foreman or superintendent for this work shall have had experience in installing not less than three such systems and shall be approved by the Architect before the work is begun. Adequate and competent supervision shall be provided to ensure first class workmanship and installation.

c. Work shall be executed and all materials installed in accordance with the best practice of the trades in a thorough, substantial, workmanlike manner by competent workmen, presenting a neat appearance when completed.

d. The Contractor shall be responsible for all construction techniques required for all electrical systems specified and shown on the drawings.

1.12 OBSERVATION OF THE WORK

a. Architect's authorized representative and/or owner's observer shall have the right to observe the work at any time. The contractor shall have a representative present when his work is being observed, and he shall give assistance, as may be required, to the architect's representative. Recommendations made by observer shall be promptly carried out, and all unsatisfactory material and/or workmanship shall be replaced to the satisfaction of the Architect.

1.13 SHOP DRAWINGS AND PRODUCT DATA

a. Submit shop drawings and product data as specified herein - General Requirements. Submittal data shall indicate the manufacturer's name, published performance, ratings and/or capacity data, detailed equipment drawings for fabricated items, wiring diagrams, installation instructions and other pertinent data. All submittals shall bear the specification section number they are related to or the specific sheet where products are shown on the contract drawings which are not referenced by the specifications. Where literature is submitted covering a group or series of similar items, the applicable items must be clearly indicated. Submittals shall be clearly marked highlighting all proposed equipment and devices to be used in this project. Submittals that do not comply with all requirements will be returned without review. Shop drawings shall note all deviations from contract documents. The Contractor cannot provide submittals and shop drawings by copying sealed engineering plans in whole or in part. The Contractor must produce their own shop drawings, no exceptions.

b. Submittal review is only for general conformance with design concept of project and general compliance with the contract documents. The Contractor is responsible for conforming and correlating equipment dimensions at job site; for information which pertains to fabrication processes or construction techniques; and for coordination of work of all trades. Review of submittals shall not relieve the Contractor of responsibility for deviation from requirements of contract documents or errors of omissions in submittals.

c. The submittals shall include a specification compliance analysis for review and approval before

work shall begin. The compliance document shall address each paragraph of the specification by indicating COMPLY, EXCEED, or EXCEPTION. Do not indicate COMPLY unless the proposed system exactly meets the paragraph requirement. If EXCEED or EXCEPTION is indicated, then provide a clear and concise explanation of the variance from the specifications and the net effect this would have on the specified system performance.

d. Contractor's Check. Submittal of shop drawings, product data and samples will be accepted only when they are submitted by the Contractor. Each submittal shall indicate by signed stamp that the submittals have been checked and that they are in accordance with contract documents and that dimensions and relationship with work of other trades have been checked. Submittals that have not been checked and signed by the Contractor will be returned for checking before being reviewed.

e. Engineer's review of submittals constitutes an acknowledgment only and in no way relieves the contractor of full responsibility for providing all systems in accordance with the intent of the contract documents. Any material provided by this contractor without approved shop drawings constitutes the contractor's agreement to comply with the engineer's intent whether specified, shown or implied.

f. Submittals are required for, but not limited to, the following items:

(1) Shop Drawings.

(a) Panelboards.

(b) Submit scaled CAD drawings for all electrical rooms indicating all N.E.C. clearances for all electrical equipment in each electrical room. Failure to submit scaled drawings with electrical switchgear, panelboards, transformers, automatic transfer switches or any other type of electrical equipment submittals will result in the rejection of that electrical equipment submittal.

(c) Provide manufacturer’s prepared integrated shop drawings indicating the manufacturer’s recommended occupancy sensor type and recommended occupancy sensor locations for areas with occupancy sensors.

(2) Product Data.

(a) Enclosed circuit breakers.

(b) Enclosed safety switches.

(c) Fuses.

(d) Grounding materials and equipment.

(e) Insulated conductors.

(f) Lighting fixtures, including lamps and drivers.

(g) Raceways.

(h) Wiring devices.

g. Each manufacturer is required to review the system design as related to the proper operation of his equipment, including electrical requirements, automatic controls, mechanical systems and equipment, locations and related items. Submit a letter with the submittals from the manufacturer stating that his equipment will operate satisfactorily under the design conditions, including air flows for all duct mounted smoke detectors. The manufacturer will also be required to review the final installation at the site and submit a second letter stating that the installation conforms to the design criteria and that the equipment will operate satisfactorily as installed, including air flows for all duct mounted smoke detectors

1.14 SUBSTITUTIONS AND PRODUCT OPTIONS

a. Within 30 days after contract date, submit to Architect a complete list of major products proposed to be used, with the name of the manufacturer and the installing subcontractor.

b. Contractor's Options.

(1) For products specified only by reference standard, select any product meeting that standard.

(2) For products specified by naming several products or manufacturers, select any one of the products or manufacturers named, which complies with the specifications.

(3) For products specified by naming one or more products or manufacturers and "or equal," Contractor must submit a request for substitutions for any product or manufacturer not specifically named.

(4) For products specified by naming only one product and manufacturer, there is no option.

c. Manufacturers' names and catalog numbers specified under sections of Division 26 are used to establish standards of design, performance, quality and serviceability and not to limit competition, nor to discriminate against an "approved equal" product of another manufacturer. Equipment of equal design to that specified, will be acceptable upon approval by the Engineer. The Architect/Engineer will consider written requests for substitution of specified products, if reviewed fourteen days prior to bid date. After bid date, request for substitution will be considered only in cases of product unavailability or other conditions beyond control of the contractor. It shall be the contractor's responsibility to:

(1) Personally investigate the proposed substitute product to determine that it has all the same accessories and is equal or superior in all respects to that specified.

(2) Provide the same guarantee for the substitution that he would for that specified.

(3) Coordinate the installation of the equipment which he proposes to substitute with all

trades and includes the costs for any changes required for the work to be complete in all respects. The contractor will prepare shop drawings where required by the Architect/Engineer or where dimensions vary.

(4) Provide itemized cost breakdown including material and labor for the proposed product substitutions. Submit complete design and performance data.

1.15 PROJECT RECORD DOCUMENTS

a. Throughout progress of the work of this Contract, maintain an accurate record of all changes in the Contract Documents. Upon completion of the Work of this Contract, transfer the recorded changes to the AutoCad drawing files and specification word processing files. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff. Thoroughly coordinate all changes within the Record Documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other Documents where such entry is required to properly show the change. Include all addenda items, request for information Architect's Supplemental Instructions and any other document that causes a change in the Construction Documents. Accuracy of records shall be such that future search for items shown in the Contract Documents may reasonably rely on information obtained from the approved Record Documents.

b. The Contractor shall mark any deviations on a daily basis. The Architect will visit the site and will require to see the "As-Built" documentation periodically. If the Contractor does not keep an accurate set of as-built drawings, the pay request may be altered or delayed at the request of the Architect. Mark the drawings with a colored pencil. Record installed feeder conduits. Dimension the location and elevation of the conduit.

c. Record Documents shall consist of the following:

(1) Job Set: Promptly following award of Contract, secure from the Architect, at no charge to the Architect, one complete set of all electrical documents comprising the Contract.

(2) Final Record Documents: Obtain the AutoCad drawings files and the specification word processing files at the Contractor's expense.

(a) The Contractor shall transfer all change data shown on the job set of to the corresponding electronic files, coordinating the changes as required, and clearly indicating at each affected detail and other drawing the full description of all changes made during construction and the actual location of items. Call attention to each entry by drawing a "cloud" around the area or areas affected.

(3) Submit the completed total set of Record Documents to the Engineer as described above. Participate in review meeting or meetings as required by the Engineer, make all required changes in the Record Documents, and promptly deliver the final Record Documents to the Architect. Upon completion of Work, the Contractor shall certify the "Record Drawings" for correctness by signing the following certification:

CERTIFIED CORRECT (3/8" high letters)

(Name of the Contractor)

By

Date

(Name of the Sub-Contractor)

By

Date

d. Deliver record drawings to the Architect in the number and manner specified in Division 1 - General Requirements.

2.0 PRODUCTS

2.1 CONSTRUCTION MATERIALS

a. Per Senate Bill 1289 passed in 2017, all state entities are required to provide all iron and steel products manufactured in the United States.

b. All materials shall be new and shall conform to the National Electrical Code and National Fire Protection Association requirements and shall be listed, inspected, and approved by the Underwriters Laboratories and shall bear the U.L. label where labeling service is available. The label or listing of the Underwriters Laboratories, Inc. will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this listing, the Contractor may submit a statement from a nationally recognized, adequately equipped independent testing agency, indicating that the items have been treated in accordance with required procedures, and that the materials and equipment comply with all contract requirements.

2.2 STANDARD PRODUCTS

a. All materials and equipment shall be standard catalog products of domestic manufacturers regularly engaged in the manufacture of products conforming to these specifications. Materials and equipment shall have been in satisfactory use at least two years prior to bid opening. Where custom or special items are required, these shall be fully described by drawings and/or material list which detail the item proposed for use on this project.

2.3 MANUFACTURERS' INSTRUCTIONS

a. The Contractor is fully responsible for furnishing the proper electrical equipment and/or material and for seeing that it is installed as intended by the manufacturer's written instructions. If needed for

proper installation, operation, or start up, the Contractor shall request advice and supervisory assistance from the representative of the specific manufacturer. The manufacturers' published instructions shall be followed for preparing, assembling, installing, erecting, and cleaning all materials and equipment. The Contractor shall promptly notify the Architect in writing of any conflict between the requirements of the contract documents and the manufacturer's directions and shall obtain the Architect's instructions before proceeding with the work. Should the Contractor perform any work that does not comply with the manufacturer's directions or instructions from the Architect, he shall bear all costs arising in connection with correcting the deficiencies.

2.4 RUST PREVENTION

a. All metallic materials shall be protected against corrosion. Exposed metallic parts of outdoor apparatus shall be given a rust inhibiting treatment and standard finish by the manufacturer. All parts such as boxes, bodies, fittings, guards, and miscellaneous parts shall be protected in accordance with the ASTM A123 or A153, except where other equivalent protective treatment is specifically approved in writing.

2.5 CAPACITIES AND SPACE LIMITATIONS

a. Capacities shall be not less than those indicated but shall be such that no component or system becomes inoperative or is damaged because of start-up or other overload conditions. Where approved equipment requires electrical power other than that indicated in the contract documents for the specified equipment, the Contractor shall be responsible to adjust protective devices, starter sizes, conductors, conduits, etc., to accommodate this approved device electrically.

b. The Contractor shall be responsible to verify that the equipment he proposes to provide will physically fit within the space indicated on the contract documents and that the required code clearances and maintenance access are maintained. Any space conflicts shall be noted in the submittals. Provide scale drawings to the Architect indicating proposed solutions to any space conflict for the Architects review and approval.

2.6 NAMEPLATES

a. Each piece of equipment shall have a nameplate from the manufacturer with the following information: name, address, catalog number, voltage, phase, full load amperes or horsepower, and/or other pertinent information on a plate securely attached to the equipment. All data on nameplates shall be legible at the time of final inspection.

3.0 EXECUTION

3.1 DELIVERY STORAGE AND HANDLING

a. The Contractor shall not receive any equipment at the job site until the equipment is ready to be installed or until there is suitable space provided to properly protect equipment from rust, weather, humidity, dust, and physical damage.

b. All equipment shall be protected in accordance with the manufacturer's recommendations and the

requirements of NFPA 70B, Appendix I, titled "Equipment Storage and Maintenance During Construction". The Contractor shall replace all damaged or defective equipment with new equipment.

c. All equipment injured or damaged in transit from factory, during delivery to premises, while in storage on premises, while being erected and installed, and while being tested, until time of final acceptance, shall be replaced by this Contractor.

3.2 PROTECTION OF EQUIPMENT

a. During construction, protect switchgear, transformers, motors, control equipment, and other items from insulation moisture absorption and metallic component corrosion by appropriate use of strip heaters, lamps or other suitable means. Apply protection immediately on receiving the products and maintain continually.

b. Keep products clean by elevating above ground or floor and by using suitable coverings.

c. Take such precautions as are necessary to protect apparatus and materials from damage. Failure to protect materials is sufficient cause for rejection of the apparatus or material in question.

d. Protect factory finish from damage during construction operations and until acceptance of the project. Satisfactorily restore any finishes that become marred or damaged.

3.3 INSTALLATION

a. Cooperation with trades of adjacent, related or affected materials or operations, and of trades performing continuations of this work under subsequent contracts, is considered a part of this work. The Contractor is responsible to coordinate with other trades in order to effect timely and accurate placing of work and to bring together, in proper and correct sequence, the work of such trades. Provide coordination drawings showing exact size and location of sleeves, openings or inserts for electrical equipment in slabs, walls, partitions and chases.

b. Provide 4-inch thick concrete housekeeping pads for indoor floor-mounted equipment, except where direct floor mounting is required. Pour pads on roughened floor slabs, sized so that outer edges extend a minimum of 3-inches beyond equipment. Trowel pads smooth and chamfer edges to a 1-inch bevel. Secure equipment to pads as recommended by the manufacturer.

c. All equipment shall be installed plumb and level. Sheet metal enclosures shall be separated from walls by not less than a 1/4-inch air gap provided by corrosion-resistant spacers. Provide corrosion- resistant bolts, nuts and washers to anchor equipment.

d. Permanently seal outdoor equipment at the base using concrete grout. Seal or screen openings into equipment to prevent entrance of animals, birds and insects. Use galvanized steel or copper mesh with openings not larger than 1/16-inch for screened openings. Seal small cracks and openings from the inside with silicon sealing compound.

e. Conceal electrical work in walls, floors, chases, under floors, underground and above ceilings except:

(1) Where shown or specified to be exposed. Exposed is understood to mean open to view.

(2) Where exposure is necessary to the proper function.

(3) Where size of materials and equipment preclude concealment.

f. All equipment shall be installed in a manner to permit access to parts requiring service. All electrical equipment shall be installed in such a manner as to allow removal for service without disassembly of other equipment.

g. All electrical equipment shall have working clearances as required by the latest version of the National Electrical Code.

3.4 HOISTING, SCAFFOLDING, AND TRANSPORTATION

a. The Contractor shall provide all hoisting, scaffolding and ladders as required to set the equipment in place in the building.

b. The Contractor shall provide necessary transportation to facilitate the delivery of all materials, equipment, tools, and labor to project.

3.5 CLEANING

a. The Contractor shall, at all times, keep the premises free from accumulations of waste material or rubbish caused by him, his employees, or his work. This debris shall be removed, not only from the building, but also from the site and from any street or alley adjacent to the site.

b. At completion of the project, the Contractor shall remove all of his tools, scaffolding, and surplus materials.

3.6 CONDUIT SLEEVES AND PENETRATION SEALS

a. Where conduits pass through walls or floors not on fill, galvanized sheet metal sleeves shall be used. In walls, they shall be flush with each finished surface. In pipe chases, they shall extend 1-1/2" above floor slab and be cemented in a water tight manner. Size of these sleeves shall be at least ½" greater than outside diameter of the conduit.

b. For conduits passing through outside walls, provide and install galvanized steel sleeves having an inside diameter at least 4" greater than the outside diameter of contained conduit. Where these occur in walls having a waterproof coating applied, the sleeves shall have flanges welded onto them to build into waterproofing. When conduits are installed, the annular space between pipe and sleeve shall be effectively sealed with an approved mastic sealer as directed by the Architect.

c. For conduits passing through outside walls, the conduit to wall penetration closures shall be "Link-Seal" as manufactured by Thunderline Corporation or Crouse Hinds. Seals shall be modular

mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the conduit and wall opening. Seals located underground shall be manufactured from stainless steel. Links shall be loosely assembled with bolts to form a continuous rubber belt around the conduit with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely water-tight seal between the conduit and wall opening. The seal shall be constructed so as to provide electrical insulation between the conduit and wall, thus reducing chances of cathodic reaction between these two members.

(1) Contractor shall determine the required inside diameter of each individual wall opening or sleeve before ordering, fabricating or installing. The inside diameter of each wall opening shall be sized as recommended by the manufacturer to fit the conduit and Link- Seal to assure a water-tight joint. Sizing (correct Link-Seal model and number of links per seal) may be obtained through manufacturer's catalog. If conduit O.D. is non- standard due to coating, insulation, etc., consult Thunderline's factory for engineering assistance and recommendation before proceeding with wall opening detail.

(2) Contractor shall familiarize his installing personnel with Link-Seal instruction bulletin (packed with each carton) which illustrates the proper procedure for installing and tightening the seal to provide a water-tight conduit penetration.

(3) Provide fire rating to meet or exceed fire rating of penetrated wall.

d. Pipe and duct sleeves, pitch pockets, and flashings compatible with the roofing installation shall be provided for roof penetrations. All roof penetrations shall be reviewed and approved by the Architect.

3.7 FIRE STOPPING

a. All conduits, cables, cable tray, etc. passing through fire rated floors and/or walls shall have the void area between the material passing through floor and/or wall sealed with an approved fire-stop material to maintain the fire rating of the floor and/or wall. Depending on the particular installation, the contractor shall use FS900 series fire stop caulk or FS500/600 series fire-stop components as manufactured by International Protective Coatings or approved equivalent.

b. All fire stop systems shall be installed as required by the manufacturer and U.L. requirements for each application.

c. The Contractor shall procure the services of an independent inspection service to review and provide a certified letter to the Contractor, Engineer and the City of Austin, stating all fire stopping has been installed per UL listing and the manufacturer’s recommendations. Independent service shall have experience in the inspection of fire stopping materials and methods installed.

3.8 ACCESS DOORS

a. Furnish and install access doors in all inaccessible wall or ceiling locations as required for access to conduit bodies, junction and pull boxes, outlet boxes, and other electrical equipment requiring

maintenance, adjustment or operation. Doors or panels required in acoustical ceilings are provided for under Division 09. However doors required in plaster, gypboard, masonry, or other solid wall or ceiling are included under this paragraph. Access doors are not indicated on the drawings. The contractor will be responsible for proper coordination in locating access doors for ease of operation and maintenance of concealed equipment.

b. Non-fire-rated access doors.

(1) Furnish INRYCO/MILCOR approved equal with 16-gauge frames, 14-gauge panels, and 22-gauge casing head. Provide continuous concealed hinges and flush screwdriver cam lock. Use Style K access doors for plastered surfaces, Style M for masonry or gypboard surfaces, and Style AP for acoustical plaster ceilings, with 18-gauge panel and all galvanized construction.

c. Fire-rated access doors (1-1/2 hour label doors).

(1) Furnish INRYCO/MILCOR or approved equal UL-listed 1-1/2 HR Label "B". Access doors with 16-gauge steel frames, and 20-gauge insulated sandwich type door panel. Provide door with an automatic closing and latching mechanism. Fire-rated access doors are required.

3.9 ELECTRICAL CONNECTIONS TO MOTORS, EQUIPMENT AND CONTROL SYSTEMS

a. Contractor shall coordinate with Division 22, 23 and other divisions as required to verify all electrical requirements of those divisions. This is to include, but not be limited to, verification of power, voltage, phase and other characteristics as being compatible with that called for on the electrical drawings and Division 26 specifications, as well as that called for in Division 22, 23 drawings and specifications or other divisions requiring electrical connections. This shall be done prior to placing orders for equipment or material, and prior to any rough-in, etc.

b. Motors are specified in Divisions 22 and 23. Electrical work includes the electrical connection of all motors, except those which are wired as a part of equipment. Connection of motors specified in Divisions 22 and 23 but not reflected on electrical drawings shall be included in division 26 scope of work.

c. The contractor shall refer to and coordinate with Divisions 22 and 23 and other divisions included in the construction documents all interlock interfacing with any and all control systems. The contractor shall furnish and install all wiring, conduit required to interlock, interface and connect all control systems in the project. This shall include any required 120V power required for miscellaneous mechanical systems not specifically shown on Div. 26 drawings such as control panels, air dryers, hot water circulation pumps, etc.

3.10 CUTTING AND PATCHING

a. Where it becomes necessary to cut through any wall, floor, or ceiling to install any work under this Section of the Contract, or to repair any defects that may appear up to the expiration of the guarantee

period, such cutting shall be done under the supervision of the Architect by this Contractor. This Contractor shall not be permitted to cut or modify any structural members without the written permission of the Architect.

b. Patching of all openings cut by this Contractor, or repairing of any damage to the work of other trades caused by cutting or by the failure of any part of the work installed under this Contract, shall be performed by the appropriate trade but shall be paid for by this Contractor.

c. Any openings cut through exterior walls or roofs shall be provided with suitable covers, while they are left open, to protect the property or materials involved. Any openings cut through walls below grade shall be properly protected to prevent entrance of water or other damaging elements. All openings shall be waterproofed upon completion of the work as specified by the architect. Any openings through fire rated walls or floors shall be sealed to meet the minimum fire rating of wall or floor penetrated.

3.11 CORE DRILLING

a. All penetrations through concrete floors and walls shall be coordinated and approved by the Structural Engineer. The Contractor shall scan the area of the proposed penetration prior to performing any work to ensure that there are no existing conduit systems, concrete reinforcing steel etc., that could be damaged by core drilling the concrete slab. The scan shall be performed using ground penetrating radar technology.

3.12 EXISTING FACILITIES

a. The Contractor shall be responsible for loss or damage to the existing facilities as used by his workmen, and shall be responsible for repairing or replacing such loss or damage. The Contractor shall send proper notices and receive written permission from the Owner to enter existing areas. Before beginning work in existing areas, make the necessary arrangements and perform other services required for the care, protection, and in service maintenance of all electrical, communication, plumbing, heating, air conditioning, and ventilating services for existing facilities. The Contractor shall erect temporary barricades with necessary safety devices, as required to protect personnel from injury, removing all such temporary protection upon completion of the work.

b. The Contractor shall provide temporary or new services to all existing facilities as required to maintain their proper operation when normal services are disrupted as a result of the work being accomplished under this project.

c. Where existing construction is removed to provide working and extension access to existing utilities, the Contractor shall remove doors, piping, conduit, outlet boxes, wiring, light fixtures, air conditioning ductwork, and equipment, etc., to provide this access and shall reinstall same upon completion of work in the areas affected.

d. Where partitions, walls, floors, or ceilings of existing construction are indicated to be removed and equipment located in these areas is required to remain in operation, the Contractor shall remove and reinstall all equipment required for the operation of the remaining electrical systems. This is to include but is not limited to electrical switches, relays, fixtures, conduit, etc.

SECTION 26 0000

ELECTRICAL GENERAL PROVISIONS

3.13 OUTAGES

a. Outages of services as required by the project will be permitted but only at time approved by the Owner. The Contractor shall notify the Owner in writing two weeks in advance of the requested outage in order to schedule required outages. No outages shall be taken unless written approval has first been received from the Owner. The time allowed for outages will not be during normal working hours unless otherwise approved by the Owner. All costs of outages, including overtime charges, shall be included in the contract amount.

3.14 TESTING

a. Tests to be completed by the Contractor shall be of two types. During construction, system testing shall be accomplished to determine whether systems are suitably wired, and if systems operated as specified. Later, demonstration testing shall be accomplished for the purpose of showing that the systems operated as designed.

(1) Provide records of tests for individual tests as required below. The tests records shall include the results of the test, and the persons conducting. These tests shall be included in the Operation and Maintenance Manual under the test section.

(2) Following each demonstration test, a certified record of each test shall be made. All demonstration testing shall be witnessed by the Architect or his representative and the owner's representative. The records of the demonstration testing shall be signed by the persons conducting and witnessing the test. Demonstration tests will not be considered complete unless a signed certificate is provided for each test.

(3) The Contractor shall provide all test equipment, temporary wiring, labor, etc., required to perform the testing.

b. System Tests

(1) After the branch circuit conductors have been installed, but before they have been

connected to the associated wiring devices, test all conductors for short circuits, open circuits. These tests shall be performed by reading resistance in ohms with a multi-meter.

(2) After feeder conductors have been installed, but before they have been terminated, test all conductors for short circuit, open circuits and insulation resistance. The short circuit and open circuit test shall be performed by reading resistance in ohms with a multi-meter. The insulation resistance test shall be performed by reading resistance to ground in ohms with a megaohm meter. Submit test results in the Operation and Maintenance Manuals.

(3) Test the insulation resistance of all motor windings to ground with a megaohm meter before applying line voltage to the motors. If these values are less than 1 megohm, the Contractor furnishing the motor shall be notified and shall correct the deficiency. Submit test results in the Operation and Maintenance Manuals.

(4) With the system energized, make line-to-line voltage and line current measurements at all motors under full load conditions. Should measured values deviate +/- 5% from the nameplate ratings, the condition shall be corrected. Notify the Architect immediately should deviations occur. Submit test results in the Operation and Maintenance Manuals.

(5) Any wiring device, lighting fixture or electrical apparatus if grounded or shorted in an integral "line" part, shall be removed and the trouble corrected or device replaced.

(6) Systems such as fire alarm, intercom, nurse call, public address, security and special access systems shall be tested by the system supplier. Following the test, provide an affidavit that the system has been tested by him, and that the system is complete and operational as specified.

(7) System voltages shall be measured and recorded under maximum load conditions available during construction. Incoming service voltage, as well as transformer secondary voltages shall be checked and adjusted to be equal to the voltage rating, or not exceeding 2-1/2% above the voltage rating. Line-to-line voltages should be adjusted between 460 and 480 volts, or 208 and 213 volts. A record of each final test along with time of day, date, and conditions of loading should be recorded for each test location. Submit test results in the Operation and Maintenance Manuals.

(8) Test for load division between all conductors in parallel feeders. The difference in current carried between the individual feeders comprising the parallel feeder shall not exceed 10% of feeder current. Records shall indicate amperage, voltage, and feeder identification. Any feeder not in compliance shall be modified to correct the load division to within 10% and shall be retested. Submit test results in the Operation and Maintenance Manuals.

(9) The Contractor shall test all receptacles for power polarity and ground to assure that all receptacles are operating properly, correctly wired and suitably grounded. Provide an affidavit to the effect that this work has been accomplished.

(10) Do not subject Ground Fault Interrupter (GFCI) type breakers or receptacles to megger tests.

c. Demonstration Test of Completed Systems. Demonstrate the features and operation of the following systems:

(1) Electrical entrance equipment:

(a) Fuses, fuse holders and switches.

(b) Meter sockets and meters.

(c) Switching.

(d) Operation of circuit breakers.

(e) Ground fault protection devices.

(2) Electrical system and control and equipment:

(a) Contactors.

(b) Panelboards.

(3) Lighting systems:

(a) Lighting controls.

(b) Interior and exterior light fixtures.

(c) Emergency lighting systems.

(d) Light fixtures, with emergency power pack.

d. Each system shall be demonstrated once only, after completion of satisfactory testing and acceptance.

e. The demonstration shall be held upon completion and acceptance of all systems at a date to be agreed upon in writing by the Architect.

f. The demonstration shall be held by the appropriate Contractors in the presence of the Architect or his representative and the manufacturer's representative.

g. Demonstrate the functions and location (in the structure) of each system, and indicate its relationship to the riser diagrams and drawings.

h. Demonstrate by "start-stop operation" how to work the controls, how to reset protective devices, how to replace fuses, and what to do in case of emergency.

i. Check rotation of all equipment and correct if necessary.

3.15 CONDITIONS OF EQUIPMENT AT FINAL ACCEPTANCE

a. At time of acceptance, the Contractor shall have inspected all installed systems to assure the following has been completed:

(1) Fixtures are operating, lenses and reflectors are free of dust, debris, and fingerprints.

(2) Panelboards have all conductors neatly formed, laced and made-up tight. Enclosures shall be vacuum cleaned, surfaces clean of stray paint, dust, grease and fingerprints. All circuit directories to be neatly typed and in place.

(3) Wall plates and exposed switch and receptacle parts to be clean, free of paint, plaster, etc.

(4) Safety and disconnect switches and motor starters to be vacuum cleaned of debris, dust and all surfaces free of stray paint, grease and fingerprints.

(5) Switchgear, transformers and system devices shall be cleaned internally and externally and have all surfaces restored to initial surface conditions.

(6) Touch-up all scratched surfaces using paint matching the existing equipment paint. Where paint cannot be matched, the entire surface shall be repainted in a color and manner approved by the Architect.

(7) All electrical equipment shall bare proper labeling as specified under this section.

3.16 GUARANTEE

a. The Contractor shall guarantee all materials and workmanship for a period of twelve (12) months after the final acceptance of work.

End of Section 26 0000

SECTION 26 0519

INSULATED CONDUCTORS

1.0 GENERAL

1.1 SUMMARY

a. This section specifies the furnishing and installation of 600 volt insulated conductors, wire connectors, cable end caps, torque seals, etc.

b. All electrical conductors shall be copper. Aluminum conductors are not allowed.

1.2 REFERENCE STANDARDS

a. ANSI/UL 83 - Thermoplastic-insulated Wires.

b. ICEA S-61-402 (NEMA WC 5) - Thermoplastic-insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

c. UL486A – 486B – Standard for Safety Wire Connectors.

1.3 APPLICABLE PROVISIONS

a. Refer to Section 26 00 00 - Electrical General Provisions.

1.4 SUBMITTALS

a. Submit manufacturer's data on electrical wires, cables connectors and accessories.

1.5 DELIVERY, STORAGE, AND HANDLING:

a. Deliver wire and cable properly packaged in factory-fabricated type containers, or wound on NEMA-specified type wire and cable reels.

b. Store wire and cable in clean dry space in original containers. Protect products from weather, damaging fumes, construction debris and traffic.

c. Handle wire and cable carefully to avoid abrasing, puncturing and tearing wire and cable insulation and sheathing. Ensure that dielectric resistance integrity of wires/cables is maintained.

2.0 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

a. Subject to compliance with requirements, acceptable manufacturers shall be as follows:

(1) Copper Insulated Conductors.

(a) American Insulated Wire Corporation.

(b) Encore Wire Ltd.

(c) Southwire Company.

(d) Aetna Insulated Wire Corp.l

(2) Wire Connectors.

(a) Burndy.

(b) 3M Electrical Products Division.

(c) Ilsco.

(d) Ideal.

(e) Thomas & Betts.

(3) Cable End (cold shrink)

(a) 3M.

(b) Thomas & Betts.

2.1 600-VOLT INSULATED CONDUCTORS

a. All conductors shall be soft-drawn annealed copper with conductivity of not less than 98% at 20 degrees C (68 degrees F).

b. Conductors No. 10 AWG and smaller shall be solid and conductors No. 8 AWG and larger shall be stranded. Minimum wire size shall be #12 unless otherwise noted on the drawings.

c. All wire and cable shall be permanently marked approximately every two feet to indicate size, voltage and type temperature rating in accordance with NEC Article 310.11.

d. Provide factory colored insulation for conductors for No. 10 and smaller. Color code larger insulated conductors with an approved field applied tape.

e. Insulation shall be as follows:

(1) Type THW: For dry and wet locations; max operating temperature 75 degrees C (167 degrees F). PVC insulation, with a minimum insulation rating of 600 volts. Meet UL 83 and Federal Spec. J-C-30B.

(2) Type THHN or THWN: For dry and wet locations; maximum operating temperature shall be 75℃ (THWN) or 90℃ (THHN). UL listed as gasoline and oil resistant. PVC insulation with nylon outer jacket. Meet UL 83 and Federal Spec J-C-30B.

(3) Type XHHW: For wet or dry locations; maximum operating temperature 90°C.
insulation shall be cross-linked polyethylene complying with UL 44 for XHHW-2.

2.2 INSULATED ELECTRICAL SPRING CONNECTORS

a. Provide color coded, electrical spring connectors with a pliable vinyl skirt. The connectors shall be temperature rated 105 degrees Celsius with 600 volt insulation. The connectors shall be U.L. listed and comply with Federal Specification W-S-160.

2.3 COMPRESSION CONNECTORS AND LUGS

a. The connectors shall be copper with tin plating. The connectors and lugs shall be designed to connect to the cable by means of dieless hydraulic compression tool.

2.4 INSULATED POWER DISTRIBUTION BLOCKS

a. The power distribution blocks shall be rated 600 volt, 90 degrees Celsius with tin plated copper connections. The blocks shall be mounted in an insulated base with a removable clear cover. The connector size and configuration shall be as recommended by the manufacturer for the conductors being spliced.

3.0 EXECUTION

3.1 INSTALLATION

a. Mechanically protect conductors for systems by installing in raceways. Do not install the conductors until raceway system is complete and properly cleaned. Do not bend any conductor either permanently or temporarily during installation to radii less than four times the outer diameter of 600-volt insulated conductors. Do not exceed manufacturer's recommended values for maximum pulling tension.

b. Use Ideal Wire Lube Yellow #77 Plus wire pulling lubricant or equal when pulling large conductors. The lubricant shall be compatible with rubber, neoprene, nylon polyvinyl chloride, high density or cross linked polyethylene, low density polyethylene, semiconducting jacket and hypalon cable types. Wiring pulling compound shall be U.L. listed and approved by wiring manufacturer.

c. Pull conductors simultaneously where more than one is being installed in same raceway.

d. Use pulling means including fish tape, cable, rope and basket weave wire/cable grips which will not damage cables or raceway.

e. Contractor may provide conductors with either THW or THHN-THWN insulation for general wiring.

f. Contractor shall provide conductors with XHHW insulation where called for on the drawings.

g. Neatly and securely bundle all conductors in enclosures using nylon straps with a locking hub or head on one end and a taper on the other.

3.2 SPLICES AND TERMINATIONS

a. Splices shall be kept to a minimum. Splices shall be made in junction and pull boxes. Splices shall not be made in conduit fittings, switch and circuit breaker enclosures, panelboards, motor starters, motor control centers or switchboards. All connectors shall be of material recommended by conductor manufacturer(s) to prevent any corrosion or electrolysis between dissimilar metals.

b. Use compression type connectors or insulated power distribution blocks for splices of all stranded conductors 6 AWG and larger. Mechanical, split bolt, type connectors for conductor splices are not acceptable.

c. Use ring-tongue type terminators on all control wiring.

d. Use insulated electrical spring connectors for conductors 8 AWG and smaller.

e. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standard 486A and B.

f. Furnish and install hot or cold shrink cable end caps to seal and insulate the portion of the conductor termination that is left exposed when conductors are terminated on mechanical lugs. The terminations shall be non-shielded and rated 1000 volts minimum and be sized in accordance with the manufacturer's recommendations.

3.3 CONDUCTOR SIZING

a. Conductors shall be provided as required by the more stringent requirements of the drawings or the specifications.

b. Provide No. 10 conductor for single-phase, 120-volt, 20-ampere branch circuits for which the distance from panelboard to the first outlet is more than 100 feet. The entire branch circuit from the overcurrent device to the last outlet shall be No. 10 minimum.

c. Provide No. 10 conductors for single-phase 277 volt, 20 amp circuits for which the distance from panelboard to the first outlet is more than 200 feet. The entire branch circuit from the overcurrent device to the last outlet shall be No. 10 minimum.

3.4 HOMERUNS

a. No more than three phase conductors, neutral and ground shall be installed in a single raceway for all feeders; HVAC and Plumbing equipment such as refrigeration equipment, fan motors, pumps, and compressors; elevators, and other similar types of equipment unless specifically noted on the drawings.

b. Multi-wire branch circuits and individual branch circuits shall be allowed to be combined in a single homerun. The maximum number of circuits shall be six. The contractor shall be responsible to apply the conductor ampacity derating factors and increase the raceway size as required by the NEC.

c. All individual branch circuits shall have a separate neutral conductor and the neutral shall be considered a current carrying conductor.

d. Provide a separate neutral conductor for each receptacle circuit serving isolated ground

receptacles. This neutral shall be considered a current carrying conductor.

e. Provide a separate neutral conductor for each branch circuit serving the receptacles in the bedroom/sleeping areas of the facility. The separate neutral is required for proper operation of the Arc Fault Circuit Interrupting overcurrent protective device.

f. Use home run circuit numbers as indicated for panelboard connections.

g. Comply with ampacity adjustment factors as required by the NEC Article 310.16.

3.5 COLOR CODE

a. Provide color coding for the conductors of each feeder, and branch circuit. The conductor color coding shall be in accordance with the local authority having jurisdiction in cases where local code requirements differ from the requirements listed in the color code table. Verify the code with the engineering prior to releasing the conductor materials for purchasing.

b. All wiring shall be color coded in accordance with Section 26 05 53.

3.6 SIGNAL, COMMUNICATIONS, AND/OR SIMILAR SYSTEMS

a. Special system(s) conductors (i.e., telephone, intercom, P.A., fire alarm system(s), etc.) shall be sized as required and recommended by the system manufacturer.

End of Section 26 0519

SECTION 26 0526

GROUNDING

1.0 GENERAL

1.1 WORK INCLUDED

a. Power system grounding.

b. Electrical equipment and raceway grounding and bonding.

c. This section specifies the furnishing and installation of grounding and bonding equipment for electrical systems.

d. Extent of electrical grounding and bonding work is as specified herein. Provide a completely grounded system sized in accordance with Article 250 of the NEC. Each piece of electrical apparatus shall be solidly grounded with separate insulated green ground w i r e .

e. All grounding conductors terminating in ground bus bar shall be labeled, i.e., water main ground, building steel ground, building counterpoise ground loop, e t c .

1.2 RELATED W ORK

a. Division 26.

1.3 REFERENCES

a. NFPA 70 – National Electrical Code, latest edition

b. ANSI/UL 467 – Electrical Grounding and Bonding Equipment

c. ANSI/IEEE STD 142 – Recommended Practice for Grounding of Industrial and Commercial Power Systems

d. IEEE 81 – Guide for Measuring Earth Receptivity, Ground Impedance and earth Surface Potential of a ground System

e. IEEE 1100 – Recommended Practice for Powering and Grounding Sensitive Electronic Equipment

f. ANSI/TIA/EIA 607 – Commercial Building Grounding and Bonding Requirements for Telecommunications.

g. ANSI/IEEE Std. 142 – Recommended Practice for grounding industrial and commercial power systems.

1.4 SYSTEM DESCRIPTION

a. Ground the electrical service system neutral at service entrance equipment to grounding electrodes- confirm. Electrical systems that are grounded shall be connected to earth in a manner that will limit the voltage imposed by lightning, line surges, or unintentional contact with higher-voltage lines and that will stabilize the voltage to earth during normal operations. Concrete encased electrodes shall be connected as the most effective grounding electrodes. Provide a completely grounded system in accordance with Article 250 of the NEC. Provide a concrete encased grounding electrode in accordance with the NEC Article 250.52(A)(3).

b. Ground each separately derived system neutral to separate ground buses that are installed in nearest electrical rooms. Transformer, emergency generator, automatic transfer switches, power conditioners, inverters, or other power supplies are separately derived systems. Standby or emergency generators are separately derived systems if the neutral is bonded to the generator frame and if there is no direct connection of the generator neutral conductor to the service neutral conductor.

c. Provide each telephone and data (TR rooms) and electrical rooms with ground bus. Connect ground busses to the building's main electrical ground bus with a #4/0 AW G ground conductor from each room ground bus to the main electrical room ground bus. Interconnecting ground busses in a daisy chain manner is prohibited and not allowed.

d. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, cable trays, auxiliary gutters, meter fittings, boxes, cable armor, cable sheath, ground bus in electrical rooms and telephone and data (TR rooms) rooms, metal frame of the building or structure encased grounding electrode, ground loop, lightning down lead conductor, grounding conductor in raceways and cables, receptacle ground connectors, and metal underground water pipe.

e. Bonding jumpers shall be installed around non-metal fittings or insulating joints to ensure electrical continuity. Bonding shall be provided where necessary to ensure electrical continuity and the capacity to conduct safely any fault current likely to be imposed.

f. Supplementary Grounding Electrode. Install ground rod in suitable recessed well; fill with gravel after connection is made.

1.5 SUBMITTALS

a. Provide submittals in accordance with and in additional to Section 26 00 00, Basic Electrical Requirements, and Division 01 for submittal requirement.

1.6 QUALITY ASSURANCE

a. Commissioning of a system or systems specified in this section is part of the construction process. Documentation and testing of these systems, as well as training of the Owner's operation and maintenance personnel, is required in cooperation with the Owner's Representative and the Commissioning Agent. Project Closeout is dependent on successful completion of all commissioning procedures, documentation, and issue closure.

2.0 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

a. Grounding system components shall be as required to comply with the design and construction of the system indicated. Components shall be as indicated in manufacturer's submittal data.

b. Ground conductors shall be stranded tinned, annealed copper cable of the sizes indicated on drawings. Bond grounding conductors at both ends of metallic conduit.

c. Grounding clips shall be Steel City Type G, or equal.

d. Ground Rods shall be copper-encased steel, 7/8" diameter, minimum length 10 feet.

e. Use chemical ground rods in areas with rocky soil.

3.0 EXECUTION

3.1 INSTALLATION

a. Install ground system in accordance with the applicable requirements of the National Electrical Code and the National Electrical Contractors Association's "Standard of Installation".

b. Install grounding conductors continuous, without splice or connection, between equipment and grounding electrodes. Install test wells at each building corner.

c. In feeder and branch circuits, provide a separate, insulated equipment grounding conductor. Terminate each end on a grounding lug, bus, or bushing.

d. Connect grounding electrode conductors to metal water pipe where metal pipe is available and accessible using suitable ground clamp. Make connections to flanged piping at street side of flange. Provide bonding jumper around water meter.

e. Install fusion welded ground connectors where they are concealed or inaccessible.

f. Ground each outlet by the use of an approved grounding clip attached to the junction box in such a position to be readily inspected on removal of the cover plate, or by the use of an approved grounding yoke type receptacle.

g. No strap grounding clamps shall be used; connections requiring bolting shall be made up with monel metal bolts, washers and nuts. Connections shall be made only after surfaces have been cleaned, or ground to expose virgin metal.

h. Conductor connections shall be made by means of solderless connectors such as serrated bolted clamps or split bolt and nut type connectors.

i. The neutral of each transformer shall be bonded to system ground at one point only. This point shall be ahead of the first secondary protective device.

j. Connect grounding conductors to ground rods at the upper end of the rod with the end of the rod and the connection points below finished grade. Below grade connection shall be exothermic-welded type connectors as manufactured by Cadweld, Thermoweld. In manhole, install ground rods with 4 to 6 inches above the floor with connections of grounding conductors fully visible and accessible.

3.2 GROUNDING ELECTRODE

a. Provide a grounding electrode system for the service entrance equipment at the building. Provide a bonding conductor between the service equipment ground and neutral bus. The ground electrode systems shall consist of the following:

(1) The grounded service conductor at the service entrance switchgear.

(2) The building structural steel shall be grounded by means of a bonding jumper or conductor connected to the ground electrode system.

(3) The metal underground water pipe (if available) shall be bonded to the ground electrode system. Provide bonding jumpers around insulated pipe joints as required.

(4) A concrete encased electrode shall be provided. The electrode shall be installed per Article 250 of the NEC.

(5) Other electrodes shall be connected to the system as called for on the drawings grounding riser diagram.

3.3 SYSTEM GROUND

a. The system neutral and ground shall be bonded to the grounding electrode conductor in the service entrance switchgear in accordance with NEC 250. The system neutral and ground shall not be bonded at any other point in the distribution system except for separately derived systems.

b. Ground all separately derived systems in accordance with NEC 250.

c. The system grounding electrode conductor shall be in accordance with NEC 250, unless larger sizes are indicated.

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d. Bond the service entrance conduits together and connect to the main bonding jumper. Main and equipment bonding jumpers shall be sized in accordance with NEC 250.

3.4 EQUIPMENT GROUND

a. Provide a ground bus in all electrical and communications rooms. Mount bus 24 inches above finished floor and 1-inch from wall around perimeter of room. Connect bus by a grounding connector with a cross-sectional area equivalent to the ground bus to an acceptable grounding electrode as described in Article 250. Connect all noncurrent-carrying metallic parts of electrical equipment in the room to the bus.

b. Raceway Systems and Equipment Enclosures.

(1) Ground cabinets, junction boxes, outlet boxes, motors, controllers, raceways, fittings, switchgear, transformer enclosures, other equipment and metallic enclosures. Ground equipment and enclosures to the continuous-grounded, metallic raceway system in addition to any other specific grounding s h o w n .

(2) Provide bonding jumpers and ground wire throughout to ensure electrical continuity of the grounding system. Bonding jumpers shall be sized in accordance with NEC 250.

(3) Provide an equipment grounding conductor in each branch circuit and each feeder.

c. Grounding conductors shall be sized in accordance with NEC 250 unless larger sizes are indicated.

d. Bonding equipment jumpers shall be sized in accordance with NEC 250 unless larger sizes are indicated.

3.5 GROUNDING BUSHINGS

a. Feeder conduits terminating in switchboards, distribution panels, motor control centers and panelboards shall be provided with grounding bushings. Bushings shall be connected to the ground bus in the equipment. Connect the equipment grounding conductor to the grounding bushing and the equipment ground bus in the associated switchgear.

3.6 MOTORS

a. Ground each motor by means of a separate grounding conductor in the conduit connection to the motor. Grounding conductors shall be sized in accordance with NEC Table 250-122 and shall be securely and permanently attached to the motor body and to the ground bus in the panelboard, switchboard or motor control center.

3.7 RECEPTACLES

a. All receptacles shall be bonded to their device box. This connection shall be made by means of a bonding jumper between the device and the box. W here the receptacle mounting yokes are designed and listed for the purpose of grounding the bonding jumper may be omitted.

b. All isolated ground receptacles shall have an isolated ground conductor installed complete from receptacle to the isolated ground bus in the associated panelboard.

3.8 FIELD QUALITY CONTROL

a. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

b. Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Resistance shall not exceed 5 ohms. Provide additional ground rod as required until resistance reading is 5 ohms or less.

c. Contractors' tests shall be scheduled and documented in accordance with the commissioning requirements.

d. System verification testing is part of the Commissioning Process. Verification testing shall be performed by the contractor and witnessed and documented by the Commissioning Agent.

End of Section 26 0526

SECTION 26 0529

METAL FRAMING AND SUPPORTS

1.0 GENERAL

1.1 SUMMARY

a. This Section specifies the furnishing and installation of metal framing, including channels, necessary hangers, fittings, clamps, anchor bolts and rods, hardware, supports, electrical accessories and brackets, for properly installing all electrical equipment and materials.

b. All support systems shall be adequate for weight of equipment and conduit, including wiring which they carry. Support systems shall be sized to support an additional 25 percent for future loads.

1.2 REFERENCE STANDARDS

a. NEMA ML 1 - Metal Framing.

b. NFPA 70 - National Electrical Code.

1.3 APPLICABLE PROVISIONS

a. Refer to Section 26 00 00 - Electrical General Provisions.

1.4 SUBMITTALS

a. Submit product data for all materials including, but not limited to: pipe straps, beam clamps, metal framing, rod hangers, trapeze hangers, u-bolts.

2.0 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

a. Subject to compliance with the requirements, acceptable manufacturers shall be as follows:

1. Metal Framing.

(a) American Electric.

(b) Allied Tube and Conduit.

(c) B-Line Systems Inc.

(d) Kindorf, Electrical Products Division.

(e) Unistrut.

2. Insert Anchors.

(a) Ackerman-Johnson Fasteners.

(b) American Electric.

(c) Hilti Inc.

(d) Star Expansion Co.

3. Supports.

(a) Caddy.

(b) Crouse-Hinds.

(c) Appleton.

(d) Steel City.

2.2 CHANNEL SYSTEMS

a. Fabricate channels from pre-galvanized stip steel in accordance with ASTM A-446, Grade A requirements. The minimum channel size shall be 1-5/8 inches wide by 7/8 inch deep. Provide larger channels as required to suit the particular installation requirements.

b. Fabricate clamping nuts steel bar stock. Channel clamping nuts shall meet the requirements of ASTM A-575, Grade M 1015 and shall be case hardened to 25 HRC. Hex head nuts and bolts shall meet the requirements of ASTM A-563 and ASTM A-307.

c. All nuts and bolts shall meet the requirements of the Unified Screw Threads standard ANSI B1.1, course series UNC, Class 2.

d. All fasteners shall have an electro-galvanized finish.

e. Channel system fittings shall be fabricated from bar or strip steel in accordance with the requirements of ASTM A-36. All fittings shall have an electro-galvanized finish.

f. Channel system clamps shall be fabricated from steel in accordance with the requirements of ASTM A-569. All clamps shall have an electro-galvanized finish. Provide clamps that eliminate metal to metal contact between the clamp and the conduit.

g. Channel system mounting brackets shall be fabricated from hot rolled steel. All fittings

shall have an electro-galvanized finish.

h. Channel system beam clamps shall be fabricated from cold formed steel or cast from malleable iron. All beam clamps shall have an electro-galvanized finish.

2.3 ROD HANGERS

a. Rod hangers shall be selected for weight supported but shall not be smaller than No. 8.

b. Rod hangers and adjustable "J" pipe hangers equal to Kindorf Type C-149 for conduits. Conduits two inches (2") and smaller may be fastened with pipe hangers equal to Kindorf Type 6H.

2.4 MISCELLANEOUS FASTENERS

a. Galvanized U-bolts or Kindorf C-210 riser pipe clamps on channel iron bearing plates at intervals of at least one clam p per joint shall be provided for support of vertical runs of conduits of more than twelve feet (12').

3.0 EXECUTION

3.1 INSTALLATION

a. Securely fasten and support conduits and raceways of all types and all electrical boxes, devices, and equipment from the main building structure. Conduit system shall not be supported by ceiling hanger wires. Support conduits within three feet (3'-0") of each end, of each bend and each termination. Support conduit runs at ten feet (10'-0") intervals along the run to maintain true raceway alignment without sag or deformation. The use of cadi-clips for conduit supports from suspended ceiling systems is not acceptable. Caddy clips must be supported from their own independent hanger wires anchored to building structure.

b. On exposed raceways and cable run without conduit, provide supports at a minimum of six feet (6') on centers and on each side of each bend. Vertical conduits shall be supported at not more than 10' on center in addition to the above.

c. Maintain horizontal and vertical alignment of raceways to not adversely effect the building structure in strength or appearance. Cable and strap shall not be used.

d. Install exposed wall mounted conduits after wall surface is installed. Secure the conduits with anchors that provide adequate space to allow wall to be painted after conduit is installed.

e. Support cabinets and boxes to the floor and to the structure above independent of all raceways entering the boxes. Structural walls or columns may be used to support these cabinets or boxes.

f. Secure panelboard cabinets and boxes to the building structure independent of all raceways entering the cabinets and boxes.

g. Angle iron or framing channel supports or other load bearing approved support means shall be used to support all panelboards, cabinets, junction and pull boxes.

h. Fasten cabinets, boxes, panelboards, disconnects, motor controls and similar devices indicated other than at walls on channel iron racks mounted to floor and structure above. Three-fourths inch (3/4") thick plywood backboards painted to match the equipment finish may be used as a part of the rack.

i. All boxes shall be rigidly and securely fastened to the structural surface to which they attach. All boxes must be supported from a structural portion of the building independent of the raceway system.

(1) Surface mounted boxes shall be fastened by means of wood screws to wood, expansion bolts on concrete, toggle bolts on hollow masonry units and machine screws on metal construction.

(2) Exposed boxes shall be supported by means of all-thread rods 1/4" diameter minimum. The all-thread rods shall be secured to the structure.

(3) Boxes concealed in walls shall be secured to the wall stud with a minimum of two fasteners. Use wood screws in wood and machine screws in metal. Boxes that attach to metal studs shall be fastened to a second wall stud by means of a backing brace or rod.

(4) Boxes recessed in suspended ceilings shall be supported in the sam e m anner as described for exposed boxes or by means of approved bar hangers that attach firmly to the ceiling grid.

(5) Boxes embedded in concrete or masonry boxes shall have integral metal ears that embed into the concrete or masonry grout.

(6) The methods of support outlined herein are not intended to cover every condition. If conditions other than these occur, the contractor shall propose a method to the engineer for approval prior to installation.

j. Place support and leveling channels for free standing type switchgear, transformers, and motor control equipment.

k. Rust inhibit all supports by galvanizing or other approved means. Supports shall be job rust inhibited at all cuts, breaks, welds, or other points where rust inhibitor coating is broken.

3.2 ANCHOR BOLTS

a. Use 3/8-inch diameter by 3 inches long expansion bolts to attach framing to concrete. Space bolts a maximum of 24 inches on center, with not less than two bolts per piece of framing.

3.3 TOUCH-UP

a. Touch up all scratches or cuts on steel components with an approved zinc chromate or a 90% zinc paint. Use a PVC compound on PVC-coated components.

End of Section 26 0529

SECTION 26 0533

RACEWAYS AND BOXES

1.0 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. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

(1) Raceways include the following:

(a) RMC.

(b) IMC.

(c) EMT.

(d) FMC.

(e) LFMC.

(f) RNC.

(g) Wireways.

(h) Surface raceways.

(2) Boxes, enclosures, and cabinets include the following:

(a) Device boxes.

(b) Floor boxes.

(c) Outlet boxes.

(d) Pull and junction boxes.

(e) Cabinets and hinged-cover enclosures.

b. Related Sections include the following:

(1) Division 07 Section “Firestopping.”

(2) Division 26 Section “Basic Electrical Materials and Methods” for raceways and box supports.

(3) Division 26 Section “Wiring Devices” for devices installed in boxes and for floor-box service fittings.

1.3 DEFINITIONS

a. EMT: Electrical metallic tubing.

b. FMC: Flexible metal conduit.

c. IMC: Intermediate metal conduit.

d. LFMC: Liquidtight flexible metal conduit.

e. RMC: Rigid metal (steel) conduit.

f. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

a. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

b. Shop Drawings: Include layout drawings showing components and wiring for nonstandard boxes, enclosures, and cabinets.

1.5 QUALITY ASSURANCE

a. Listing and Labeling: Provide raceways and boxes specified in this Section that are listed and labeled.

(1) The Terms “Listed” and “Labeled”. As defined in NFPA 70, Article 100.

b. Comply with NECA’s “Standard of Installation”.

c. Comply with NFPA 70.

1.6 COORDINATION

a. Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

2.0 PRODUCTS

2.1 MANUFACTURERS

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

(1) Metal Conduit and Tubing:

(a) Carol Cable Co., Inc.

(b) Grinnell Co.: Allied Tube and Conduit Div.

(c) Triangle PWC, Inc.

(d) Wheatland Tube Co.

(2) Nonmetallic Conduit and Tubing:

(a) CertainTeed Corp.: Pipe & Plastics Group.

(b) Condux International: Electrical Products.

(c) Hubbell, Inc.: Raco, Inc.

(d) Lamson & Sessions: Carlon Electrical Products.

(e) R&G Sloan Manufacturing Co., Inc.

(f) homas & Betts Corp.

(g) Champion Fiberglass.

(3) Conduit Bodies and Fittings:

(a) American Electric; Construction Materials Group.

(b) Crouse-Hinds; Div. of Cooper Industries.

(c) Emerson Electric Co.; Appleton Electric Co.

(d) Hubbell, Inc.; Killark Electric Manufacturing Co.

(e) Lamson & Sessions; Carlon Electrical Products.

(f) O-Z/Gedney; Unit of General Signal.

(4) Metal Wireways:

(a) Hoffman Engineering Co.

(b) Square D Co.

(5) Nonmetallic Wireways:

(a) Hoffman Engineering Co.

(b) Lamson & Sessions; Carlon Electrical Products.

(6) Surface Metal Raceways:

(a) Hubbell, Inc.; Wiring Device Division.

(b) Airey-Thompson Co., Inc.; A-T Power Systems.

(c) American Electric; Construction Materials Group.

(d) Wiremold Co. (The); Electrical Sales Division.

(7) Surface Nonmetallic Raceways:

(a) Butlet Manufacturing Co.; Walker Division.

(b) Hubbell, Inc.; Wiring Device Division.

(c) Lamson & Sessions: Carlon Electrical Products.

(d) Panduit Corp.

(e) Wiremold Co. (The); Electrical Sales Division.

(8) Boxes, Enclosures, and Cabinets:

(a) American Electric; FL Industries.

(b) Butler Manufacturing Co.; Walker Division.

(c) Crouse-Hinds; Div. of Cooper Industries.

(d) Erickson Electrical Equipment Co.

(e) Hoffman Engineering Co.; Federal-Hoffman, Inc.

(f) Hubbell Inc.; Killark Electric Manufacturing Co.

(g) Hubbell Inc.; Raco, Inc.

(h) O-Z/Gedney; Unit of General Signal.

(i) Parker Electrical Manufacturing Co.

(j) Scott Fetzer Co.; Adalet-PLM.

(k) Spring City Electrical Manufacturing Co.

(l) Thomas A7 Betts Corp.

(m) Woodhead Industries, Inc.; Daniel Woodhead Co.

2.2 METAL CONDUIT AND TUBING

a. RMC: Rigid Metal (Steel) Conduit: ANSI C80.1.

b. IMC: ANSI C80.6.

c. EMT and Fittings: ANSI C80.3

(1) Fittings: Steel Set Screw.

d. FMC: Zinc-coated steel.

e. LFMC: Flexible steel conduit with PVC jacket.

f. Fittings: NEMA FB 1; Fittings for all raceways shall be “steel” or “malleable iron”, “die cast or plastic fittings” shall not be utilized. Fittings for flexible steel conduit shall be “steel” or “malleable iron” with “insulated throats”.

2.3 NONMETALLIC CONDUIT AND TUBING

a. RNC: NEMA TC 2, Schedule 40 or 80 PVC.

b. RNC Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.

c. RTRC: NEC – Article 355 – Fiberglass conduit.

2.4 METAL WIREWAYS

a. Material: Sheet metal sized and shaped as indicated.

b. Fittings and Accessories: Include 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.

c. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

d. Wireway Covers: As indicated.

e. Finish: Manufacturer’s standard enamel finish.

2.5 SURFACE RACEWAYS

a. Surface Metal Raceways: Galvanized steel with snap-on covers or as indicated on the drawings. Finish with manufacturer’s standard prime coating.

b. Surface Nonmetallic Raceways: 2-piece construction, manufactured of rigid PVC compound with matte texture and manufacturer’s standard color.

c. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.6 OUTLET AND DEVICE BOXES

a. Sheet Metal Boxes: NEMA OS 1.

b. Cast-Metal Boxes: NEMA FB 1, Type FD, cast box with gasketed cover.

c. Nonmetallic Boxes: NEMA OS 2.

2.7 FLOOR BOXES

a. Floor Boxes: Cast metal, fully adjustable, rectangular or as scheduled on the Electrical Drawings.

2.8 PULL AND JUNCTION BOXES

a. Small Sheet Metal Boxes: NEMA OS 1.

b. Cast-Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

2.9 ENCLOSURES AND CABINETS

a. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

(1) Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

b. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage, and include accessory feet where required for freestanding equipment.

3.0 EXECUTION

3.1 EXAMINATION

a. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRING METHODS

a. Outdoors: Use the following wiring methods:

(1) Exposed: Rigid metal (steel) (RMC) or IMC.

(2) Concealed: Rigid metal (steel) (RMC) or IMC.

(3) Underground, Single Run: RNC or RTRC.

(4) Underground, Grouped: RNC or RTRC.

(5) Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

(6) Boxes and Enclosures: NEMA 250, Type 3R or Type 4.

b. Indoors: Use the following methods:

(1) Exposed: EMT, IMC or RMC.

(2) Concealed: EMT, IMC or RMC.

(3) Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except in wet or damp locations, use LFMC.

(4) Damp or Wet Locations: Damp or wet locations shall be as defined in the National Electrical Code (NEC); Rigid steel (RMC) or (IMC) conduit.

(5) Boxes and Enclosures: NEMA 250, Type 1, except as follows:

(a) Damp or Wet Locations: Damp or wet locations shall be as defined in the National Electrical Code (NEC) except for installations "in concrete slabs and underground". NEMA 250, Type 4, stainless steel.

c. Under Suspended Floor Structures (Same as Damp or Wet Locations except as noted below for Boxes and Enclosures): Use the following wiring methods:

(1) Rigid metal steel, (RMC), or (IMC) conduit.

(2) Boxes and Enclosures: NEMA 250, Type 1.

d. In Concrete Slabs:

(1) RNC with Rigid steel elbows (RMC).

3.3 INSTALLATION

a. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.

b. Minimum Raceway Size: ½-inch trade size.

c. Conceal raceways, unless otherwise indicated, within finished walls, ceilings, and floors.

d. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

e. Install raceways level and square and at proper elevations. Provide adequate headroom.

f. Complete raceway installation before starting conductor installation.

g. Support raceways as specified in Division 26 Section "Basic Electrical Materials and Methods."

h. Use temporary closures to prevent foreign matter from entering raceways.

i. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

j. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

k. Use raceway fittings compatible with raceways and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, unless otherwise indicated.

l. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.

m. Raceways Embedded in Grade Supported concrete Slabs:

(1) Raceways shall not be embedded in concrete slabs except raceways serving floor outlets, raceways serving free standing equipment and other locations where specifically acceptable to the Owner's Representative.

(2) Install in middle third of slab thickness where practical, and leave at least 1-inch concrete cover.

(3) Raceways placed in beams or joists shall be placed in the middle of the beam or joist.

(4) Raceways shall not be supported by the steel reinforcement of a structural member. Raceways shall be supported by an independent support system of sufficient strength to maintain the position of the conduit during concrete placement.

(5) Raceways shall not be spaced closer than 3 diameters or widths on center.

(6) Raceways shall not be larger in outside diameter than 1/3 the overall thickness of the slab, wall or beam in which they are embedded or displace more than 4 percent of the area of the compression zone of the structural member.

(7) Raceways of aluminum construction shall not be embedded in concrete.

(8) Raceways turning up from concrete slabs shall be rigid stem (RMC) factory 90 degree elbows.

n. Raceways Embedded in Suspended Concrete Slabs:

(1) Raceways shall not be embedded in suspended concrete slabs at any location without the specific approval of the project's Structural Engineer prior to project bid data.

(2) If raceways are allowed by the Structural Engineer to be embedded in concrete slabs, the following will be the only areas and installation criteria acceptable under this section of the project specifications:

(a) Raceways shall not be embedded in concrete slabs except raceways serving floor outlets, raceways serving free standing equipment and other locations where specifically acceptable to the Owner's Representative.

(b) Raceways shall not be larger in outside diameter than 1/3 the overall thickness of the slab, wall or beam in which they are embedded or displace more than 4 percent of the area of the compression zone of the structural member.

(c) Raceways shall not be supported by the steel reinforcement of a structural member. Raceways shall be supported by an independent support system of sufficient strength to maintain the position of the conduit during concrete placement.

(d) Raceways shall not be spaced closer than 3 diameters or widths on center.

(e) No raceway larger than ¾-inch trade size shall be embedded in suspended concrete slabs.

(f) Raceways shall not be placed within 1-1/2 bar diameters of adjacent steel reinforcement diameter.

(g) Raceways shall not impair the strength of the construction.

(h) Raceways of aluminum construction shall not be embedded in concrete.

(i) Raceways turning up through concrete slabs shall be rigid steel (RMC) factory 90 degree elbows.

o. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.;

(1) Run parallel or banked raceways together, on common supports where practical.

(2) Make bends in parallel or banked runs from same centerline to make bends parallel. Use rectory elbows only where elbows can be installed parallel; otherwise, provide fieldbends for parallel raceways.

p. Join raceways with fittings designed and approved for the purpose and make joints tight.

(1) Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.

(2) Use insulating bushings to protect conductors.

q. Terminations: Where raceways are terminated with locknuts and bushings, align raceways toenter squarely and install locknuts with dished part against the box. Secure with 2 locknuts: 1 inside and 1 outside the box.

r. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder.

s. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of the pull wire.

t. Telephone and Signal System Raceways, 2-inch Trade Size and Smaller: In addition to the above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

u. Install raceway sealing fittings according to manufacturer's written instructions. Locate fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

(1) Where conduits pass from warm to cold locations, such as the boundaries of refrigerated spaces, entrances to air conditioning units, entrances to air handling units, etc.

(2) Where otherwise required by NFPA 70.

v. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with the finished floor. Extend conductors to equipment with rigid steel conduit: FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded flush plugs flush with floor for future equipment connections.

w. Flexible Connections: Use maximum of 6 feet of flexible conduit for recessed and semi recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquidtight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.

x. Install nonferrous conduit or tubing for circuits operating above 60 Hz.

y. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying the raceways to receptacle or fixture ground terminals.

(1) Select each surface raceway outlet box, to which a lighting fixture is attached, of sufficient diameter to provide a seat for the fixture canopy.

(2) Where a surface raceway is used to supply a fluorescent lighting fixture having central-stem suspension with a backplate and a canopy (with or without extension ring), no separate outlet box is required.

(3) Provide surface metal raceway outlet box, and the backplate and canopy, at the feed-in location of each fluorescent lighting fixture having end-stem suspension.

(4) Where a surface metal raceway extension is made from an existing outlet box on which a lighting fixture is installed, no additional surface-mounted outlet box is required provide a backplate slightly smaller than the fixture canopy.

z. Set floor boxes level and adjust to finished floor surface.

aa. Install hinged-cover enclosures and cabinets plumb. Support at each cornet.

3.4 PROTECTION

a. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.

(1) Repair damage to galvanized finished with zinc-rich paint recommended by manufacturer.

(2) Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.5 CLEANING

a. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

End of Section 26 0533

SECTION 26 0533.01

ELECTRICAL BOXES

1.0 GENERAL

1.1 SUMMARY

a. This section specifies the furnishing and installation of all outlet boxes, floor boxes, junction boxes and pull boxes.

1.2 REFERENCE STANDARDS

a. ANSI/NEMA Publication No. OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers and Box Supports, and Cast Aluminum Covers.

b. ANSI/UL 514 - Electrical Outlet Boxes and Fittings.

1.3 APPLICABLE PROVISIONS

a. Refer to Section 26 00 00 - Electrical General Provisions.

1.4 SUBMITTALS

a. Submit manufacturer's product data on electrical boxes.

1.5 DELIVERY STORAGE AND HANDLING

a. Deliver boxes properly packaged in accordance with Section 26 00 00.

2.0 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

a. Subject to compliance with the requirements, acceptable manufacturers shall be as follows:

(1) Appleton.

(2) American Electric.

(3) Cooper Crouse-Hinds.

(4) Hubbell Electrical Products.

(5) Hoffman Engineering Company.

(6) Thomas & Betts.

(7) O.Z. Gedney.

(8) Raco Inc.
(9) Thomas & Betts

2.2 OUTLET BOXES

a. Provide galvanized steel boxes of sufficient size to accommodate wiring devices to be installed at outlet. Provide an extension ring for the device to be installed. Square or rectangular boxes may be supplied. Provide boxes with threaded screw holes, with corrosion-resistant cover and grounding screws for fastening surface and device type box covers, and for equipment type grounding. Unless otherwise noted, provide 1 - ½ 2-1/8-inch deep by 4-inch box.

b. Provide corrosion-resistant cast-metal FS or FD rain tight outlet wiring boxes with threaded hubs for surface mounting in areas having exposed rigid metal conduit systems and all outdoor locations. Provide galvanized boxes for surface mounting in areas having exposed EMT.

c. Boxes for Lighting Fixtures. Provide galvanized steel octagonal boxes with fixture stud supports and attachments as required to properly support ceiling and bracket-type lighting fixtures. Unless otherwise noted, provide 1 - ½ 2-1/8-inch deep by 4-inch box.

d. Masonry Boxes. Provide galvanized steel, 3-1/2-inch deep, masonry boxes for all devices installed in masonry walls.

2.3 FLUSH FLOOR BOXES

a. Provide flush floor boxes as indicated on the drawings.

b. Provide rectangular, cast iron and formed concrete tight metal, corrosion resistant, Class 1 watertight, shallow type 2" deep for floors 3" thick or under and be semi-adjustable. For floors 4" or thicker the box shall be 3 7/16" deep and be fully adjustable. All boxes shall be a minimum of sixteen cubic inches per gang, compartmental type for combination receptacle and communications type, complete with duplex receptacle and brass flange and cover plate unless otherwise noted on the drawings. Duplex cover plates shall be capable of being locked down. Communications or sound covers shall be the concentric screw type. All flanges shall be compatible with the finished floor.

2.4 JUNCTION AND PULLBOXES

a. Junction and Pull Boxes: Provide galvanized code-gauge sheet steel junction and pull boxes, with screw-on covers; of types, shapes and sizes, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers. Junction and pull boxes shall be 16 gauge for sizes up to 12' x 12' x 12' and 10 gauges for all sizes 12" x 12" x 12" and larger.

b. Provide NEMA 1 boxes in interior dry locations.

c. Provide NEMA 3R boxes in all exterior locations and interior locations subject to moisture.

d. Provide NEMA 4 cast iron boxes with external recessed flanged cover when cast in concrete.

3.0 EXECUTION

3.1 COORDINATION

a. In order that all outlets may come in proper relation to paneling, decorated areas, etc., this Contractor shall familiarize himself with the details of these spaces and shall carefully lay out all outlets so that the equipment or piping of other trades passing under, over, across or in close proximity to same, will not cause the device or fixtures at or in these outlets to be inaccessible for use or maintenance. This Contractor must consult with the other Contractors on the project and procure all details of the various locations so as to make the outlet boxes come in proper relation to the work of all other trades. The Architect/Engineer reserves the right to relocate any outlet within reason from its original location shown on the plans prior to the application of the walls at no cost.

3.2 OUTLET BOXES

a. Unless otherwise indicated, mount all outlet boxes flush within 1/4-inch of the finished wall or ceiling line. Provide galvanized steel extension rings where required to extend the box forward in conformance to NEC requirements. Attach ring with at least two machine screws. Provide plaster covers for all boxes in plastered walls and ceilings.

b. Boxes for suspended lighting fixtures shall not be attached to or supported from suspended ceilings, unless specifically approved by ceiling installer/manufacturer. Do not support boxes from ceiling grids.

c. Do not connect outlet boxes back to back unless specific approval is obtained. Where such a connection is necessary to complete a particular installation, fill the voids around the wire between the boxes with sound insulating material.

d. Provide only the conduit openings necessary to accommodate the conduits at the individual location. Provide knockout closures to cap all unused openings.

e. Provide weatherproof outlets and outlets in areas subject to moisture with gaskets between the box and the cover plate.

f. All boxes shall be provided with covers.

g. Mounting Height. Mounting height of a wall-mounted outlet box means the height from finished floor to horizontal center line of the cover plate. Where outlets are indicated adjacent to each other, mount these outlets in a symmetrical pattern with all tops at the same elevation. Where outlets are indicated adjacent, but with different mounting heights, line up outlets to form a symmetrical vertical pattern on the wall. None of the mounting heights listed in this section are to be construed as waiving of the regulations of any authority having lawful jurisdiction. Verify all device mounting heights with the Architect prior to rough-in. Device mounting heights shall be as follows:

(1) Receptacles and Telephone Outlets +18" AFF

(2)	Wall Switches	+48" AFF
(3)	Manual Motor Starters	+54" AFF
(4)	Disconnect Switches	+54" AFF

(5) Fire alarm system visual and audio/visual devices shall be mounted at eighty inches (80") above the highest floor level within the space or six inches (6") below ceiling, whichever is lower.

(6) Special system devices such as lighting motion sensors shall be mounted as recommended by the manufacturer's written instructions.

3.3 FLOOR BOXES

a. Verify locations of all floor boxes with the Architect before installation. Completely envelope floor boxes in concrete except at the top. Increase slab thickness at boxes if required for bottom covering. Adjust covers flush with finished floor.

3.4 JUNCTION AND PULL BOXES

a. Install boxes as required to facilitate cable installation in raceway systems. Junction and pull boxes shall be sized to accommodate conductor system splices and associated insulation. Generally provide boxes in conduit runs of more than 100-feet or as required in Section 26 05 33. Locate boxes strategically and make them of such shape to permit easy pulling of wire or cables. The use of extension rings to increase the junction boxes interior space capacity is not acceptable.

b. Provide boxes so that covers are readily accessible and easily removable after completion of the installation. furnish and install suitable access doors for boxes located above inaccessible ceilings. Select a practical size for each box and cover. All boxes shall cover plates. Refer to architectural drawings for required access doors' fire ratings.

3.5 FIRE ALARM SYSTEM BOXES

a. All junction boxes associated with the fire alarm system shall be painted red. Each box cover plate shall be labeled as required by the fire alarm system specifications. Refer to Section 26 00 00 or 26 05 53 for acceptable label type.

End of Section 26 0533.01

SECTION 26 0553

ELECTRICAL IDENTIFICATION

1.0 GENERAL

1.1 SUMMARY

a. This Section includes identification of electrical materials, equipment, and installations. It includes requirements for electrical identification components including but not limited to; buried electrical line warnings, identification labeling for raceways, cables, and conductors, operational instruction signs, warning and caution signs, equipment labels and signs.

b. Label all wiring devices, junction, pull boxes, and disconnect switches with corresponding panelboard I.D. and circuit number.

1.2 REFERENCE STANDARDS

a. NFPA 70 - National Electrical Code

b. ANSI - American National Standards Institute

c. OSHA - Occupational Safety and Hazard Association

1.3 APPLICABLE PROVISIONS

a. Section 26 00 00 - Electrical General Provisions

1.4 SUBMITTALS

a. Submit manufacturer's product data for all electrical identification materials.

2.0 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

a. Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

(1) Ideal Industries, Inc.

(2) LEM Products, Inc.

(3) Panduit Corp.

(4) Seton Name Plate Co.

(5) Standard Signs, Inc.

(6) Thomas & Betts Corp.

(7) T & B W estline.

(8) W .H. Brady, Co.

2.2 ADHESIVE TAPE

a. Colored Adhesive Marking Tape for W ires, and Cables shall be self-adhesive vinyl tape not less than 7 mils thick by 3/4 inch wide. Color shall be as required by the color code table. The tape shall be Scotch #35 or equal.

2.3 UNDERGROUND LINE MARKING TAPE

a. Underground line marking tape shall be W BT 4 mil polyethylene, 3" wide, with lettering as specified. All underground line marking tape shall be foil backed detectable buried utility tape as manufactured by Thomas & Betts or approved equal.

2.4 PLASTIC LAMINATE SIGNS

a. Engraving stock melamine plastic laminate, 1/16-inch minimum thick for signs up to 20 square inches, or 8 inches in length; 1/8-inch thick for larger sizes.

b. Engraved legend in white letters on black face and punched for mechanical fasteners.

2.5 INTERIOR BAKED ENAMEL W ARNING SIGNS

a. Provide printed aluminum signs, punched for fasteners, with colors, legend, and size appropriate to the location.

2.6 EXTERIOR SIGNS

a. Exterior Metal-Backed Butyrate Warning and Caution Signs: Weather-resistant, non- fading, printed cellulose acetate butyrate signs with 20-gage, galvanized steel backing, with colors, legend, and size appropriate to the location. Provide 1/4-inch grommets in corners for mounting.

2.7 CABLE TIES

a. Cable Ties shall be self-locking nylon cable ties, 3/16-inch minimum width, 50-lb minimum tensile strength, and suitable for a temperature range from minus 40 degree F to 225 degree F. T & B Ty-wrap or equal.

3.0 EXECUTION

3.1 INSTALLATION

a. Install identification devices in accordance with manufacturer's written instructions and requirements of NEC.

b. W here identification is to be applied to surfaces that require a finish, install identification after completion of finish work.

3.2 SW ITCHGEAR

a. In general, the following information is to be provided for the types of electrical equipment as listed. Verify the nameplate legend with the A/E.

(1) Panelboards.

(a) Identify the panelboard designation and voltage characteristics.

(b) Prepare a neatly typed circuit directory behind clear heat-resistant plastic for each panelboard. Identify circuits by equipment served and by room numbers. The room names and numbers shall be verified with the Architect. Indicate spares and spaces with light, erasable pencil marking. Identify the panelboard with an engraved plastic laminate sign.

3.3 MISCELLANEOUS ELECTRICAL EQUIPMENT

a. Identify all power receptacles with panelboard I.D. and circuit number. The information shall be contained on the face plate. The device cover plate shall be labeled with the “Brother P- Touch” or equal. The label material shall be white self adhesive vinyl cloth that is oil, water and humidity resistant. The minimum size of the label material shall .5" wide by .5" high. Provide other sizes of label material as required for the particular applications so that the printing is clearly legible.

3.4 JUNCTION AND PULLBOXES

a. Junction and pull boxes shall be labeled with a labeling machine engraver and include the following:

(1) Panel which the circuits contained in the box originate. (Panelboard I.D. and circuit numbers)

(2) Circuits contained in the box.

(3) Voltage of the circuits contained in the box.

3.5 UNDERGROUND ELECTRICAL LINE IDENTIFICATION

a. Provide a burial utility tape, over all underground electrical installations that are exterior to the building. This shall include all feeders, branch circuits and communications conduits.

(1) Warning tape over electrical installation under 600 volts shall be red with black lettering stating "BURIED ELECTRICAL LINE".

(2) Warning tape over electrical installations over 600 volts shall be red with black lettering stating "BURIED HIGH VOLTAGE LINE".

(3) Warning tape over communications installations shall be orange with black lettering stating "BURIED TELEPHONE LINE".

b. Tape shall be installed one foot to six inches below finished grade.

3.6 CONDUCTOR COLOR CODE

a. Provide color coding for the conductors of each feeder, and branch circuit. The conductor color coding shall be in accordance with the City of Austin electrical code ordinance no. 20111020-089, Article 310.110. Verify the conductor color code with the City of Austin Inspection Department prior to releasing the conductor materials for purchasing.

CONDUCTOR COLOR CODE	
SYSTEM VOLTAG	208/120V three phase 4 W.
PHASE A	Red
PHASE B	Black
PHASE C	Yellow
NEUTRAL	White
GROUND	Green

b. Furnish and install conductors with color factory-applied the entire length of the conductors except as follows:

(1) Furnish and install conductors with factory applied color the entire length of the conductor, for all conductors that are 10 AW G and smaller.

(2) For conductors larger than 10 AW G, apply colored pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent possible unwinding. Use 3/4-inch-wide tape in colors as specified. Do not cover cable identification markings by taping. Tape locations may be adjusted slightly to prevent such covering.

3.7 W ARNING SIGNS

a. Apply warning, caution, and instruction signs and stencils as follows:

(1) Install "Danger: High Voltage" signs on entry doors to electrical rooms and on outdoor medium voltage switchgear.

(2) Provide instruction signs where required to explain functions of emergency systems, remote lighting controls, etc.

3.8 NAMEPLATES.

a. Apply equipment identification labels of engraved plastic- laminate on each major unit of electrical equipment in building, including central or master unit of each electrical system. This includes communication/signal/alarm system s, unless unit is specified with its own self-explanatory identification. Except as otherwise indicated, provide single line of text, with ½-inch high lettering on 1-inch high label (1-1/2-inch high where two lines are required), white lettering in black field. Text shall match terminology and numbering of the Contract Documents and shop drawings. Verify the exact terminology with the A/E.

Lettering Height	
1/2"	Panelboards, electrical cabinets, and enclosures.
1/4"	Contactors.
1/4"	Disconnect switches.
1/2"	Junction and pull boxes.

b. Install nameplates labels at locations indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment. Nameplate shall be secured to equipment by means of self tapping machine screws.

END OF SECTION

SECTION 26 0800

ELECTRICAL TESTING

1.0
2.GENERAL

2.1 SUMMARY

a. This section specifies testing of the electrical systems.

b. Tests to be completed by the Contractor shall be of two types. During construction, system testing shall be accomplished to determine whether systems are suitably wired, and if systems operated as specified. Later, demonstration testing shall be accomplished for the purpose of showing that the systems operated as designed.

(1) Provide records of tests for individual tests as required below. The tests records shall include the results of the test, and the persons conducting. These tests shall be included in the Operation and Maintenance Manual under the test section.

(2) Following each demonstration test, a certified record of each test shall be made. All demonstration testing shall be witnessed by the Architect or his representative and the owner's representative. The records of the demonstration testing shall be signed by the persons conducting and witnessing the test. Demonstration tests will not be considered complete unless a signed certificate is provided for each test.

(3) The Contractor shall provide all test equipment, temporary wiring, labor, etc., required to perform the testing.

c. It is the intent of these tests to assure that all electrical equipment is operational within industry and manufacturer's tolerances and is installed in accordance with design specifications and manufacturer's recommendations.

d. Set all adjustable trip settings on over current protective devices in accordance with Section 26 00 00.

e. The following test are included in this section. This does not preclude other system test and testing requirements in other specification sections and testing and demonstration required by the Authorities Having Jurisdiction.

(1) Ground resistance test.

(2) 600V cable insulation (Megger) test.

(3) Panelboard

2.2 APPLICABLE PROVISIONS

SECTION 26 0800

ELECTRICAL TESTING

a. Section 26 00 00 - General Electrical Provisions.

2.3 SUBMITTALS

a. Records of all test reports.

2.4 QUALIFICATIONS OF TESTING AGENCY

a. The testing agency shall meet federal OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907. Membership in the National Electrical Testing Association constitutes proof of meeting such criteria.

2.5 ACCEPTABLE TESTING AGENCIES

a. General Electric Service Department.

b. E.T.I.

2.6 TEST INSTRUMENT CALIBRATION

a. The testing laboratory shall have a calibration program which maintains all applicable test instrumentation within rated accuracy.

b. Instruments shall be calibrated in accordance with the following frequency schedule

(1) Field instruments - 6 months maximum.

(2) Laboratory instruments - 12 month.

(3) Leased specialty equipment - 12 months.

(4) Dated calibration labels shall be visible on all test equipment.

2.7 SETTINGS OF OVER CURRENT DEVICES

a. The testing laboratory shall be responsible for implementing all settings and adjustments on protective devices in accordance with values shown in the coordination study.

b. Enter "address" codes for power monitoring devices or similar instrumentation where shown. Test monitoring instrumentation for accuracy in combination with associated PT's and CT's.

2.8 TEST REPORTS

a. The test reports shall include the following:

SECTION 26 0800

ELECTRICAL TESTING

(1) Description of equipment tested.

(2) Description of test.

(3) List of test equipment used in calibration and calibration date.

(4) Test results.

(5) Conclusions and recommendations.

(6) Appendix, including appropriate test forms.

b. The test report shall be bound and its contents certified.

c. Submit five copies of the completed report to the Architect no later than fifteen working days after completion of test.

2.9 TEST FAILURE

a. Any system material or workmanship which is found defective on the basis of acceptance tests shall be reported directly to the Architect and the contractor shall replace the defective material or equipment and have test repeated until test proves satisfactory without additional cost to the Owner.

2.10 NOTIFICATION OF TESTING

a. Notify the engineer and the Owner two weeks (10) working days before any scheduled testing. The engineer and the Owner observe the testing at their option.

3.0 PRODUCTS - NOT USED

4.0 EXECUTION

4.1 SYSTEM VOLTAGE TESTS

a. With the system energized, make line-to-line voltage and line current measurements at all motors under full load conditions. Should measured values deviate +/- 5% from the nameplate ratings, the condition shall be corrected. Notify the Architect immediately should deviations occur. Submit test results in the Operation and Maintenance Manuals.

4.2 GROUND RESISTANCE TEST

a. Building ground electrode resistance testing shall be accomplished with a ground resistance direct-reading single test meter utilizing the Fall-of-Potential Method.

b. Test results shall be in writing, and shall show temperature, humidity, and condition of the soil at the time of the tests. In the case where the ground resistance exceeds XX ohms, provide additional grounding electrodes to reduce the resistance to ground to XX ohms.

c. Tests shall include measurement of ground resistance at the following equipment and structures:

(1) Main Electrical Room Ground Bar.

(2) Signal reference grids (ground rod grid and on-slab metallic plane).

4.3 600 VOLT CABLE INSULATION TEST

a. Measure and record insulation resistence of all feeders using a 1000 volt megger for one minute. Make tests with circuits isolated from source and load.

b. After the branch circuit conductors have been installed, but before they have been connected to the associated wiring devices, test all conductors for short circuits, open circuits. These tests shall be performed by reading resistance in ohms with a multi-meter. Records of these test are not required.

c. Test for load division between all conductors in parallel feeders. The difference in current carried between the individual feeders comprising the parallel feeder shall not exceed 10% of feeder current. Records shall indicate amperage, voltage, and feeder identification. Any feeder not in compliance shall be modified to correct the load division to within 10% and shall be retested. Submit test results in the Operation and Maintenance Manuals.

4.4 PANELBOARDS

a. Test the torque of all bolted cable to bus connections and all bus to bus connections and paint red dot using Torque seal as manufactured by Organic Products (tel # 214-438-7321) on each bolt to confirm the torque test. Check for A-B-C phase rotation.

b. Perform a dielectric test all buses.

c. Perform the following test and observations of all molded case circuit breakers in distribution panels and distribution switchboard and all molded case circuit breakers 225 amps and above in branch circuit panels.

(1) Circuit breakers to be operated several times to ensure smooth operation.

(2) Inspect the circuit breaker molded case for cracks.

(3) Rated current to be passed through each phase and millivolt readings to be taken across contacts.

(4) Time-current characteristic tests to be performed by passing 300% rated current through each phase and monitoring trip time.

(5) Instantaneous pick-up current to be determined by finding the current level at which breaker trips out in less than 2 cycles.

(6) Insulation resistance tests to be performed at 1000 volts D.C.

(7) Contacts, shunts, etc. to be visually inspected for alignment.

(8) Inverse time, instantaneous pick-up and millivolt drop across contacts, including resistance values as well as deficiencies causing breaker to function outside published limits to be recorded. Times are compared with manufacturer's or NEMA published values.

d. Perform infrared thermal inspection of all bussing, bus connection and cable terminations.

4.5 MISCELLANEOUS SYSTEMS

a. The Contractor shall test all receptacles for power polarity and ground to assure that all receptacles are operating properly, correctly wired and suitably grounded. Provide an affidavit to the effect that this work has been accomplished.

b. Do not subject Ground Fault Interrupter (GFCI) type breakers or receptacles to megger tests.

4.6 INFRARED THERMAL INSPECTIONS

a. Provide an in depth thermal evaluation of all equipment and/or objects specified.

b. The infrared thermographer shall exercise reasonable care in the performance of work to prevent hazard to self or others, and/or prevent unscheduled interruption of utility services.

c. Quality Control:

(l) The infrared thermographer shall have sufficient knowledge of the system, object or process being inspected to understand the observed patterns of radiation. All infrared thermographers shall be a certified Level 2 Thermographer: A Certified Level 2 Thermographer shall have successfully met and passed the experience, training, and testing requirements for a Level 2 Thermographer set forth by the American Society for Nondestructive Testing (ASNT) and pursuant SNT-TC-1A, 1992. Training and certification will be recognized only if administered by one of the following:

(a) An accredited third party independent training organization such as The

Academy of Infrared Thermography, The Infraspection Institute, John Snell and Associates, etc.

(b) An ASNT Certified Level 3 Thermographer as prescribed in SNT-TC-1A, 1992.

d. The infrared thermographer will use radiometric thermal imaging equipment that incorporates the use of Focal Plane Array (FPA) technology having a temperature sensitivity of 0.15^0C, obtain accurate thermal data to $.2^0$C, and provide high resolution color thermal images that make the hot spots and affected component easily discernible to maintenance personnel without the need for other real time photographs or images. Thermal imaging equipment will be cooled by a closed loop electronic cooler and not require the use of liquid nitrogen. Thermal imaging equipment will have a minimum spatial resolution of 1.4 mrad. Thermal imaging equipment will have a minimum thermal sensitivity of 2^0C. When providing quantitative infrared thermal data, the thermographer will assure that the infrared measuring equipment meets the manufacturer's standard equipment specifications for accuracy by performing a field test of the equipment. All temperature measuring equipment will be calibrated at intervals recommended by the manufacturer and at least every three years.

e. Submit two complete copies of the results in bound format. Provide digital files of all of the thermal images on a CD. The report shall include the following at a minimum:

(1) The printed image of each item inspected. Each image shall be identified by the unit's name as indicated on the Drawings or as marked in the field for existing equipment.

(2) Date and time of inspection.

(3) Name of person or persons performing the inspection.

(4) A brief written statement about each image. If the image indicated that there may be a potential problem, provide recommendations on how to correct the problem.

4.7 DEMONSTRATION TESTING

a. Demonstration Test of Completed Systems. Demonstrate the features and operation of the following systems:

(1) Electrical system and control and equipment:

(a) Contactors.
(b) Panelboards.

(2) Lighting systems:

(a) Lighting controls.
(b) Interior and exterior light fixtures.

(c) Emergency lighting systems.
(d) Light fixtures, with emergency power pack.

b. Each system shall be demonstrated once only, after completion of satisfactory testing and acceptance.

c. The demonstration shall be held upon completion and acceptance of all systems at a date to be agreed upon in writing by the Architect.

d. The demonstration shall be held by the appropriate Contractors in the presence of the Architect or his representative and the manufacturer's representative.

e. Demonstrate the functions and location (in the structure) of each system, and indicate its relationship to the riser diagrams and drawings.

f. Demonstrate by "start-stop operation" how to work the controls, how to reset protective devices, how to replace fuses, and what to do in case of emergency.

g. Check rotation of all equipment and correct if necessary.

End of Section 26 0800

SECTION 26 2416

PANELBOARDS

1.0 GENERAL

1.1 SUMMARY

a. This section specifies the furnishing and installation of distribution and lighting and appliance branch circuit panelboards.

1.2 REFERENCE STANDARDS

a. UL 50 - Cabinets and Boxes.

b. UL 67 - Electric Panelboards.

c. NEMA AB 1 - Molded Case Circuit Breakers.

d. NEMA AB 2 - Procedures for Verifying the Performance of Molded Case Circuit Breakers.

e. NEMA FU 1 - Low Voltage Cartridge Fuses.

f. NEMA KS 1 - Enclosed Switches.

g. NEMA PB 1 - Panelboards.

h. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

1.3 APPLICABLE PROVISIONS

a. Refer to Section 26 00 00 - Electrical General Provisions.

1.4 SUBMITTALS

a. Submit shop drawings for panelboards and component devices.

b. Include outline and support points, dimensions, voltage, main bus ampacity, short circuit ampere interrupting rating, circuit breaker arrangement, sizes and number of poles. Shop drawing shall list all circuit breakers to be installed in panelboard.

1.5 OPERATION AND MAINTENANCE DATA

a. Provide operation and maintenance data in accordance with Section 26 00 00.

2.0 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

a. Subject to compliance with the requirements, acceptable manufacturers shall be as follows.

(1) Eaton.

(2) ABB

(3) Siemens Energy and Automation Inc.

(4) Schneider Electric.

2.2 GENERAL

a. Provide all spaces specified on the schedules complete with all breaker mounting accessories required to accommodate the breaker frame size specified.

b. All panelboards shall be supplied with a separate dedicated ground bus. Provide isolated ground bus where noted on the drawings. All bussing shall be copper.

c. Provide full size neutral bus bars in all panels as required by the panel schedule and/or one line diagram.

2.3 SHORT CIRCUIT RATINGS

a. Each panelboard, shall have a short circuit current rating equal to or greater than the rating shown on the panelboard schedule or on the one-line diagram. The rating shall be per Underwriter's Laboratories Standard UL 67.

b. The short circuit rating shall be based solely on the ratings of the branch breakers in the panel. Series rating of standard AIC branch breakers with high AIC integral or remote main/feeder breakers is not acceptable.

c. Panelboards shall be marked with their maximum short circuit current rating at the supply voltage and shall be UL listed. 240 volt maximum panels shall be rated 10,000 AIC RMS symmetrical minimum. 480 volt maximum panels shall be rated 14,000 AIC RMS symmetrical minimum.

2.4 LIGHTING AND APPLIANCE PANELBOARDS (100-400 Amperes)

a. Panelboard bus structure and main lugs or main circuit breaker shall have current ratings as shown on the panelboard schedule. Such ratings shall be established by heat rise tests, conducted in accordance with UL Standard 67. Bus structure shall be insulated. Bus bar connections to the branch circuit breakers shall be the "distributed phase" or phase sequence type. All current carrying parts of the bus structure shall be plated.

b. The panelboard bus assembly shall be enclosed in a steel cabinet. The rigidity and gauge of steel to be as specified in UL Standard 50 for cabinets. Wiring gutter space shall be in accordance with UL Standard 67 for panelboards. The box shall be fabricated from galvanized steel. Each front shall include a door and have a flush, cylinder tumbler-type lock with catch and spring-loaded stainless steel door pull.

Fronts shall have adjustable indicating trim clamps which shall be completely concealed when the doors are closed. Doors shall be mounted with completely concealed steel hinges. Fronts shall not be removable with door in the locked position.

2.5 OVERCURRENT PROTECTIVE DEVICES

a. Circuit Breakers. Provide thermal magnetic, bolt-on circuit breakers for the specified service with the number of poles and ampere ratings indicated. All circuit breakers shall be as specified in Section 26 28 13 - Overcurrent Protective Devices.

(1) Provide breakers which are quick-make and quick-break on both manual and automatic operation. Use a trip-free breaker which is trip indicating. Incorporate inverse time characteristic by magnetic trip. Where indicated, provide ground fault circuit breakers.

(2) For 2-pole and 3-pole breakers, use the common-trip type so that an overload or fault on one poles will trip all poles simultaneously. Handle ties are not acceptable.

(3) Connect breakers to the main bus by means of a solidly bolted connection. Use breakers which are interchangeable, capable of being operated in any position within the panel. Independently mount breakers so that a single unit can be removed from the front of the panel without disturbing or removing main bus, other units or other branch circuit connections.

b. Fusible Switches. Provide fusible switches for the specified service with the number of poles and ampere ratings indicated.

(1) Provide switches which are quick-make and quick-break type. Provide branch circuit panelboards with toggle handle switches and distribution panelboards with switches having external operating handles capable of being padlocked in the OFF position.

(2) Provide each main or distribution switch with fuses conforming to Section 16476 Overcurrent Protective Devices.

(3) Connect switches to the main bus by solidly bolted connections. Use switches which are interchangeable. Independently mount switches so that a single unit can be removed from the front of the panel without disturbing main bus, other units or circuit connections.

3.0 EXECUTION

3.1 INSTALLATION

a. All wiring in the panelboard enclosure shall be bundled together with nylon ty-wraps in a neat workman like manner.

b. At the completion of the electrical system, the Contractor shall check each phase of all panelboards under full load conditions and arrange so that all phases shall carry the same load or as near as possible.

c. Stub two 2" empty conduits from each flush mounted panelboard to above an accessible ceiling.

d. Flush mounted panelboards shall be fully recessed in the wall with the panelboard trim flush with the finished wall. Review all flush mounted panelboard locations prior to rough-in to verify that the panelboard will fully recess in the wall. Furr the wall as directed by the Architect to fully recess the panelboard.

3.2 IDENTIFICATION

a. All panelboards shall be identified in as required by Section 26 00 00.

b. A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door. All circuit loads shall be identified on the circuit directory as specified in section 26 05 53.

3.3 MOUNTING HEIGHT

a. Install the panelboards so that the distance from the floor to the center of the switch or circuit breaker in the highest position will not exceed the maximum distance allowed by the NEC.

End of Section 26 2416

SECTION 26 2726

WIRING DEVICES

1.0 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. This Section includes receptacles, connectors, switches, and finish plates.

1.3 DEFINITIONS

a. GFCI: Ground-fault circuit interrupter – circuit breaker.

b. SPD: Surge Protective Device

1.4 SUBMITTALS

a. Product Data: For each product specified.

b. Shop Drawings: Legends for receptacles and switch plates.

c. Samples: for devices and device plates for color selection and evaluation of technical features.

d. Maintenance Data: For materials and products to include in maintenance manuals specified in Division 01.

1.5 QUALITY ASSURANCE

a. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

b. Comply with NEMA WD 1.

c. Comply with NFPA 70.

1.6 COORDINATION

a. Receptacles for Owner-Furnished Equipment: Match plug configurations.

(1) Cord and Plug Sets: Match equipment requirements.

2.0 PRODUCTS

2.1 MANUFACTURERS

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

(1) Wiring Devices:

(a) Hubbell, Inc.; Wiring Devices Div.

(b) Leviton Manufacturing Co., Inc.

(c) Pass & Seymour/Legrand; Wiring Devices Div.

2.2 RECEPTACLES

a. Straight-Blade Duplex Receptacles: Extra hard use specification grade.

b. Locking Receptacles: specification grade.

c. GFI Tamper-Resistant Combination USB and SPD Receptacles: Hospital grade.

d. GFI Receptacles: Feed-through type, with integral NEMA WD 6, configuration 5-2OR duplex receptacle arranged to protect connected downstream receptacles on same circuit. Design units for installation in a 2-3/4-inch-deep outlet box without an adapter.

e. Industrial Heavy-Duty Receptacle: Comply with IEC 309-1.

f. Convenience Receptacles: Equal to Hubbell No. HBL5352 (single), CR5352 (duplex) 20 Amperes, 125 volts, NEMA 5-20R.

2.3 SWITCHES

a. Snap Switches: Heavy-duty, specification grade, quiet type.

b. Combination Switch and Receptacle: both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.

(1) Switch: 20 A, 120/277-vac.

(2) Receptacle: NEMA WD 6, Configuration 5-2OR.

c. Switches:

(1) Single pole toggle: Equal to Hubbell No. 1221, 20 amperes, 120/277 volt.

(2) Three-way toggle: Equal to Hubbell No. 1223, 20 amperes, 120/277 volt.

(3) Four-way toggle: Equal to Hubbell No. 1224, 20 amperes, 120/277 volt.

(4) Single pole, keyed toggle: Equal to Hubbell No. HBL122RKL, 20 amperes, 120/277 volt, locking type with key.

(5) Three-way, keyed toggle: Hubbell HBL1223RKL, 3-way, Industrial Grade, 20 amperes, 120/277 volt, locking type with two (2) keys or

(6) Single pole toggle with pilot light: Equal to Hubbell No. HPL1221PL, 120/277 volt, with pilot light.

(7) Single pole toggle with lighted handle: Equal to Hubbell HBL1221I, 1-pole, Industrial Grade, 20 amperes, 120 volt with lighted handle.

(8) Single pole toggle with lighted handle: Equal to Hubbell1221IL, 1-pole, Industrial Grade, 20 amperes, 277 volt with lighted handle.

2.4 WALL PLATES

a. Single and combination types match corresponding wiring devices.

(1) Plate-Securing Screws: Metal with head color to match plate finish.

(2) Provide tamperproof metal screws equal to P&S No. 7169 for securing device coverplates for 277volt circuit applications or tamper-resistant devices.

(3) Material for finished Spaces: 0.04-inch-thick, Type 302, satin-finished stainless steel or Nylon unbreakable cover.

(4) Material for Unfinished Spaces: Galvanized steel.

2.5 FINISHES

a. Color: Manufacturer’s standard, as selected by Architect.

3.0 EXECUTION

3.1 INSTALLATION

a. Install devices and assemblies plumb and secure.

b. Install wall plates when painting is complete.

c. Install wall dimmers to achieve indicated rating after derating for ganging as instructed by manufacturer.

d. Do not share neutral conductor on load side of dimmers.

e. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension horizontal, and grounding terminal of receptacles on the left. Group adjacent switches under single, multi-gang wall plates.

f. Protect devices and assemblies during painting.

g. Adjust locations at which floor service outlets and telephone/power service poles are installed to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

a. Comply with Division 26 Section “Electrical Identification”.

3.3 CONNECTIONS

a. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.

b. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values. If manufacturer’s torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROLS

a. Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.

b. Test GFCI operation with both local and remote fault simulations according to manufacturer’s written instructions.

c. Replace damaged or defective components.

3.5 CLEANING

a. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

4.0 TABLE

4.1 RECEPTACLES:

a. Convenience Receptacles: Equal to Hubbell No. HBL5352 (single), CR5352 (duplex) 20 Amperes, 125 volts, NEMA 5-20R.

b. GFI Duplex: Equal to Hubbell No. GFTR20AL 20 amperes, 125 volts, NEMA 5-20R.

c. Single: Equal to, Hubbell HBL8310, Hospital Grade, 20 amperes, 125 Volts, NEMA 5-20R.

d. Duplex, Tamper-resistant: Equal to Hubbell HBL8300SGA, Hospital Grade, 20 amperes, 125 Volts, NEMA 5-20R.

e. Duplex, Corridors: Equal to Hubbell HBL8300, Hospital Grade, 20 Amperes, 125 volts, NEMA 5-20R.

End of Section 26 2726

SECTION 26 2813

OVERCURRENT PROTECTIVE DEVICES

1.0 GENERAL

1.1 SUMMARY

a. This section specifies the furnishing and installation of low voltage fuses rated 600 volts and below, 6000 amperes and below and automatic circuit breakers.

1.2 REFERENCE STANDARDS

a. ANSI/ANSI C97.1 - Standard for Low Voltage Cartridge Fuses 600 Volts and Less.

b. ANSI/UL 198.2 - High-Interrupting-Capacity Current-Limiting Fuses.

c. NEMA FU 1 - Low Voltage Cartridge Fuses.

d. NEMA AB 1 - Molded Case Circuit Breakers.

e. NEMA AB 2 - Procedures for Verifying the Performance of Molded Case Circuit Breakers.

f. UL 198.4 - Class R Fuses.

1.3 APPLICABLE PROVISIONS

a. Refer to Section 26 00 00 - Electrical General Provisions.

1.4 SUBMITTALS

a. Submit shop drawings and product data for fuses and circuit breakers.

b. Include time current curves, dimensions, voltage, short circuit ampere interrupting rating, continuous current rating and number of poles.

1.5 OPERATION AND MAINTENANCE DATA

a. Provide operation and maintenance data in accordance with Section 26 00 00.

2.0 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

a. Subject to compliance with the requirements, acceptable manufacturers shall be as follows:

(1) Fuses.

(a) Bussman - Cooper Industries.

(b) Mersen.

(2) Circuit Breakers.

(a) ABB.

(b) Eaton.

(c) Siemens Energy and Automation Inc.

(d) Schneider Electric.

2.2 FUSES

a. Provide fuses with a voltage rating suitable for the normal voltage of the system in which they are to be applied.

b. Class RK1 Time-Delay Fuses: Fuses rated from 1/10 to 600 amperes shall be UL Class RK1, dual element time-delay type. The fuses shall have separate overload and short circuit elements. The fuses shall have a spring assisted thermal element with a melting point of 284ºF. The two elements shall be physically separated in different chambers. The fuse shall be capable of maintaining an overload of 500% of its rated current for a minimum of 10 seconds. The fuses shall have a U.L. listed interrupting rating of 200,000 amperes rms/sym.

c. Class RK5 Time-Delay Fuses: Fuses rated from 1/10 to 600 amperes shall be UL class RK5, dual element time-delay type. The fuses shall have separate overload and short circuit elements. The fuses shall have a spring assisted thermal element with a melting point of 284ºF. The two elements shall be physically separated in different chambers. The fuse shall be capable of maintaining an overload of 500% of its rated current for a minimum of 10 seconds. The fuses shall have a U.L. listed interrupting rating of 200,000 amperes rms/sym.

2.3 MOLDED CASE CIRCUIT BREAKERS

a. Provide molded-case thermal magnetic circuit breakers. Provide breakers with permanent thermal and instantaneous magnetic trips in each pole. Two and three pole breakers shall be common trip. Construct with over center, trip-free, toggle type operating mechanisms with quick-make, quick- break action and positive handle indication. Construct breakers for mounting and operating in any physical position and operating in an ambient temperature of 40 degrees C. Provide breakers with mechanical screw type removable connector lugs, AL/CU rated for 65º or 75ºC wire for breaker sizes less than 100 amperes and 75ºC for breaker sizes 100 amperes and greater. The circuit breakers shall have a minimum 10,000 AIC at 120/208 volts and 14,000 AIC at 277/480 volt. Provide breakers with an AIC rating equal to or greater than the minimum rating noted on the panelboard schedules.

2.4 GROUND FAULT CIRCUIT BREAKERS

a. Provide circuit breakers with integral ground fault circuit protection where called for on the drawings. The ground fault protection circuit shall be rated UL Class A, 4-6 mA for personnel protection.

Commented [Comment1]: NOTE: SELECT EITHER RK1 OR RK5 IF FUSES ARE BEING USED FOR CIRCUIT PROTECTION. USE RK5 FOR MOTOR CIRCUITS

3.0 EXECUTION

3.1 INSTALLATION

a. Install overcurrent protective devices for all wiring and equipment as indicated, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC and NEMA standards for installation of overcurrent protective devices.

3.2 FUSES

a. Check all fuse clip fasteners for alignment and tightness in accordance with the manufacturers recommendations.

b. Install fuses so label is in an upright, readable position.

c. Fuses for HVAC equipment shall be provided in accordance with equipment manufacturer's recommendations.

d. All fused disconnects shall have a label placed on the inside of the door that indicates fuse size and type. The manufacturers standard label shall suffice.

e. 1/10 to 600 ampere fuses for individual motor circuits shall be Class RK5/RK1 sized at 1.25 times the full load amperes of the motor for 1.15 service factor motors and 1.15 times the full load amperes for 1.0 service factor motors.

3.3 CIRCUIT BREAKERS

a. Fasten circuit breakers without mechanical stresses, twisting or misalignment being exerted by clamps, supports, or cabling.

b. Set field-adjustable circuit breakers for trip settings as indicated, subsequent to installation of units.

c. Inspect circuit-breakers operating mechanisms for malfunctioning and, where necessary, adjust or replace units for free mechanical movement.

3.4 SPARE FUSES

a. As spares, provide the greater amount of either three fuses or 10 percent of each size and type installed. Deliver the spare fuses to the Owner at the time of final acceptance of the project. Neatly encase the spare fuses in suitable containers or cabinets.

b. Provide spare fuse cabinet, labeled "SPARE FUSE CABINET", and sized to accommodate the required spare fuses. Mount cabinet adjacent to main switchboard, unless otherwise noted. Attach list of all fuses provided on the project to inside cabinet door.

End of Section 26 2813

SECTION 26 2816

ENCLOSED SWITCHES

1.0 GENERAL

1.1 SUMMARY

a. This Section specifies the furnishing and installation of enclosed switches.

b. Provide enclosed switches as the disconnecting means for equipment.

1.2 REFERENCE STANDARDS

a. NFPA 70 - National Electrical Code.

b. UL 98 - Safety Standard for Enclosed Switches.

c. NEMA KS 1 - Enclosed Switches.

1.3 APPLICABLE PROVISIONS

a. Section 26 00 00 - Electrical General Provisions.

1.4 SUBMITTALS

a. Product Data: Submit manufacturer's product data on enclosed switches. Submittals shall include the following:

(1) Voltage, Phase, Horsepower/Ampere Rating

(2) NEMA Enclosure Type

(3) Dimensions

2.0 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

a. Subject to compliance with the requirements, acceptable manufacturers shall be as follows.

(1) Eaton.

(2) ABB.

(3) Siemens Energy and Automation Inc.

(4) Schneider Electric.

2.2 CHARACTERISTICS

a. Provide switches with voltage rating of 240 volts or 600 volts a-c, as required to match the distribution system voltage.

b. Provide heavy duty switches conforming to NEMA KS 1 standard for Type HD switches.

c. Provide switches with quick-make, quick-break contacts.

d. Unless otherwise indicated, provide 3-pole, visible blade switches.

2.3 CONSTRUCTION

a. Switches shall be furnished in NEMA 1 general purpose enclosures in interior dry locations and NEMA 3R enclosures in exterior locations and indoor areas subject to moisture. Covers on NEMA 1 enclosures shall be attached with pin type hinges. NEMA 3R covers shall be securable in the open position. Enclosures shall be manufactured from galvanized steel. Enclosures shall have a gray baked enamel finish, electrodeposited on cleaned, phosphatized steel.

b. The operating handle shall be suitable for padlocking in the OFF position with as many as three padlocks of 5/16-inch diameter shank. The switch cover shall be interlocked with the operating mechanism to prevent opening the cover when the switch is in the ON position and to prevent turning the switch ON when the door is open.

c. The lugs shall be front accessible, UL listed for 65 or 75 degree C, aluminum or copper wires.

d. Provide incoming line terminals with an insulated shield so that live parts are not exposed when the door is open.

e. Provide switches with isolated, fully rated neutral block in circuits with a neutral conductors.

f. Provide each switch with a ground lug for termination of the circuit grounding conductors.

g. Provide fused switches with rejection-type fuse holders which are suitable for use with fuses specified.

h. Provide factory nameplate, front cover mounted, indicating the switch type, catalog number and voltage, amperage and horsepower ratings.

3.0 EXECUTION

3.1 INSTALLATION

a. Provide switches for all equipment as required to comply with NEC requirements for equipment disconnecting means.

b. Mount the switches so that the operating handle is approximately 54 inches above finished floor. Where switches are group mounted, align the tops of all of the switches.

c. Disconnecting means for mechanical equipment shall not be mounted to the equipment. They shall be mounted adjacent to the equipment and within sight of the equipment.

3.2 DISCONNECT SWITCHES MARKING

a. All disconnect switches shall be labeled as required by Section 26 00 00 or 26 05 53.

3.3 GROUNDING

a. Connect the equipment ground conductor to the grounding lug in the enclosed switches.

End of Section 26 2816

SECTION 26 5113

LIGHTING FIXTURES AND LAMPS

1.0 GENERAL

1.1 SUMMARY

a. This section specifies the furnishing and installation of lighting fixtures complete with lamps and driver(s), mounting accessories and other miscellaneous materials as required for a complete system.

1.2 REFERENCE STANDARDS

a. ANSI C78.52 - LED Lamps.

b. ANSI C82.16 – LED Drivers.

c. ANSI/UL - 844 Safety Standard for Electric Lighting Fixtures for Use in Hazardous Locations.

d. NEMA FA 1 - Outdoor Floodlighting Equipment.

e. UL 57 - Electric Lighting Fixtures.

f. UL 844 - Electric Lighting Fixtures for Use in Hazardous Locations.

1.3 APPLICABLE PROVISIONS

a. Section 26 00 00 - Electrical General Provisions.

1.4 SUBMITTALS

a. Submit manufacturer's product data sheets for all light fixtures. Include published photometric data, coefficients of utilizations and candlepower distribution curves. Provide product data for all ballasts and lamps. Provide product data for all emergency battery and inverter units.

1.5 OPERATION AND MAINTENANCE DATA

a. Provide operation and maintenance data in accordance with Section 26 00 00. Provide lamp ordering information for each type of lamp and the local lamp distributors address and phone numbers.

1.6 LAMP WARRANTY

a. The lamp and ballasts shall of the same manufacturer or an approved equivalent combination that can provide the following lamp warranty.

(1) Provide a minimum 70,000 burn hour lamp material replacement warranty. This warranty shall commence from the date of installation of the lighting fixtures.

1.7 DELIVERY STORAGE AND HANDLING

a. Deliver all lighting fixtures in factory-fabricated containers or wrappings, which properly protect fixtures from damage.

b. Store all lighting fixtures in original packaging. Store inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, laid flat and blocked off ground.

c. Handle all lighting fixtures carefully to prevent damage, breaking, and scoring of finishes. Do not install damaged units or components; replace with new.

1.8 COORDINATION

a. The various ceiling types are indicated on the architectural plans and in the room finish schedules. All lighting fixtures shall be coordinated with the architectural requirements to insure that the proper trim kit, and/or mounting accessory is provided with each fixture for the intended application. All trim kits and accessories shall be provided by contractor whether or not they are specifically indicated by the manufacturer's catalogue numbers on the lighting fixture schedule.

2.0 PRODUCTS

2.1 ACCEPTABLE MANUFACTURES

a. The product of an acceptable Manufacturer is listed on the light fixture schedule on the drawings. The product and manufacturer listed are intended to establish the level of quality desired on this project. Equal products of the other acceptable manufacturers will be considered. Subject to compliance with the requirements, acceptable manufacturers for lamps and ballasts shall be as follows:

(1) Lamps.

(a) As provided by fixture manufacturer.

(2) Drivers.

(a) As provided by fixture manufacturer.

2.2 LIGHTING FIXTURES

a. Lighting fixtures are specified by type and manufacturer in the lighting fixture schedule on the drawings.

2.3 LAMPS

a. As specified on Light Fixture Schedule.

2.4 LED LIGHT FIXTURES

a. Each luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply) and integral controls as per this specification.

b. Each luminaire shall be designed to operate at an average operating temperature of 25°C.

c. The operating temperature range shall be 0°C to +25°C.

d. Lumen output shall not decrease by more than 20% over the minimum operational life of 70,000 hours.

e. Individual LEDs shall be connected such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.

f. LED Boards shall be suitable for field maintenance or service from below the ceiling with plug-in connectors. LED boards shall be upgradable.

g. Correlated Color temperature (CCT) range as per specification, 3500K shall be correlated to chromaticity as defined by the absolute (X,Y) coordinates on the 2D CIE chromaticity chart.

h. The color rendition index (CRI) shall be 90 or greater.

i. Color shift over 6,000 hours shall be <0.007 change in u' v' as demonstrated in IES LM80 report.

2.5 Driver: AccuDrive, 120 – 277 volt, UL Listed, CSA Certified, Sound Rated A+. Driver shall be > 80% efficient at full load across all input voltages. Input wires shall be 18AWG solid copper minimum. Driver shall be suitable for full-range dimming. The luminaire shall be capable of continuous dimming without perceivable flicker over a range of 100% to 5% of rated lumen output with a smooth shut off function. Dimming shall be controlled by a 0-10V signal. Driver shall be UL listed. Maximum stand-by power shall be 1 Watt. Driver disconnect shall be provided where required to comply with codes.

2.6 INTEGRAL BATTERY PACKS

a. Fixtures designated as emergency lights shall be provided with integral battery packs. The battery pack shall meet or exceed the following requirements:

(1) The unit shall have a minimum output of 85% of the full lumen rating of the lamp for a minimum of ninety minutes upon interruption of normal power.

(2) The unit shall have a sealed, maintenance free, high temperature nickle-cadmium battery.

(3) The unit shall have a quick disconnecting means.

(4) The unit shall be provided with a remote test switch and pilot light. For fixtures that are suspended the test switch and pilot light shall be integral with the light fixture.

2.7 LENSES

a. At a minimum, all lenses for troffer fixtures shall be pattern A12 with minimum unpenetrated thickness of .125 inches.

b. Provide one lens retaining hold-down clip per side on all fluorescent light fixtures.

2.8 EXIT LIGHT FIXTURES

a. Exit light directional indicators shall be "Chevron" type as required by NFPA 101.

3.0 EXECUTION

3.1 INSTALLATION

a. Install lighting fixtures at locations and heights as indicated, in accordance with fixture manufacturer's written instructions, applicable requirements of NEC, NECA's "Standard of Installation," NEMA standards, and with recognized industry practices to ensure that lighting fixtures fulfill requirements.

b. Provide fixtures and/or fixture outlet boxes with hangers to properly support fixture weight. Submit design of hangers, method of fastening, other than indicated or specified herein, for review by Architect.

c. Provide hangers and support members for fixtures as required for proper installation. Provide appurtenances which include stud supports, stems, mounting brackets, frames and plaster rings.

d. Support fixtures from the building structure or from furring channels. Furring channels must be a minimum size of 1-1/2 inches. Lay-in (recessed) lighting fixtures shall be supported from building structure by a 12 gauge galvanized carbon steel (ASTM-A-641) soft temper hanger wires. provide one hanger at each corner of each lay-in light fixture one foot (1'-0") wider and larger. supporting of light fixtures from ceiling system is not acceptable.

e. Provide support members for exit fixtures as required to provide rigid installation.

f. Flexible metal conduit from junction box to lighting fixture shall not touch the ceiling as finally installed.

g. Install flush mounted fixtures properly to eliminate light leakage between fixture frame and finished surface.

h. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL standards 486A and B, and the National Electrical Code.

3.2 EMERGENCY BATTERY PACKS

a. The battery pack shall be connected to an uswitched phase conductor of the circuit serving the area where the unit is installed and shall be connected ahead of all local controls.

b. The remote test switch and pilot light shall be flush mounted in the ceiling adjacent to the light fixture for all recessed mounted light fixtures.

3.3 GROUNDING

a. Provide equipment grounding connections for all lighting fixtures. Tighten connections to comply with tightening torques specified in UL standard 486A to assure permanent and effective grounds.

3.4 ADJUSTING, CLEANING AND RELAMPING

a. Adjust all directional light fixtures as directed by the Architect.

b. Clean all light fixture housings, reflectors, lenses and diffusers at completion of project.

c. Relamp all light fixtures at substantial completion that have inoperative lamps or lamps that display a visual amount of color shift.

3.5 DEMONSTRATION

a. Demonstrate that all light fixtures are complete and operational.

b. Demonstrate the operation of all lighting controls, including the setting and adjustment of time clocks and other automatic controls.

End of Section 26 5113

SECTION31 2000
EARTHWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings, general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

B. References

1. ASTM D 422 – Mechanical Analysis
2. ASTM D 424 – Plasticity Index
3. ASTM D 698 – Moisture Density Relationship
4. ASTM D 1557 – Moisture Density Relationship
5. ASTM D 2487 – Soil Classification
6. ASTM D 2049 – Moisture Density Determination
7. ASTM D 2922 – Field Density Test (Nuclear Method)
8. TxDOT Standard Specifications

1.02 DESCRIPTION OF WORK:

A. Extent of earthwork is indicated on drawings or as directed by the Engineer and consists of, but is not limited, to the following:

B. Excavation shall consist of the removal of material encountered to subgrade elevations indicated and subsequent disposal of these excavated materials.

C. Trenching shall consist of an open cut excavation to grades indicated on plans for the placement of utilities, concrete conduit, footings and culverts.

D. Dewatering is included in this section.

E. Embankment and Fill shall consist of the placing and compacting of suitable materials obtained from approved sources.

F. Backfilling is included in this section.

G. Preparation of subgrade for walks and pavements is included in this section.

1.03 RELATED SECTIONS:

A. Concrete is specified in Division 3.

B. Shoring and bracing is specified in the Trench Excavation Safety Protection section.

C. Base and Pavements are specified in other sections.

1.04 QUALITY ASSURANCE:

A. Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

B. Testing and Inspection Service: Owner's Engineer will engage soil testing and inspection service for quality control testing during earthwork operations.

1. Laboratory control is employed to assist the Contractor in producing the

specified results, but in no way relieves the Contractor of his obligation to produce the specified results.

2. A soils laboratory selected by the Engineer and Owner shall provide soil testing and inspection service. Testing service will include testing facilities for quality control testing during earthwork operations. Cost of this service shall be paid by the Owner.

C. Tests for Proposed Soil Materials: Contractor shall perform at his expense tests for soil materials proposed for use in the work and submit test reports on the same day tests are conducted, to the Engineer and the Owner for tests herein specified and for additional tests as may be required.

1. Provide one moisture-density relation for each type of soil encountered in subgrade and fills.
2. The testing service will determine the suitability of all materials that may be used as fill or backfill.
3. For borrow materials, perform a mechanical analysis (ASTM D 422) plasticity index (ASTM D 424), and moisture-density relation (ASTM D 1557).

D. Quality Control Testing during Construction: When fill or backfill is required to be compacted to any specified density, the Engineer may order such fill or backfill to be laboratory tested in order to ascertain compliance with specification requirements. Tests will be executed immediately prior to covering of such compacted areas. Cost for such laboratory work is to be paid for by the Owner.

1.05 SUBMITTALS:

A. A testing laboratory, as specified above, shall be employed to test and determine if the required density is being obtained and to test compaction of exposed subgrades. Laboratory reports on tests performed shall include coordinates and elevations of field tests and shall be distributed as follows:

Engineer	1 copy
Contractor	1 copy
Owner	1 copy

B. Testing service shall inspect and certify in writing all subgrades and fill layers before further construction work is performed thereon. All compacted fills shall consist of laboratory approved materials placed in horizontal layers as specified. A minimum of one field density determination shall be performed for every 5000 square feet in each layer, but in no case less than 3 tests per layer per day.

C. When tests indicate compaction does not meet requirements, fill and backfill shall be dried out or moistened as necessary and recompacted. Recompacted areas shall be retested. This procedure shall be repeated until tests indicate compliance with specified requirements. Reworking and retesting shall be provided at no cost to the Owner.

1.06 JOB CONDITIONS:

A. Site Information: Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that Owner will not be responsible for interpretations or conclusions drawn therefrom by Contractor. Data is made available for

convenience of Contractor. Additional test borings and other exploratory operations may be made by Contractor at no cost to Owner.

B. Existing Utilities: Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.
   1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, the contractor shall consult with the utility owner immediately for directions. Coordinate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
   2. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, during occupied hours, except when permitted in writing by the Engineer and then only after acceptable temporary utility services have been provided.
   3. Provide minimum of 72-hour notice to Engineer and Owner, and receive written notice to proceed before interrupting any utility.
   4. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.

C. Use of Explosives: The use of explosives is not permitted.

D. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.
   1. Operate warning lights as recommended by authorities having jurisdiction.
   2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.
   3. At trees which are to remain, perform excavation within drip-line by hand, and protect the root system from damage or dry out, to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with burlap. Paint root cuts of 1" diameter and larger with emulsified asphalt tree paint.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS:

A. Satisfactory soil materials are those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW and SP.

B. Unsatisfactory soil materials are those complying with ASTM D2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH and PT.

C. Cohesionless soil materials include gravels, sand-gravel mixtures, sands and gravely-sands.

D. Cohesive soil materials include clayey and silty gravels, sand-clay mixtures, gravel-silt mixtures, clayey and silty sands, sand-silt mixtures, clays, silts, and very fine sands. Fill material may be required from offsite sources to produce the designated lines and grades of fills, backfills, and rough grades. Fill material brought from off the site shall conform to specifications for various uses as specified.

1. Class B Fill shall be drain gravel conforming to the Type C material as specified in the TxDOT Item 302.
2. Class C Fill shall be native earth material and as further described in following paragraphs.
3. Fill materials shall be approved and conform to the following requirements, except as specifically indicated otherwise:
    a. Fill shall be earth, free of debris, cinders, combustibles, frost, ice, roots, sod, wood, cellulose, organic materials, and materials that may be subject to termite attack. Up to 30 percent of all material may be rock-like-materials not more than 0.25 cubic foot in volume nor more than 12 inches in length, if evenly distributed in the total fill.
    b. Top 18 inches of fills or to replace excess excavation under topsoil of lawn and planted areas shall be earth, free of debris, cinders, frost, ice, sod, wood, and roots over 1/4 inch in diameter. Up to 10 percent of fill material may be rock-like materials not more than 0.05 cubic foot in volume nor more than 4 inches in length. Also, up to 20 percent of fill material may be topsoil, but not sod.
    c. Class C Fill shall be compacted in 8” layers to at least 90 percent to optimum density as determined by ASTM D 1557.

PART 3 - EXECUTION

3.01 EXCAVATION:

A. Excavation is Unclassified, and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.

B. Unauthorized Excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without direction of the Engineer. Unauthorized excavation, as well as remedial work directed by the Engineer, shall be at Contractor's expense.
    1. Under retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to the Engineer.
    2. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by the Engineer.

C. Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations and grades as shown. For all paving to be placed over cut areas, excavate to required depths. Trim cuts accurately to provide for minimum design thickness of slabs or requirements of Class C Fill. Just prior to placing any base materials, density and moisture content of the top 3 inches of compacted subgrade shall be checked and if tests show the density to be more than 2% below the specified minimum or the moisture content course shall be reworked as necessary to obtain the specified compaction and moisture content.

D. Excavation for Ditches: Cut ditches to the cross-sections and grades as shown on the drawings. Deposit excavated materials a sufficient distance from the edge of ditches to prevent cave-ins or material falling or sliding into the ditch. Keep

ditches free of an accumulation of leaves, sticks and other debris until final acceptance of the work.

E. Excavation for Areas Outside Confines of Pavements and Structures: For all cut areas outside pavements excavate to required levels, grades and contours.

F. Execute earth fill outside pavement and structures to the levels, grades, and contours with Class C Fill.

G. Stability of Excavations: Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace according to the Trench Excavation Safety Protection section where sloping is not possible because of space restrictions or stability of material excavated.

H. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

I. Material Storage: Stockpile excavated materials classified as satisfactory soil material until required for fill or backfill operations. Place, grade and shape stockpiles for proper drainage.

1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
2. Dispose of excess soil material and waste materials as herein specified.
3. Where topsoil will be required on site for finish grading and planting work, strip existing topsoil to a minimum depth of 4 inches in areas of construction and cut areas of grading. Sift topsoil free of growth, debris, etc., and stockpile on site as directed. If size of site precludes on site storage, make arrangements for use of an offsite area and stockpile topsoil there. Protect against theft, erosion and any accumulation of debris during construction operations. Do not strip topsoil when it is in muddy condition.

J. Removal of Unsatisfactory Soil Materials: Excavate unsatisfactory soil materials, encountered that extend below the required elevations, to the additional depth until satisfactory material is encountered. Satisfactory and unsatisfactory soil materials shall be as determined by the testing laboratory.

1. Payment for such additional excavation, provided it is not due to the fault or neglect of the Contractor, will be made under the provisions of the Contract for Changes in the Work.
2. Where the removal of unsatisfactory soil materials is due to the fault or negligence of the Contractor in his performance of earthwork and site grading operations, excavate the resulting unsatisfactory soil material and replace with compacted satisfactory soil material as required.

3.02 TRENCHING

A. Excavate for Trenches: Dig trenches to the uniform width required for particular item to be installed, sufficiently wide to provide ample working room. Provide 6" to 12" clearance on both sides of pipe or conduit.

B. Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations.

C. Where rock is encountered, carry excavation 4" below required elevation and backfill with a 4" layer of crushed stone or gravel prior to installation of pipe.

D. For pipes or conduit 5" or less in nominal size and for flat-bottomed multiple-duct conduit units, do not excavate beyond indicated depths. Hand excavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil.

E. Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for entire body of pipe.

F. Flowable Fill is an acceptable option to class B Fill for backfilling of trenches.

3.03 DEWATERING:

A. Dewatering: Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area. Do not allow water to accumulate in excavations. Remove water to prevent soil changes detrimental to stability of subgrades. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

1. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.

3.04 BACKFILL AND FILL:

A. General: Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.

1. The surface of the ground of all unpaved areas other than rock which are to receive embankment shall be loosened by scarifying or plowing to a depth of not less than 4 inches. The loosened material shall be recompacted to Class C Fill requirements.
2. Areas to receive fill material shall be proof rolled with rolling equipment weighing not less than 20 tons with not less than four pneumatic tired wheels inflated to at least 100 psi. All areas shall receive at least four consecutive passes of the equipment which shall be observed by a soils engineer. The proof rolling will locate soft zones which may need to be undercut and will densify the upper layers of the soil to receive the fill.

B. Materials: Under walks and pavements use acceptable soil material to within 2 feet of finished grade. Use satisfactory excavated or borrow material from the 2 foot line to subgrade identified in the plan details.

1. Under grassed areas use onsite soil material to within 6 inches of the finished grade. Add native or borrowed topsoil to finished grade for seeded or sprigged areas or 2 inches below finished grade for areas to be sodded.
2. Under piping and conduit, use excavated material, borrow or Class B Fill where wet conditions occur.

C. Backfill Excavations as promptly as work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, damp proofing, waterproofing and perimeter insulation.
2. Inspection, testing, approval, and recording locations of underground utilities.
3. Removal of concrete formwork.

4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of structure or utilities, or leave in place if required.
5. Removal of trash and debris.
6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

D. Embankment Under Future Roadways: Embankment areas under future roadways shall be constructed in layers approximately parallel to the finished grade of the roadbed and unless otherwise specified, each layer shall be so constructed as to provide a uniform, slope of 1/4 inch per foot from the center line of the roadbed to the outside.

1. Embankments shall be constructed to the grade established on the plans and completed embankments shall correspond to the general shape of the typical sections shown on the plans and each section of the embankment shall correspond to the detailed section or slopes as shown on plans. After completion of the roadway, it shall be continuously maintained to its finished section and grade until the project is accepted.
2. Except as otherwise specified, earth embankments shall be constructed in successive 6-inch layers for the full width of the individual roadway cross section and in such lengths as are best suited to the sprinkling and compaction methods utilized.
3. Minor quantities of rock encountered in constructing earth embankment shall be incorporated in the specified embankment shall be incorporated in the specified embankment layers, or may be placed in accordance with the requirements for the construction of rock embankments in the deeper fills, provided such placement of rock is not immediately adjacent to structures.
4. Each layer of embankment shall be uniform as to material, density and moisture content before beginning compaction. Where layers of unlike materials abut each other, each layer shall be featheredged for at least 100 feet or the material shall be so mixed as to prevent abrupt changes in the soil. No material placed in the embankment by dumping in a pile or windrow shall be incorporated in a layer in that position, but all such piles or windrows shall be moved by blading or similar methods. Clods or lumps of material shall be broken and the embankment material mixed by blading, harrowing, discing or similar methods to the end that a uniform material of uniform density is secured in each layer. Water required for sprinkling to bring the material to the moisture content necessary for maximum compaction shall be evenly applied and it shall be the responsibility of the Contractor to secure a uniform moisture content throughout the layer by such methods as may be necessary.
5. All earth cuts, full width or part width cuts in side hill, which are not required to be excavated below subgrade elevation for base and backfilled, shall be scarified to a uniform depth of at least 6 inches below grade, and the material shall be mixed and reshaped by blading and then sprinkled and rolled in accordance with the requirements outlined above for earth embankments and to the same density as that required for the adjacent embankment.

6. After each layer of earth embankment or select material is complete, tests as necessary will be made by the Engineer. If the material fails to meet the density specified, the course shall be reworked as necessary to obtain the specified compaction.

7. The upper or final layer of the embankment shall contain no stones larger than 4 inches in their greatest dimension, and shall be composed of material so graded that the density and uniformity of the surface layer may be secured by the methods and requirements as set forth for Class C Fill.

E. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials,, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break-up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

1. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

F. Placement and Compaction: Place backfill and fill material in layers not more than 8" in loose depth for material compacted by heavy compaction equipment, and not more than 4" in loose depth for material compacted by hand-operated tampers.

1. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

2. Place backfill and fill materials evenly adjacent to structures, piping or conduit to required elevations. Take care to prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping or conduit to approximately same elevation in each lift.

3.05 PREPARATION OF SUBGRADE (GRADING AND COMPACTION):

A. General: Uniformly grade areas within limits of grading, including adjacent transition areas. Smooth finished surface within specified tolerances and compact to elevations, uniform levels and slopes as indicated on plans.

1. The subgrade for paved areas shall be finished to elevations required to allow for base and finished paving.

2. Grading, including excavated and filled sections and adjacent transition areas shall be reasonably smooth, compacted, and free from irregular surface changes. Degree of finish shall be that ordinarily obtainable from either blade-grader or scraper operations, except as otherwise specified. Tolerance for areas within 10 feet of buildings and all areas to be paved, shall not exceed one-half inch (1/2") in cross section and in a length of 16 feet measured longitudinally. All ditches, swales and gutters shall be finished to drain readily. Unless otherwise indicated on drawings, subgrade shall be evenly sloped to provide drainage away from building walls in all directions at a grade not less than 1/4 inch per foot. Provide slope transitions at top and bottom of banks and at other breaks in grade.

3. Redress and recompact any areas that settle below required grades because of traffic, precipitation, or storage loading before execution of other work required. Correct any deviations in grading tolerance for areas to be paved by loosening, adding, or removing material, reshaping and compacting by sprinkling and rolling. Sufficient subgrade shall be prepared in advance to insure satisfactory execution of the work.
4. After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

B. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture density relationship (cohesive soils) determined in accordance with ASTM D 698; and not less than the following percentages of relative density, determined in accordance with ASTM D 2049, for soils which will not exhibit a well-defined moisture-density relationship (cohesionless soils).

C. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations. Provide sufficient equipment capable of adding measured amounts of moisture to the soil material as determined by moisture-density relation tests. Maintain the actual moisture content in the soil material at the time of compaction to within the limits specified for satisfactory soil materials.
1. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
2. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread on the surface where directed and permitted to dry. Assist drying by discing, harrowing or pulverizing until the moisture content is reduced to a satisfactory value, as determined by moisture-density relation tests. When accepted by the soils laboratory, the soil material may be used in compacted backfill or fill.

D. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 0.10' above or below required subgrade elevation.

E. Compact top 6" of subgrade and each layer of backfill or fill material at 90% maximum density for cohesive material or 95% relative density for cohesionless material.

F. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 1/2" above or below required subgrade elevation.

G. Pavements: Compact top 6" of subgrade and each layer of backfill or fill material at 90% maximum density for cohesive material or 95% relative density for cohesionless material.

H. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding.
1. Finish surfaces free from irregular surface changes, and as follows:

I. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than

0.10' above or below required subgrade elevations. The subgrade for lawn and planting areas shall be not less than 4 inches below final finish grade, unless a greater depth is indicated on the drawings.

1. Compact top 6" of subgrade and each layer of backfill or fill material at 85% maximum density for cohesive soils and 90% relative density for cohesionless soils.

3.06 FIELD QUALITY CONTROL:

A. Quality Control Testing during Construction: Allow testing service to inspect and approve subgrades and fill layers before further construction work is performed.

1. Perform field density tests in accordance with ASTM D 2922 (nuclear method).

B. Paved Areas: Make at least one field density test of subgrade for every 5000 square feet of paved area, but in no case less than 3 tests. In each compacted fill layer, make one field density test for every 5000 square feet of paved area, but in no case less than 3 tests.

1. If in opinion of the Engineer, based on testing service reports and inspection, subgrade or fills which have been placed are below specified density, provide additional compaction and testing at no additional expense to the Owner.

3.07 MAINTENANCE:

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

1. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

C. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.08 CLEAN UP:

A. Removal from Owner's Property: Remove waste materials, including unacceptable excavated material, trash and debris, and dispose of it off Owner's property.

END OF SECTION

SECTION 31 2200
GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of topsoil.

B. Rough grading the site for site structures and building pads.

C. Finish grading.

1.02 RELATED REQUIREMENTS

A. Section 31 1000 - Site Clearing.

B. Section 31 2316 - Excavation.

C. Section 31 2316.13 - Trenching: Trenching and backfilling for utilities.

D. Section 31 2316.26 - Rock Removal.

E. Section 31 2323 - Fill: Filling and compaction.

F. Section 32 9219 - Seeding: Finish ground cover.

G. Section 32 9223 - Sodding: Finish ground cover.

H. Section 32 9300 - Plants: Topsoil in beds and pits.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 2200 - Unit Prices, for general requirements relating to unit prices for this work.

B. Topsoil: Applies to Unit Price.
   1. Measurement Method: By the cubic foot.
   2. Includes: Excavating existing topsoil, stockpiling, scarifying substrate surface, placing where required, and compacting.

1.04 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with Texas Department of Transportation Standard Specification for Construction and Maintenance of Highways, Streets and Bridges.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil: See Section 31 2323.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect from damage above- and below-grade utilities to remain.

D. Notify utility company to remove and relocate utilities.

E. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.

F. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.

G. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.

3.03 ROUGH GRADING

A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

B. Do not remove topsoil when wet.

C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

D. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.

E. When excavating through roots, perform work by hand and cut roots with sharp axe.

F. See Section 31 2323 for filling procedures.

G. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key fill material to slope for firm bearing.

H. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.04 SOIL REMOVAL

A. Stockpile excavated topsoil on site.

B. Stockpile excavated subsoil on site.

C. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

3.05 FINISH GRADING

A. Before Finish Grading:
   1. Verify building and trench backfilling have been inspected.
   2. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.

C. Where topsoil is to be placed, scarify surface to depth of 3 inches.

D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.
E. Place topsoil in areas where seeding are indicated.
F. Place topsoil where required to level finish grade.
G. Place topsoil to thickness as scheduled.
H. Place topsoil during dry weather.
I. Remove roots, weeds, rocks, and foreign material while spreading.
J. Near plants spread topsoil manually to prevent damage.
K. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
L. Lightly compact placed topsoil.

3.06 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.
B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

3.07 REPAIR AND RESTORATION

A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.
B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from Architect as to remedy.
C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

3.08 FIELD QUALITY CONTROL

A. See Section 31 2323 for compaction density testing.

3.09 CLEANING

A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.
B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 31 2316
EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for building volume below grade, footings, pile caps, slabs-on-grade, paving, site structures, and utilities within the building.

B. Trenching for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Geotechnical report; bore hole locations and findings of subsurface materials.

B. Section 01 5713 - Temporary Erosion and Sedimentation Control: Slope protection and erosion control.

C. Section 01 7000 - Execution and Closeout Requirements: General requirements for dewatering of excavations and water control.

D. Section 02 4100 - Demolition: Shoring and underpinning.

E. Section 31 2200 - Grading: Grading.

F. Section 31 2316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

G. Section 31 2323 - Fill: Fill materials, filling, and compacting.

H. Section 31 3700 - Riprap.

I. Section 33 4600 - Subdrainage: Filter aggregate and filter fabric for foundation drainage systems.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 2200 - Unit Prices, for general requirements applicable to unit prices for excavation.

B. Excavating Soil Materials:
   1. Measurement method: By the cubic foot.
   2. Includes: Excavating to required elevations, loading and placing materials in stockpile.
   3. Does Not Include Over-Excavation: Payment will not be made for over-excavated work nor for replacement materials.

C. See Section 31 2323 - Fill, for measurement and payment provisions related to fill.

1.04 PROJECT CONDITIONS

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 2200 for additional requirements.

3.03 EXCAVATING

A. Excavate to accommodate new structures and construction operations.

B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

D. Do not interfere with 45 degree bearing splay of foundations.

E. Cut utility trenches wide enough to allow inspection of installed utilities.

F. Hand trim excavations. Remove loose matter.

G. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 2323.

H. Grade top perimeter of excavation to prevent surface water from draining into excavation.

I. Remove excavated material that is unsuitable for re-use from site.

J. Remove excess excavated material from site.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

3.05 PROTECTION

A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION

SECTION 31 2316.13
TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 RELATED REQUIREMENTS

A. Geotechnical report; bore hole locations and findings of subsurface materials.

B. Section 31 2200 - Grading: Site grading.

C. Section 31 2316 - Excavation: Building and foundation excavating.

D. Section 31 2316.26 - Rock Removal: Removal of rock during excavating.

E. Section 31 2323 - Fill: Backfilling at building and foundations.

F. Section 33 4600 - Subdrainage: Filter aggregate and filter fabric for foundation drainage systems.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 2200 - Unit Prices, for general requirements applicable to unit prices for earthwork.

B. Excavating Soil Materials:
   1. Measurement method: By the cubic foot.
   2. Includes: Excavating to required elevations, loading and placing materials in stockpile.
   3. Does Not Include Over-Excavation: Payment will not be made for over-excavated work nor for replacement materials.

C. General Fill:
   1. Includes: Excavating existing soil, stockpiling, scarifying substrate surface, placing where required, and compacting.

D. Structural Fill:
   1. Includes: Excavating existing soil, stockpiling, scarifying substrate surface, placing where required, and compacting.

E. Granular Fill:
   1. Includes: Excavating existing material, stockpiling, scarifying substrate surface, placing where required, and compacting.

F. Aggregates:
   1. Includes: Excavating existing material, stockpiling, scarifying substrate surface, placing where required, and compacting.

1.04 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: Indicated on drawings.

1.05 REFERENCES

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2010

B. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2006.

C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

D. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.

E. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

F. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.

G. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

H. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

I. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.

J. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Samples: 10 lb sample of each type of fill; submit in air-tight containers to testing laboratory.

C. Materials Sources: Submit name of imported materials source.

D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

E. Compaction Density Test Reports.

1.07 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.
   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

2.01 FILL MATERIALS

A. General Fill - Fill Type Conforming to TxDOT Specifications for Construction and Maintenance of Highways, Streets and Bridges.

B. Structural Fill - Fill Type Conforming to TxDOT Specifications for Construction and Maintenance of Highways, Streets and Bridges

C. Concrete for Fill: Lean concrete.

D. Granular Fill - Fill Type :Coarse aggregate, conforming to TxDOT Specifications for Construction and Maintenance of Highways, Streets and Bridges

E. Sand - Fill Type: Conforming to TxDOT Specifications for Construction and Maintenance of Highways, Streets and Bridges.

F. Topsoil: See Section 31 2200.

2.02 ACCESSORIES

2.03 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 2200 for additional requirements.

3.03 TRENCHING

A. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow inspection of installed utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove excavated material that is unsuitable for re-use from site.

G. Remove excess excavated material from site.

3.04 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.05 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

F. Correct areas that are over-excavated.
   1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

G. Compaction Density Unless Otherwise Specified or Indicated:

H. Reshape and re-compact fills subjected to vehicular traffic.

3.06 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Utility Piping, Conduits, Duct Bank:
   1. Bedding: Use general fill.
   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. At Pipe Culverts:
   1. Bedding: Use general fill.
   2. Place filter fabric specified in Section 33 0513 over compacted bedding.
   3. Cover with general fill.
   4. Fill up to subgrade elevation.
   5. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

D. Over Subdrainage Piping at Foundation Perimeter and Under Slabs:
   1. Drainage fill and geotextile fabric: Section 33 4600.
   2. Cover drainage fill with general fill.
   3. Compact to 95 percent of maximum dry density.

E. At French Drains:
   1. Use granular fill.
   2. Compact to 95 percent of maximum dry density.

3.07 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.08 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.

C. If tests indicate work does not meet specified requirements, remove work, replace and retest.

D. Frequency of Tests: <u>two per site.</u>

3.09 CLEANING

A. Leave unused materials in a neat, compact stockpile.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 31 2316.16

STRUCTURAL EXCAVATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Excavating for building volume below grade, footings, pile caps, slabs-on-grade, paving, site structures, and utilities within the building.

1.2 RELATED REQUIREMENTS

A. Geotechnical report; bore hole locations and findings of subsurface materials.

B. Section 31 2323.16 - Structural Fill: Fill materials, filling, and compacting.

1.3 PROJECT CONDITIONS

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect utilities that remain and protect from damage.

3.2 EXCAVATING

A. Excavate to accommodate new structures and construction operations.

B. Notify Architect/Structural Engineer of Record of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

D. Do not interfere with 45 degree bearing splay of foundations.

E. Cut utility trenches wide enough to allow inspection of installed utilities.

F. Hand trim excavations. Remove loose matter.

G. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 2323.

H. Grade top perimeter of excavation to prevent surface water from draining into excavation.

I. Remove excavated material that is unsuitable for re-use from site.

J. Remove excess excavated material from site.

3.3 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

3.4 PROTECTION

A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION

SECTION 31 2323
FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for building volume below grade.

B. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

A. Section 01 5713 - Temporary Erosion and Sedimentation Control: Slope protection and erosion control.

B. Section 03 3000 - Cast-in-Place Concrete.

C. Section 26 4200 - Cathodic Protection.

D. Section 31 2200 - Grading: Removal and handling of soil to be re-used.

E. Section 31 2200 - Grading: Site grading.

F. Section 31 2316 - Excavation: Removal and handling of soil to be re-used.

G. Section 31 2316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

H. Section 31 2316.26 - Rock Removal: Removal of rock during excavating.

I. Section 31 3700 - Riprap.

J. Section 32 1413 - Precast Concrete Unit Paving: Leveling bed placement under pavers.

K. Section 32 1416 - Brick Unit Paving: Leveling bed placement under pavers.

L. Section 32 1423 - Asphalt Unit Paving: Leveling bed placement under pavers.

M. Section 32 1440 - Stone Paving: Leveling bed placement under pavers.

N. Section 33 4600 - Subdrainage: Filter aggregate and filter fabric for foundation drainage systems.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 2200 - Unit Prices, for general requirements applicable to unit prices for earthwork.

B. General Fill:
   1. Includes: Excavating existing soil, stockpiling, scarifying substrate surface, placing where required, and compacting.

C. Structural Fill:
   1. Includes: Excavating existing soil, stockpiling, scarifying substrate surface, placing where required, and compacting.

D. Granular Fill:
   1. Includes: Excavating existing material, stockpiling, scarifying substrate surface, placing where required, and compacting.

E. Aggregates:
   1. Includes: Excavating existing material, stockpiling, scarifying substrate surface, placing where required, and compacting.

1.04 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: Indicated on drawings.

1.05 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2010

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

C. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

D. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Samples: 10 lb sample of each type of fill; submit in air-tight containers to testing laboratory.

C. Materials Sources: Submit name of imported materials source.

D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

E. Compaction Density Test Reports.

1.07 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.
   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

2.01 FILL MATERIALS

A. General Fill - Fill Type: Conforming to TxDOT Specifications for Construction and Maintenance of Highways, Streets and Bridges

B. Structural Fill - Fill Type: Conforming to TxDOT Specifications for Construction and Maintenance of Highways, Streets and Bridges.

C. Concrete for Fill: Lean concrete.

D. Granular Fill - Gravel - Fill Type: AASHTO M147, Grade 2; passing the 7/8" sieve; with a liquid limit of not more than 25 and a plasticity index of not more than 5 in accordance with ASTM D4318.

E. Sand - Fill Type: Conforming to TxDOT Specifications for Construction and Maintenance of Highways, Streets and Bridges.

F. Topsoil: See Section 31 2200.

2.02 ACCESSORIES

A. Geotextile Fabric: Non-biodegradable, woven

B. Vapor Retarder: 10 mil thick, polyethylene.

2.03 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the Work are as indicated.

B. Identify required lines, levels, contours, and datum locations.

C. See Section 31 2200 for additional requirements.

D. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

E. Verify structural ability of unsupported walls to support imposed loads by the fill.

F. Verify underground tanks are anchored to their own foundations to avoid flotation after backfilling.

3.02 PREPARATION

A. Scarify subgrade surface to a depth of 6 inches to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

F. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

G. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

H. Correct areas that are over-excavated.
   1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

I. Compaction Density Unless Otherwise Specified or Indicated:

J. Reshape and re-compact fills subjected to vehicular traffic.

3.04 FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Structural Fill
   1. Maximum depth per lift: 6 inches, compacted.
   2. Compact to minimum 95 percent of maximum dry density.

C. Pervious Structural Fill
   1. Use granular fill.
   2. Maximum depth per lift: 6 inches, compacted.
   3. Compact to minimum 95 percent of maximum dry density.

D. Under Interior Slabs-On-Grade:
   1. Use granular fill.
   2. Compact to 95 percent of maximum dry density.

E. At Foundation Walls and Footings:
   1. Do not backfill against unsupported foundation walls.

F. Over Subdrainage Piping at Foundation Perimeter and Under Slabs:
   1. Drainage fill and geotextile fabric: Section 33 4600.
   2. Cover drainage fill with general fill.
   3. Compact to 95 percent of maximum dry density.

G. Over Buried Utility Piping, Conduits, and Duct Bank in Trenches
   1. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

H. At Interior Crawl Spaces:
   1. Use general fill.
   2. Compact to 90 percent of maximum dry density.

I. Inside Planter Boxes:
   1. Use granular fill, 4 inches deep.
   2. Cover with geotextile fabric.
   3. Cover with sand, 2 inches deep.
   4. Finish with topsoil, to within 2 inches of planter rim, lightly tamped.

J. Around and Over Underground Tanks:
   1. Use initial fill of sand.

a. Compact to 95 percent of maximum dry density.
2. Complete with general fill.
a. Compact to 95 percent of maximum dry density.

K. At Lawn Areas:
1. Use general fill.
2. Compact to 95 percent of maximum dry density.
3. See Section 31 2200 for topsoil placement.

L. At Planting Areas Other Than Lawns
1. Use general fill.
2. Compact to 95 percent of maximum dry density.
3. See Section 31 2200 for topsoil placement.

M. At French Drains:
1. Use granular fill.
2. Compact to 95 percent of maximum dry density.

N. Under Pavers Set on Sand Leveling Bed:
1. Use granular fill.
2. Fill up to bottom of sand leveling bed.
3. Compact to 95 percent of maximum dry density.
4. See unit pavers section for leveling bed placement.

O. Under Monolithic Paving and Monolithic Paver Setting Beds:
1. Compact subsoil to 95 percent of its maximum dry density before placing fill.
2. Use general fill.
3. Compact to 95 percent of maximum dry density.
4. See Section 32 1123 for aggregate base course placed over fill.

3.05 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

3.06 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.

C. If tests indicate work does not meet specified requirements, remove work, replace and retest.

D. Frequency of Tests: <u>two per site.</u>

3.07 CLEANING

A. Leave unused materials in a neat, compact stockpile.

B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 31 2323.16

STRUCTURAL FILL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Filling, backfilling, and compacting for building volume below grade.

1.2 RELATED REQUIREMENTS

A. Geotechnical report; bore hole locations and findings of subsurface materials.

B. Section 31 2316.16 - Structtural Excavation: Removal and handling of soil to be re-used.

1.3 REFERENCE STANDARDS

A. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

B. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Materials Sources: Submit name of imported materials source.

C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

D. Compaction Density Test Reports.

1.5 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. General Fill: Subsoil excavated on-site.

1. Graded.

2. Free of lumps larger than {CH#10000698}, rocks larger than {CH#10000699}, and debris.

3. Conforming to ASTM D2487 Group Symbol .

4. Plasticity Index (PI) maximum 20 percent, with moisture content between minus two (-2) and plus three (+3) points of the optimum.

B. Structural Fill- Fill Type Item 247, Type "A", Grade 2: Conforming to State of Texas Highway Department standard.

C. Granular Fill- Fill Type 57 Rock: Coarse aggregate, conforming to State of Texas Highway Department standard.

2.2 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.1 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.

3.2 PREPARATION

A. In the area occupied by the foundation , plus a distance show on the drawings, remove topsoil including all organic materials, roots, etc. from the site per drawings. Do not use for underfloor fill. Remove additional material as necessary to provide minimum fill per drawings.

B. The resulting surface shall be proof rolled with a sufficiently heavy roller (15 TONS) to locate and densify weak and compressible zones. A minimum of 6 passes of the roller is required. Any soft sposts shall be removed and replaced with compacted structural fill.

C. The rolled subgrade shall be scarified just prior to fill placement to a minimum depth of 6" and recompacted to a mimimum of 95% of the maximum density as determined by ASTM D 698 compaction test, maintaining moisture content between -1 and +3 percentage points until

covered.

3.3 FILLING

A. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

B. Beginning at low end, build up to the bottom of the slab with structural fill. Refer to plan for minimum thicknesses. NO DIRT FILL SHALL BE USED UNDER THE BUILDING FOUNDATION. Submit written certification of compliance with requirements above by test preformed on field sample.

C. All fill shall be placed in 8" loose horizontal lifts and compacted to a minimum of 95% of the maximum density as detemined by ASTM D 698 compaction test.

3.4 FILL AT SPECIFIC LOCATIONS

A. Under Interior Slabs-On-Grade:

1. Use structural fill.

B. At Foundation Walls and Footings:

Use general fill.

1. Fill up to subgrade elevation.

2. Compact each lift to 90 percent of maximum dry density.

3. Do not backfill against unsupported foundation walls.

4. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

C. At Foundation Walls and Footings with concrete or paving above fill:

D.

1. Use Select Fill.

2. Fill up to subgrade elevation.

3. Compact each lift to 95 percent of maximum dry density.

4. Do not backfill against unsupported foundation walls.

5. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

E. Over Subdrainage Piping at Foundation Perimeter and Under Slabs:

1. Drainage fill and geotextile fabric: Section 33 4600.

2. Cover drainage fill with structural fill or flowable fill.

3. Fill up to subgrade elevation.

4. Compact to 95 percent of maximum dry density.

F. Over Buried Utility Piping, Conduits, and Duct Bank in Trenches and [_____]:

1. Bedding: Use sand.

2. Cover with structural fill or flowable fill.

3. Fill up to subgrade elevation.

4. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

G. At {CH#10000883}:

1. Use {CH#10000884}.

2. Fill up to 8 inches below finish grade.

3. Compact to 95 percent of maximum dry density.

3.5 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

3.6 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

3.7 CLEANING

A. Leave unused materials in a neat, compact stockpile.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 32 1115
FLEXIBLE BASE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings, general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of flexible base work is shown on drawings and consists of but is not limited to a foundation course for surfacing, pavement, or other base courses; shall be composed of crushed stone or gravel, and shall be constructed as herein specified in one or more courses in conformity with the typical sections shown on the plans and to the lines and grades established.

1.03 RELATED SECTIONS:

A. Saw-cutting of edges of existing pavement is specified in Selective Demolition section.

B. Compaction of subgrade is specified in Earthwork section.

1.04 SUBMITTALS:

A. Material Certificates: Provide copies of materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

1.05 QUALITY ASSURANCE:

A. Codes and Standards: Comply with Texas State Department of Highways and Public Transportation (THD) Standard Specifications, 1982 edition, and with local governing regulations if more stringent than herein specified.

1.06 JOB CONDITIONS:

A. Weather Limitations: Do not perform flexible base installation in weather conditions, which will prevent proper installation as required by specifications.

B. Grade Control: Establish and maintain required lines and elevations as indicated on plans.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. General: The material shall be crushed or uncrushed as necessary to meet the requirements hereinafter specified, and shall consist of durable stone or gravel, crushed and/or screened to the required particle size, with or without other approved fine sized material. The material shall be from approved sources.

B. Testing of flexible base materials shall be in accordance with the following standard Laboratory Test Procedures:

Preparation for Soil

Constants and Sieve Analysis THD Tex-101-E

Liquid Limit	THD Tex-104-E
Plastic Limit	THD Tex-105-E
Plasticity Index	THD Tex-106-E
Linear Shrinkage	THD Tex-107-E
Sieve Analysis	THD Tex-110-E
Los Angeles Abrasion	ASTM C 131-66 (Grad. A)

C. Samples for testing the material shall be taken prior to the compaction operations.

D. The material shall be well graded and when properly tested, shall meet the following requirements:

Retained on 1-3/4 inch sieve	0%
Retained on No. 4 sieve	45% to 75%
Retained on No. 40 sieve	60% to 85%

E. The material passing the No. 40 sieve shall be known as Soil Binder and shall meet the following requirements:

a. Liquid Limit shall not exceed 40

b. Plasticity Index shall not exceed 12

F. The crushed stone or crushed gravel shall have an abrasion of not more than forty (40) when subjected to the Los Angeles Abrasion Test.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION:

A. Proof roll compacted subgrade surface to check for unstable areas and areas requiring additional compaction.

B. Contractor shall be responsible for unsatisfactory conditions. Do not begin flexible base work until deficient compacted subgrade areas have been corrected and are ready to receive flexible base.

3.02 PLACING FLEXIBLE BASE:

A. The flexible base material shall be placed on the approved subgrade in courses not to exceed six (6) inches compacted depth. It shall be the responsibility of the Contractor that the required amount of material be delivered and uniformly spread and shaped. All material shall be moved from the place where it is dumped by cutting into windrows. After the material has been cut into windrows, it shall be sprinkled, spread, shaped, and rolled in proper sequence to prevent segregation and as necessary for required compaction.

B. The surface upon completion shall be smooth and in conformity with typical sections and to the established lines and grades. Any deviation in excess of 1/4 inch in cross section and in length of 16 feet measured longitudinally shall be corrected. All irregularities, depressions, or weak spots which develop shall be corrected.

C. Flexible base shall be compacted to an apparent dry density of not less than 95 percent of the maximum dry density as determined in accordance with THD Test Method Tex 113-E. Tests for density will be made within 24 hours after

compaction operations are completed. If the material fails to meet the density specified, it shall be reworked as necessary to meet the density required.

D. Just prior to the placing of any succeeding course of flexible base or surfacing on a previously compacted course, the density and moisture of the top three (3) inches of flexible base shall be checked and if test show the density to be more than 2 percent below the specified minimum or the moisture content to be more than 3 percent above or below the optimum, the course shall be reworked as necessary to obtain the specified compaction and moisture content.

3.03 FIELD QUALITY CONTROL:

A. General: Test in-place flexible base courses for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable flexible base as required.

END OF SECTION

SECTION 02530
CONCRETE CURB, WALK AND FLATWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings, general provisions of Contract, including general and Supplementary Conditions and Division-1 Specification sections, apply to work specified in this section.

1.02 DESCRIPTION OF WORK:

A. Extent of concrete curbs, walks and medians are shown on drawings.

B. Concrete Curb may be either machine laid or formed. It shall consist of Portland Cement concrete curbing with or without reinforcing steel as required, construction on an improved base in accordance with this specification and in conformity with the lines, grades, section and details shown on plans.

C. Concrete Walks shall consist of Portland Cement concrete walks with reinforcing as required conforming to the lines, grades, section and details shown on plans.

D. Concrete Medians shall consist of Portland Cement concrete medians and islands with reinforcing steel as required conforming to the lines, grades, sections and details shown on plans.

1.03 RELATED SECTIONS:

A. Concrete, Reinforcing Steel and other related items are specified in Division 3.

B. Improved Base is specified in other sections.

C. Backfill is specified in the Earthwork section.

1.04 QUALITY ASSURANCES:

A. Codes and Standards: Comply with local governing regulations if more stringent than herein specified.

1.05 JOB CONDITIONS:

A. Grade Control: Establish and maintain lines and elevations.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Concrete: Comply with requirements of applicable Division 3 sections for concrete materials, admixtures, bonding materials, curing materials and other items as required. Reinforcing shall be new stock, free of mill scale, and delivered to site free of rust other than that obtained in prompt transportation.

B. Forms: Steel, wood or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Coat forms with a non-staining form release agent that will not discolor or deface surface of concrete.

C. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.

D. Metal Expansion Caps: Furnish for one end of each dowel bar in expansion joints. Design caps with one end closed and a minimum length of 3 inches to allow bars movement of not less than 1 inch, unless otherwise indicated.

E. Expansion Joint Materials: Comply with requirements of applicable Division 7 sections for performed expansion joint fillers and sealers.

F. Curing and Sealing Compound: Apply immediately after finishing and comply with requirements as specified in Division 3.

2.02 CONCRETE MIX, DESIGN AND TESTING:

A. Comply with requirements of applicable Division 3 sections for concrete mix, design, sampling and testing, quality control and as herein specified.

B. Compressive Strength shall be as follows:

1. Curb - 3,000 psi, minimum in 28 days.
2. Walk – 3,000 psi, minimum in 28 days.
3. Median - 3000 psi, minimum in 28 days.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION:

A. Area shall be excavated, shaped and compacted to lines, grades and cross section as shown on plans. If the surface is undercut, or the natural ground is below, "top of prepared surface" then necessary backfill shall be made with approved material and compacted with a mechanical tamper.

B. Formed Curb, Walks and Medians shall be placed on the prepared surface with a 2 inch flexible base cushion (minimum thickness). The flexible base cushion shall be moist at the time the concrete is placed.

C. Where the existing surface is at least seventy percent rock or gravel, the flexible base cushion can be eliminated.

D. Machine Laid Curb shall be placed on an improved base surface.

3.02 FORMS:

A. General: Forms shall be of metal or well seasoned wood. Wood forms for straight sections shall be not less than one and a half (1 ½) inches in thickness. Forms shall be clean, straight and free from warp. All forms shall be securely staked to line and grade and maintained in a true position during the depositing of concrete. Before concrete is placed, all forms shall be oiled with a light form oil.

B. Formed Curbs: The inside forms shall be rigidly attached to the outside forms.

C. Machine Laid Curb: No forms are required.

3.03 REINFORCING STEEL:

A. The reinforcing steel, if required shall be placed in position as shown on plans. Care shall be exercised to keep all steel in its proper location during the concrete placement.

3.04 EXPANSION JOINTS:

A. Expansion Joint Material, one-half inch thick, shall be provided at intervals not to exceed forty (40) feet in curbs and twenty (20) feet in walks and medians.

B. Expansion joint material shall also be provided where the new construction abuts existing concrete. The expansion joint material shall be placed vertically and shall extend the full depth and width of the curb, walk, or median.

C. Dowel bars shall be smooth bars, three-eights of an inch in diameters, 18 inches in length and shall be installed at each expansion joint. One 9 inch end of each dowel shall be thoroughly coated with hot oil asphalt or red lead, so that it will not bond to the concrete; approved types of slip joints may be used in lieu of coating ends of dowels. In curb, 2 dowel bars shall be used and located as detailed on plans. For walks and medians, dowel bars shall be spaced 18 inches apart.

3.05 DUMMY JOINTS:

A. Curb: Templates for "dummy" joints shall be of steel, not less than three-sixteenths (3/16) of an inch in thickness and patterned to the shape of the curb. Templates shall be cleaned and oiled and spaced to cut the curb in sections ten (10) feet in length. The templates shall extend a distance of one half (1/2) inch into the curb from the top down.

B. Walk and Median shall be marked with transverse "dummy" joints five feet apart, by the use of approved jointing tools.

C. Walk at back of curb – continue dummy joints through both. The depth of the dummy joints shall be a minimum of ¼ of the total concrete thickness.

3.06 CONCRETE:

A. Placement: Concrete shall be placed in the forms, spaded, rodded and tamped to exclude all air and honeycombing and until mortar entirely covers the surface and has a monolithic finish.

B. If a vibrator is used, care shall be taken not to leave it in one location long enough to induce segregation.

C. Surface Finishing: The top surface shall be floated and troweled to a uniform smooth surface, then finished with a camel hair brush or wood float to a gritty texture. The outer edges shall be rounded with approved tools to the radii shown on the plans.

D. On curbs, the surface shall be dusted with a dust consisting of one part Portland Cement and two parts fine sand, then floated and troweled as stated above.

E. Curing: Immediately after finishing the curb, it shall be protected by a membrane curing agent.

F. Backfilling: Walks and curbs shall be backfilled to the full height of the concrete.

3.07 MACHINE LAID CURB:

A. Curb Extrusion: The curb shall be laid by a curbing extrusion machine. The line for top of curb shall be maintained from a guide-line or guide-rails set by the Contractor. Curb outline shall strictly conform to the details shown on the plans.

The forming tube of the extrusion machine shall be readily adjustable vertically during the forward motion of the machine, to provide required variable height of curb necessary to conform to the established grade line. If a guide-line is used, a pointer or gage shall be attached to the machine in such a manner that a comparison can be made between the curb and the guideline in order to provide a continual check on the curb grade. Other methods may be used if approved by the Engineer.

B. The concrete shall be fed into the machine in such a manner and at such consistency that the finished curb will present a well compacted mass with a surface free from voids and honeycomb and true to established shape, line and grade.

C. Immediately following extrusion any voids between the trench walls and curb shall be filled with well compacted concrete and finished off flush with the surface of the base.

D. Cold Joints: Whenever extrusion is suspended long enough to produce a cold joint, three-eights (3/8) inch smooth dowel bars, eighteen (18) inches long, shall be embedded nine (9) inches into the completed curb, one-quarter (1/4) curb height from top and bottom. The end of the curb at the point of suspension of extrusion shall be cut back until all remaining concrete is of a dense well compacted nature.

E. Miscellaneous: Expansion joints, dummy joints, finishing and curing compound work shall follow the procedures previously outlined.

3.08 MAINTENANCE:

A. Repair and replace damaged concrete as directed by the engineer.

B. Protect the concrete until acceptance of work.

C. Wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

3.09 CLEAN UP:

A. Remove forms from site.

B. Backfill and slope to per cross sections.

END OF SECTION

SECTION 32 1216
HOT MIX ASPHALTIC CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.

B. Single course bituminous concrete paving.

C. Double course bituminous concrete paving.

D. Surface sealer.

1.02 RELATED REQUIREMENTS

A. Section 31 2200 - Grading: Preparation of site for paving and base.

B. Section 31 2323 - Fill: Compacted subgrade for paving.

C. Section 32 1313 - Concrete Paving: Concrete substrate.

D. Section 32 1313 - Concrete Paving: Concrete curbs.

E. Section 32 1423 - Asphalt Unit Paving.

F. Section 32 1713 - Parking Bumpers: Concrete bumpers.

G. Section 32 1723 - Painted Pavement Markings: Concrete bumpers.

H. Section 33 0513 - Manholes and Structures: Manholes, including frames; gutter drainage grilles, covers, and frames for placement by this section.

I. Section 09 9000 - Painting and Coating: Pavement markings.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 2200 - Unit Prices for requirements applicable to this section. Measurement and payment will be as follows:

B. Asphalt Pavement Mix (Base Course): By the ton. Includes preparing base, tack coating surfaces, placing, compacting and rolling, testing. Includes mix design, supplying to site, testing.

C. Asphalt Pavement Mix (Binder Course): By the ton. Includes preparing base, tack coating surfaces, placing, compacting and rolling, testing. Includes mix design, supplying to site, testing.

D. Asphalt Pavement Mix (Wearing Course): By the ton. Includes preparing base, tack coating surfaces, placing, compacting and rolling, testing. Includes mix design, supplying to site, testing.

E. Seal Coat: By the square yard. Includes preparing surfaces and applying.

1.04 REFERENCE STANDARDS

A. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types; The Asphalt Institute; 1997.

B. AI MS-19 - A Basic Asphalt Emulsion Manual; The Asphalt Institute; Fourth Edition.

C. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction; 2009a.

1.05 PERFORMANCE REQUIREMENTS

A. Design paving and subbase for movement of trucks up to 60,000 lbs (27 200 kg).

B. Design paving and subbase for movement of trucks up to 30,000 lbs (13 600 kg).

C. Design paving and subbase for main arterial street traffic.

D. Design paving and subbase for light duty commercial vehicle traffic.

E. Design paving and subbase atfor residential street traffic.

F. Design paving and subbase for parking.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with TxDOT Specifications for Construction and Maintenance of Highways, Streets and Bridges standard.

B. Mixing Plant: Conform to TxDOT Specifications for Construction and Maintenance of Highways, Streets and Bridges standard.

C. Obtain materials from same source throughout.

1.07 FIELD CONDITIONS

A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

B. Place bitumen mixture when temperature is not more than 15 F degrees below bitumen supplier's bill of lading and not more than maximum specified temperature.

PART 2 PRODUCTS

2.01 MATERIALS

A. Asphalt Cement: ASTM D946.

B. Aggregate for Base Course: In accordance with TxDOT Specifications for Construction and Maintenance of Highways, Streets and Bridges standards.

C. Aggregate for Binder Course: In accordance with TxDOT Specifications for Construction and Maintenance of Highways, Streets and Bridges standards.

D. Aggregate for Wearing Course: In accordance with TxDOT Specifications for Construction and Maintenance of Highways, Streets and Bridges standards.

E. Fine Aggregate: In accordance with TxDOT Specifications for Construction and Maintenance of Highways, Streets and Bridges standards.

F. Mineral Filler: Finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter.

G. Fiber Reinforcement: Synthetic fibers shown to have long-term resistance to deterioration when in contact with alkalis and moisture; 1/2 inch length.
   1. Manufacturers:
      a. Forta Corporation: www.forta-fi.com.

H. Primer: In accordance with TxDOT Specifications for Construction and Maintenance of Highways, Streets and Bridges standards.

I. Tack Coat: Homogeneous, medium curing, liquid asphalt.

J. Seal Coat: AI MS-19, sand type.

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

A. Use dry material to avoid foaming. Mix uniformly.

B. Base Course: 3.0 to 6 percent of asphalt cement by weight in mixture in accordance with AI MS-2.

C. Binder Course: 4.5 to 6 percent of asphalt cement by weight in mixture in accordance with manufacturers specifications.

D. Wearing Course: 5 to 7 percent of asphalt cement by weight in mixture in accordance with AI MS-2.

2.03 SOURCE QUALITY CONTROL

A. Test mix design and samples in accordance with AI MS-2.

PART 3 EXECUTION

3.01 BASE COURSE

A. Place and compact base course.

3.02 PREPARATION - PRIMER

A. Apply primer in accordance with manufacturer's instructions.

B. Apply primer on aggregate base or subbase at uniform rate of 1/3 gal/sq yd.

C. Use clean sand to blot excess primer.

3.03 PREPARATION - TACK COAT

A. Apply tack coat in accordance with manufacturer's instructions.

B. Apply tack coat on asphalt or concrete surfaces over subgrade surface at uniform rate of 1/3 gal/sq yd.

C. Apply tack coat to contact surfaces of curbs, gutters.

D. Coat surfaces of manhole frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.04 PLACING ASPHALT PAVEMENT - SINGLE COURSE

A. Install Work in accordance with TxDOT Specifications for Construction and Maintenance of Highways, Streets and Bridges standards.

B. Place asphalt within 24 hours of applying primer or tack coat.

C. Install gutter drainage grilles and frames in correct position and elevation.

D. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

E. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.05 PLACING ASPHALT PAVEMENT - DOUBLE COURSE

A. Place asphalt binder course within 24 hours of applying primer or tack coat.

B. Place wearing course within two hours of placing and compacting binder course.

C. Install gutter drainage grilles and frames in correct position and elevation.

D. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

E. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.06 CURBS

A. Install extruded asphalt curbs profile as indicated.

3.07 SEAL COAT

A. Apply seal coat to surface course and asphalt curbs in accordance with AI MS-19.

3.08 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Variation from True Elevation: Within 1/2 inch.

3.09 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for quality control.

B. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.

3.10 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury for_ days or until surface temperature is less than 140 degrees F.

3.11 SCHEDULE

A. Pavement at Truck Ramp and Garbage Area: Single course of 3-1/2 inch compacted thickness, sand seal coat.

B. Pavement at Parking Areas: Two courses; binder course of 2-1/2 inch compacted thickness and wearing course of 1 inch compacted thickness, fog seal coat.

C. Pavement at Rear Bus Loading Area: Thickness and compaction of subbase to support vehicles up to 30,000 lb.

D. Pavement Front Sidewalks: Thickness and compaction of subbase to support moderate pedestrian traffic.

END OF SECTION

SECTION 32 1217
PRIME COAT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings, general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of prime coat work is shown on drawings, and consists, but is not limited to, an application of asphaltic material on the completed flexible base and/or other required areas in accordance with the plans and specifications.

1.03 RELATED SECTIONS:

A. Prepared base is specified in another section.

B. Saw-cutting of edges of existing pavement is specified in Selective Demolition section.

1.04 SUBMITTALS:

A. Material Certificates: Provide copies of materials, certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

1.05 QUALITY ASSURANCES:

A. Codes and Standards: Comply with Texas State Department of Highways and Public Transportation (THD) Standard Specifications, 1993 edition, and with local governing regulations if more stringent than herein specified.

1.06 JOB CONDITIONS:

A. Weather Limitations: Prime coat shall not be applied when ambient temperature is below 60° Fahrenheit and falling, but it may be applied when the air temperature is above 50° Fahrenheit and is rising; the air temperature being taken in the shade and away from artificial heat. Asphaltic material shall not be placed when general weather conditions are not suitable.

B. Grade Control: Maintain required lines and elevations.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. General: The asphalt material for prime coat shall meet the requirements for Medium Curing Type Cutback Asphalt, MC-30, Item 300, “Asphalts, Oils and Emulsions” of the Texas State Department of Highways and Public Transportation Standard Specifications.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION:

A. Remove loose material from compacted base surface immediately before applying prime coat.

B. Proof roll prepared base surface to check for unstable areas and areas requiring

additional compaction.

C. Contractor shall be responsible for unsatisfactory conditions. Do not begin prime coat work until deficient base areas have been corrected and are ready to receive prime coat.

D. Prime Coat: When the base and/or area is satisfactory to receive the prime coat, the surface shall be cleaned by sweeping or other approved method. If required the surface shall be lightly sprinkled with water just prior to application of the asphaltic material. The asphaltic material shall be applied on the clean surface by an approved type of self-propelled pressure distributor so operated as to distribute the prime coat at a rate not to exceed 0.20 gallon per square yard of surface, evenly and smoothly, under a pressure necessary for proper distribution.

E. Exercise care in applying bituminous materials to avoid splattering or smearing of adjoining surfaces. Remove and replace or clean any damaged surfaces.

3.02 FIELD QUALITY CONTROL:

A. General: Maintain even coverage during application, apply additional coat(s) as required to maintain indicated coverage throughout.

END OF SECTION

SECTION 32 1218
TACK COAT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings, general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification section, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of tack coat work is shown on drawings and consists of, but is not limited to, an application of asphaltic material on completed base after the prime coat has sufficiently cured, existing pavement, bituminous surface, or other required areas in accordance with the plans and specifications.

1.03 RELATED SECTIONS:

A. Prepared base and prime coat are specified in other sections.

B. Saw-cutting of edges of existing pavement is specified in Selective Demolition Section.

1.04 SUBMITTALS:

A. Material Certificates: Provide copies of material certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

1.05 QUALITY ASSURANCES:

A. Codes and Standards: Comply with Texas State Department of Highways and Public Transportation (THD) Standard Specifications, and with local governing regulations if more stringent than herein specified.

1.06 SITE CONDITIONS:

A. Weather Limitations: Tack coat shall not be applied when ambient temperature is below 60° Fahrenheit and falling, but it may be applied when the air temperature is above 50° Fahrenheit and is rising; the air temperature being taken in the shade and away from artificial heat. Asphaltic material shall not be placed when general weather conditions are not suitable.

B. Grade Control: Maintain required lines and elevations.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. General: The asphalt material for tack coat shall meet the requirements for Rapid Curing Type Cutback Asphalt, RC-250, Item 300, "Asphalts, Oils, and Emulsions" of the Texas State Department of Highways and Public Transportation Standard Specifications.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION:

A. Remove loose material from compacted base surface immediately before applying tack coat.

B. Proof roll prepared base surface to check for unstable areas and areas requiring additional compaction.

C. Contractor shall be responsible for unsatisfactory conditions. Do not begin tack coat work until deficient base areas have been corrected and are ready to receive tack coat.

D. Tack Coat: Before the tack coat is applied, the surface shall be cleaned thoroughly. The asphaltic material shall be applied on the clean surface by an approved type of self-propelled pressure distributor, so operated as to distribute the tack coat at a rate not to exceed 0.10 gallon per square yard of surface, evenly and smoothly under a pressure necessary for proper distribution. Where the pavement mixture will adhere to the surface on which it is to be placed without the use of a tack coat, the tack coat may be omitted. The tack coat shall be rolled with a pneumatic tire roller.

E. Allow to dry until at proper condition to receive paving.

F. Exercise care in applying bituminous materials to avoid splattering or smearing of adjoining surfaces. Remove and replace or clean any damaged surfaces.

G. Joints: Apply tack coat to all surfaces of joints between old and new pavements to be connected, or between successive days work, to ensure continuous bond between adjoining work. DO NOT OMIT UNDER ANY CIRCUMSTANCES.

3.02 FIELD QUALITY CONTROL:

A. General: Maintain even coverage during application; apply additional coat(s) as required to maintain indicated coverage throughout.

END OF SECTION

SECTION 32 1723.13
PAINTED PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Parking lot markings, including parking bays, crosswalks, arrows, handicapped symbols, and curb markings.

B. Roadway lane markings and crosswalk markings.

C. "No Parking" curb painting.

1.02 RELATED REQUIREMENTS

A. Section 32 1216 - Asphalt Paving.

B. Section 32 1313 - Concrete Paving.

1.03 REFERENCE STANDARDS

A. FS TT-B-1325 - Beads (Glass Spheres); Retro-Reflective; Rev. D, 2007.

B. FS TT-P-1952 - Paint, Traffic Black, and Airfield Marking, Waterborne; Rev. E, 2007.

C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.

D. FHWA MUTCD - Manual on Uniform Traffic Control Devices for Streets and Highways; U.S. Department of Transportation, Federal Highway Administration; http://mutcd.fhwa.dot.gov; current edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to beused, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Certificates: Submit for each batch of paint and glass beads stating compliance with specified requirements.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Paint: 2 containers, 1 gallon size, of each type and color.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver paint in containers of at least 5 gallons accompanied by batch certificate.

B. Deliver glass beads in containers suitable for handling and strong enough to prevent loss during shipment accompanied by batch certificate.

C. Store products in manufacturer's unopened packaging until ready for installation.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 MATERIALS

A. Line and Zone Marking Paint: MPI No. 97 Latex Traffic Marking Paint; color(s) as indicated.
   1. Roadway Markings: As required by authorities having jurisdiction.
   2. Parking Lots: Yellow.
   3. Handicapped Symbols: Blue.

B. Line and Zone Marking Paint: Refer to Section 09 9000.

C. Paint For Obliterating Existing Markings: FS TT-P-1952; black for bituminous pavements, gray for portland cement pavements.

D. Reflective Glass Beads: FS TT-B-1325, Type I (low index of refraction), Gradation A (coarse, drop-on); with silicone or other suitable waterproofing coating to ensure free flow.

E. Temporary Marking Tape: Preformed, reflective, pressure sensitive adhesive tape in color(s) required; Contractor is responsible for selection of material of sufficient durability as to perform satisfactorily during period for which its use is required.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Obliteration of existing markings using paint is acceptable in lieu of removal; apply the black paint in as many coats as necessary to completely obliterate the existing markings.

D. Clean surfaces thoroughly prior to installation.
   1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.
   2. Completely remove rubber deposits, existing paint markings, and other coatings adhering to the pavement, by scraping, wire brushing, sandblasting, mechanical abrasion, or approved chemicals.

E. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.

F. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.

G. Temporary Pavement Markings: When required or directed by Architect, apply temporary markings of the color(s), width(s) and length(s) as indicated or directed.
   1. After temporary marking has served its purpose, remove temporary marking by carefully controlled sandblasting, approved grinding equipment, or other approved method so that surface to which the marking was applied will not be damaged.
   2. At Contractor's option, temporary marking tape may used in lieu of temporary painted marking; remove unsatisfactory tape and replace with painted markings at no additional cost to Owner.

3.03 INSTALLATION

A. Begin pavement marking as soon as practicable after surface has been cleaned and dried.

B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F or more than 95 degrees F.

C. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.

D. Comply with FHWA MUTCD manual (http://mutcd.fhwa.dot.gov) for details not shown.

E. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.

F. Apply uniformly painted markings of color(s), lengths, and widths as indicated on the drawings true, sharp edges and ends.
   1. Apply paint in one coat only.
   2. Wet Film Thickness: 0.015 inch, minimum.
   3. Width Tolerance: Plus or minus 1/8 inch.

G. Roadway Traffic Lanes: Use suitable mobile mechanical equipment that provides constant agitation of paint and travels at controlled speeds.
   1. Conduct operations in such a manner that necessary traffic can move without hindrance.
   2. Place warning signs at the beginning of the wet line, and at points well in advance of the marking equipment for alerting approaching traffic from both directions. Place small flags or other similarly effective small objects near freshly applied markings at frequent intervals to reduce crossing by traffic.
   3. If paint does not dry within expected time, discontinue paint operations until cause of slow drying is determined and corrected.

4. Skip Markings: Synchronize one or more paint "guns" to automatically begin and cut off paint flow; make length of intervals as indicated.
5. Use hand application by pneumatic spray for application of paint in areas where a mobile paint applicator cannot be used.
6. Distribute glass beads uniformly on the paint lines within ten seconds without any waste, applied at rate of 6 pounds per gallon of paint; if the marking equipment does not have a glass bead dispenser, use a separate piece of equipment adjusted and synchronized with the paint applicator; remove and replace markings having faulty distribution of beads.

H. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.
1. Mark the International Handicapped Symbol at indicated parking spaces.
2. Hand application by pneumatic spray is acceptable.

I. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

3.04 DRYING, PROTECTION, AND REPLACEMENT

A. Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked.

B. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly painted markings.

C. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer.

D. Remove and replace markings that are applied at less than minimum material rates; deviate from true alignment; exceed length and width tolerances; or show light spots, smears, or other deficiencies or irregularities.

E. Remove markings in manner to avoid damage to the surface to which the marking was applied, using carefully controlled sand blasting, approved grinding equipment, or other approved method.

F. Replace removed markings at no additional cost to Owner.

END OF SECTION

SECTION 33 1116
SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and fittings for site water lines including domestic water lines and fire water lines.

B. Valves, Fire hydrants, and Domestic water hydrants.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete for thrust restraints.

B. Section 09 9000 - Painting and Coating.

C. Section 31 2316 - Excavation: Excavating of trenches.

D. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

E. Section 31 2323 - Fill: Bedding and backfilling.

F. Section 33 0513 - Manholes and Structures.

G. Section 33 1300 - Disinfecting of Water Utility Distribution: Disinfection of site service utility water piping.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 2200 - Unit Prices, for additional unit price requirements.

B. Pipe and Fittings: By the linear foot. Includes hand trimming excavation, pipe and fittings, bedding, concrete thrust restraints, connection to building service piping, and to municipal utility water source.

C. Valves: By the unit. Includes valve, fittings and accessories.

D. Hydrant: By the unit. Includes hand trimming excavation, gravel sump, hydrant, valve, connection, and accessories.

1.04 REFERENCES

A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2012 (ANSI B16.18).

B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2010).

C. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2009.

D. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2012.

E. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2009.

F. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2006.

G. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).

H. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter; 2012.

I. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals; 1998 (Reapproved 2011).

J. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society; 2011 and errata.

K. AWWA C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water; American Water Works Association; 2008 (ANSI/AWWA C104/A21.4).

L. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; American Water Works Association; 2010 (ANSI/AWWA C105/A21.5).

M. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; American Water Works Association; 2007 (ANSI/AWWA C111/A21.11).

N. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast, for Water; American Water Works Association; 2009 (ANSI/AWWA C151/A21.51).

O. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service; American Water Works Association; 2009.

P. AWWA C502 - Dry Barrel Fire Hydrants; American Water Works Association; 2005 (ANSI/AWWA C502/C502a).

Q. AWWA C504 - Rubber Seated Butterfly Valves; American Water Works Association; 2010.

R. AWWA C508 - Swing-Check Valves for Waterworks Service, 2 In. (50 mm) Through 24 In. (600 mm) NPS; American Water Works Association; 2011 (ANSI/AWWA C508).

S. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service; American Water Works Association; 2009 (ANSI/AWWA C509).

T. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances; American Water Works Association; 2010 (ANSI/AWWA C600).

U. AWWA C606 - Grooved and Shouldered Joints; American Water Works Association; 2011.

V. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Distribution; American Water Works Association; 2008 (ANSI/AWWA C900/C900a).

W. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service; American Water Works Association; 2008.

X. UL 246 - Hydrants for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with utility company requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.01 WATER PIPE

A. Manufacturers:

B. Ductile Iron Pipe: AWWA C151:
   1. Fittings: Ductile iron, standard thickness.
   2. Joints: AWWA C111, rubber gasket with rods.
   3. Jackets: AWWA C105 polyethylene jacket.

C. Copper Tubing: ASTM B88, Type K, annealed:
   1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.
   2. Joints: Compression connection or AWS A5.8, BCuP silver braze.

D. PVC Pipe: ASTM D1785, Schedule 40.
   1. Fittings: ASTM D2466, PVC.
   2. Joints: ASTM D2855, solvent weld.

E. PVC Pipe: AWWA C900 Class 100:
   1. Fittings: AWWA C111, cast iron.
   2. Joints: ASTM D3139 compression gasket ring.

F. Polyethylene Pipe: ASTM D3035, for 45 psig pressure rating:
   1. Fittings: AWWA C901, molded or fabricated.
   2. Joints: Compression.

G. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with " Water Service " in large letters.

2.02 VALVES

A. Valves: Manufacturer's name and pressure rating marked on valve body.

B. Gate Valves Up To 3 Inches:
   1. Brass or Bronze body, non-rising stem, inside screw, single wedge or disc, compression ends, with control rod, post indicator, valve key, and extension box.
   2. Substitutions: See Section 01 6000 - Product Requirements.

C. Gate Valves 3 Inches and Over:

1. AWWA C500, iron body, bronze trim, non-rising stem with square nut, single wedge, flanged ends, control rod, post indicator, valve key, and extension box.
2. Substitutions: See Section 01 6000 - Product Requirements.

D. Ball Valves Up To 2 Inches:
1. Brass body, teflon coated brass ball, rubber seats and stem seals, Tee stem pre-drilled for control rod, AWWA inlet end, compression outlet with electrical ground connector, with control rod, valve key, and extension box.
2. Substitutions: See Section 01 6000 - Product Requirements.

E. Swing Check Valves From 2 Inches to 24 Inches:
1. AWWA C508, iron body, bronze trim, 45 degree swing disc, renewable disc and seat, flanged ends.

F. Butterfly Valves From 2 Inches to 24 Inches:
1. AWWA C504, iron body, bronze disc, resilient replaceable seat, water or lug ends, ten position lever handle.

2.03 HYDRANTS

A. Hydrants: AWWA C502, UL 246, dry barrel type.
1. Inside dimension: 7 inches minimum, with minimum 5 inches diameter valve seat opening.
2. Minimum net water area of barrel not less than 190 percent of valve opening.
3. 6 inch bell or mechanical joint inlet connection with accessories, gland bolts, and gaskets.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Hydrant Extensions: Fabricate in multiples of 6 inches with rod and coupling to increase barrel length.

C. Hose and Streamer Connection: Match sizes with utility company, two hose nozzles, one pumper nozzle.

D. Finish: Primer and two coats of enamel in color required by utility company.

2.04 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 31 2316.13.

B. Cover: As specified in Section 31 2316.13.

2.05 ACCESSORIES

A. Concrete for Thrust Restraints: Concrete type specified in Section 03 3000.

B. Backflow Preventer.

C. Meter.

D. Manhole and Cover: Refer to Section 33 0513.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building service connection and municipal utility water main size, location, and invert are as indicated.

3.02 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.03 TRENCHING

A. See the sections on excavation and fill for additional requirements.

B. Hand trim excavation for accurate placement of pipe to elevations indicated.

C. Form and place concrete for pipe thrust restraints at each change of pipe direction. Place concrete to permit full access to pipe and pipe accessories. Provide 15 sq ft thrust restraint bearing on subsoil.

D. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.04 INSTALLATION - PIPE

A. Maintain separation of water main from sewer piping in accordance with TCEQ Chapter 290.44.

B. Group piping with other site piping work whenever practical.

C. Establish elevations of buried piping to ensure not less than two ft of cover.

D. Install pipe to indicated elevation to within tolerance of 5/8 inches.

E. Install ductile iron piping and fittings to AWWA C600.

F. Install grooved and shouldered pipe joints to AWWA C606.

G. Route pipe in straight line.

H. Install pipe to allow for expansion and contraction without stressing pipe or joints.

I. Slope water pipe and position drains at low points.

3.05 INSTALLATION - VALVES AND HYDRANTS

A. Set valves on solid bearing.

B. Center and plumb valve box over valve. Set box cover flush with finished grade.

C. Set hydrants plumb; locate pumper nozzle perpendicular to and facing roadway.

D. Set hydrants to grade, with nozzles at least 20 inches above ground.

E. Locate control valve 4 inches away from hydrant.

F. Provide a drainage pit 36 inches square by 24 inches deep filled with 2 inches washed gravel. Encase elbow of hydrant in gravel to 6 inches above drain opening. Do not connect drain opening to sewer.

G. Paint hydrants in accordance with Section 09 9000.

3.06 SERVICE CONNECTIONS

A. Provide water service to utility company requirements with reduced pressure backflow preventer and water meter with by-pass valves and sand strainer.

B. Provide sleeve in retaining wall for service main. Support with reinforced concrete bridge. Calk enlarged sleeve watertight.

C. Anchor service main to interior surface of foundation wall.

D. Provide 18 gage galvanized sheet metal sleeve surrounding service main to 6 inches above floor and 6 feet minimum below grade. Size for 2 inches minimum of glass fiber insulation stuffing.

3.07 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 4000.

B. Pressure test water piping to 150 psi.

C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

END OF SECTION