UTAH DEPARTMENT OF TRANSPORTATION

ST. GEORGE MAINTENANCE STATION #4521
HURRICANE MAINTENANCE STATION #4522

TO BE LOCATED IN
HURRICANE, UTAH

PROJECT MANUAL

March 2009

Prepared By

Sargent Design Group

DFCM Project Number: 07292900

TABLE OF CONTENTS

DOCUMENTS
COVER SHEET
PROFESSIONAL STAMPS
LIST OF WARRANTIES
TABLE OF CONTENTS

TECHNICAL SPECIFICATIONS

DIVISION 1 - GENERAL REQUIREMENTS

01010	SUMMARY OF WORK
01027	APPLICATIONS FOR PAYMENT
01035	MODIFICATION PROCEDURES
01040	PROJECT COORDINATION
01045	CUTTING AND PATCHING
01050	FIELD ENGINEERING
01095	REFERENCE STANDARDS AND DEFINITIONS
01096	MATERIAL KEYNOTE LEGEND
01200	PROJECT MEETINGS
01300	SUBMITTALS
01400	QUALITY CONTROL SERVICES
01500	TEMPORARY FACILITIES
01600	MATERIALS AND EQUIPMENT
01631	PRODUCT SUBSTITUTIONS
01700	PROJECT CLOSEOUT
01740	WARRANTIES AND BONDS

DIVISION 2 - SITEWORK

02055	SOILS
02060	AGGREGATE
02081	MANHOLES AND STRUCTURES
02230	SITE CLEARING
02311	ROUGH GRADING
02324	TRENCHING
02448	HORIZONTAL DIRECTIONAL DRILLING
02511	ASPHALTIC CONCRETE PAVING (ZERO VOIDS MIX)
02512	SITE WATER DISTRIBUTION
02516	DISINFECTION OF WATER DISTRIBUTION
02538	SANITARY SEWER PIPING
02552	FUEL ISLAND MODIFICATIONS
	FUEL VAULT INSTALLATION GUIDELINES
02721	AGGREGATE BASE COURSE
02740	ASPHALTIC CONCRETE PAVING
02763	PAVEMENT MARKING

DIVISION 3 - CONCRETE

03053	CONCRETE WATERPROOFING SYSTEM
03054	OLIOPHOBIC SEALER
03055	CONCRETE WATERPROOFING SYSTEM – ADD ALTERNATE #1
03300	CAST-IN-PLACE CONCRETE

DIVISION 5 - METALS

05120 STRUCTURAL STEEL
05310 STEEL DECK
05400 COLD-FORMED METAL FRAMING
05500 METAL FABRICATIONS
05510 METAL STAIRS
05521 PIPE AND TUBE RAILINGS
05530 GRATINGS

DIVISION 6 - WOOD AND PLASTICS

06105 MISCELLANEOUS CARPENTRY
06402 INTERIOR ARCHITECTURAL WOODWORK
06651 SOLIDS SURFACE FABRICATIONS

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

07901 JOINT SEALANTS

DIVISION 8 - DOORS AND WINDOWS

08111 STANDARD STEEL DOORS AND FRAMES
08360 SECTIONAL OVERHEAD DOORS
08520 ALUMINUM WINDOWS
08521 HORIZONTAL SLIDING VINYL WINDOWS (PVC)
08710 DOOR HARDWARE
08800 GLAZING

DIVISION 9 - FINISHES

09255 GYPSUM BOARD ASSEMBLIES
09300 TILE
09660 RESILIENT TILE FLOORING
09678 RESILIENT WALL BASE AND ACCESSORIES
09900 PAINTING

DIVISION 10 - SPECIALTIES

10100 VISUAL DISPLAY BOARDS
10425 SIGNS
10500 METAL LOCKERS AND STORAGE CABINETS
10522 FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES
10800 TOILET AND BATH ACCESSORIES

DIVISION 11 – MOBILE LIFT

NOT USED

DIVISION 12 - FURNISHINGS

12511 HORIZONTAL LOUVER BLINDS

DIVISION 13 – SPECIAL CONSTRUCTION

13125 METAL BUILDING SYSTEMS
DIVISION 14 - CONVEYING SYSTEMS

14620 TROLLEY HOISTS

DIVISION 15 - MECHANICAL

15000 GENERAL MECHANICAL
15050 BASIC MATERIALS & METHODS
15060 PIPE AND PIPE FITTINGS
15170 MOTORS
15180 PIPE AND EQUIPMENT IDENTIFICATION
15191 AIR SYSTEM TESTING AND BALANCING
15200 VIBRATION, NOISE CONTROL AND SEISMIC PROTECTION
15250 INSULATION
15251 HOT WATER AND COLD WATER PIPE INSULATION
15258 DUCT INSULATION
15400 PLUMBING SYSTEMS
15410 PLUMBING FIXTURES
15411 HOT AND COLD WATER SYSTEMS AND DRAIN PAN PIPING SYSTEMS
15412 EMERGENCY PLUMBING FIXTURES
15413 SOIL, WASTE AND VENT PIPING SYSTEM
15452 DRINKING WATER COOLING SYSTEM
15460 PROPANE GAS-FIRED STORAGE TYPE WATER HEATERS
15490 WASTE OIL PIPING
15491 LUBRICATION EQUIPMENT
15540 FUEL-FIRE GAS UNIT HEATERS
15576 FLUES
15577 FURNACE AIR PIPING
15600 HEAT GENERATION
15611 PROPANE GAS-FIRED FURNACES
15670 CONDENSING UNITS
15820 DUCT ACCESSORIES
15838 POWER VENTILATORS
15855 DIFFUSERS, REGISTERS, AND GRILLES
15861 STEEL DUCTWORK
15862 ROUND DUCTWORK
15867 DUCTWORK TESTING
15887 LOUVERS
15970 CONTROL SYSTEMS
15985 SEQUENCE OF OPERATION

DIVISION 16 - ELECTRICAL

16001 ELECTRICAL GENERAL PROVISIONS
16060 GROUNDING AND BONDING
16070 ELECTRICAL HANGERS AND SUPPORTS
16123 BUILDING WIRE AND CABLE
16130 RACEWAY AND BOXES
16140 WIRING DEVICES GENERAL
16210 ELECTRICAL UTILITY SERVICES
16411 ENCLOSED SWITCHES
16442 PANELBOARD
16510 INTERIOR LUMINAIRES
16520 EXTERIOR LUMINAIRES

APPENDIX

GEOTECHNICAL REPORT

INSTRUCTION TO BIDDERS

1. Drawing and Specifications, Other Contract Documents

Drawings and Specifications, as well as other available Contract Documents, may be obtained from: (Division of Facilities Construction and Management) DFCM

2. Proposals

Before submitting a Proposal, each bidder shall carefully examine the Contract Documents; shall visit the site of the Work; shall fully inform themselves as to all existing conditions and limitations; and shall include in the Proposal the cost of all items required by the Contract Documents. If the bidder observes that portions of the Contract Documents are at variance with applicable laws, building codes, rules, regulations or contain obvious erroneous or uncoordinated information, the bidder shall promptly notify the Architect and the necessary changes shall be accomplished by Addendum.

The Proposal, bearing original signatures, must be typed or handwritten in ink on the DFCM Proposal form and submitted in a sealed envelope at the location specified by the Notice to Contractor's prior to the time designated for the opening of bids.

3. Contract and Bond

The Contractor's Agreement will be in the form bound in the specifications. The Contract Time will be as indicated in the Proposal. The successful bidder, simultaneously with the execution of the Contract Agreement, will be required to furnish a performance bond and a payment bond, both bearing original signatures, upon the forms provided along with the Specifications. The performance and payment bonds shall be for an amount equal to one hundred percent (100%) of the Contract Sum and secured from a company that meets the requirements specified in the requisite forms. Any bonding requirements for Subcontractors will be specified in the Supplementary General Conditions.

4. Listing of Subcontractors, Suppliers and Vendors

Listing of Subcontractors shall be as required by U.C.A. 63A-5-208 and the Building Board Rules. These requirements are summarized in the Instructions and Subcontractor’s List Form, which is included as part of these Contract Documents.

Such list shall be binding upon the Contractor with a limited exception as provided in said State law and Article 5 of the General Conditions; however, Owner has a right to reject any or all Subcontractors, suppliers and vendors listed or unlisted which Owner and/or Architect feels is unqualified to do the Work or for other reason in the best interest of the State of Utah.

Owner may withhold awarding the contract to a particular bidder if one or more of the proposed Subcontractors, suppliers and vendors are considered by the Owner to be unqualified to do the Work or for other reason in the best interest of the State of Utah.

Copies of all bids or other proposals from Subcontractors and Sub-subcontractors shall, upon request of the Owner, be submitted to the Owner for review.

Any bonding requirements for Subcontractors will be specified in the Supplementary General Conditions.

5. **Interpretation of Plans and Specifications**

If any person or entity contemplating submitting a bid is in doubt as to the meaning of any part of the drawings, specifications or other Contract Documents, such person shall submit to the Architect a request for an interpretation thereof. **The request for interpretation must be submitted to the architect no later than four (4) working days (not including Saturday, Sunday or State Holidays) prior to the bid opening**. Any interpretation of the proposed documents will be made only by Addenda duly issued and a copy of such Addenda will be mailed or delivered to each person or entity receiving a set of documents. Neither the Owner nor the Architect will be responsible for any other explanations or interpretations of the proposed documents.

6. **Addenda**

Any addenda issued during the time of bidding shall become part of the documents loaned to the bidders for the preparation of the bid, shall be covered in the bid, and shall be made a part of the Contract.

7. **Award of Contract**

The Contract will be awarded (as soon as possible) to the lowest responsible bidder; based on the lowest combination of base bid and acceptable prioritized alternates; provided the bid is reasonable and the bid is in the interests of the Owner to accept and after applying the Utah Preference Laws in U.C.A. Title 63, Chapter 56. The Owner reserves the right to waive any technicalities or formalities in any bid or in the bidding. Alternates will be accepted on a prioritized basis with Alternate #1 being highest priority, Alternate #2 having second priority, etc.

8. **Qualifications**

The Contractor's and Subcontractors' past performance, organization, equipment and ability to perform and complete their contracts in the manner and within the time limit specified will be elements along with the cash amount of the bid, which will be considered by the Owner in the letting of the contract. The Contractor shall comply with and require all of its Subcontractors to comply with the license laws as required by the State of Utah.

9. **Cost Breakdown**

The Contractor shall, before starting the Work, submit to the Division of Facilities Construction and Management a cost breakdown showing the cost of various segments of “The Work” according to a specification heading, with the total amount equaling the contract price. This breakdown shall be used as the basis of payment as stated in the Contract Documents. Further requirements are discussed in Article 9 of the General Condition.

10. **Right to Reject Proposals.**

The Owner reserves the right to reject any or all proposals.

11. **Return of Bid Security**

Cashier or certified checks of the successful bidder will be returned upon acceptance of the 100% performance bond and separate 100% payment bond. Cashier or certified checks of other bidders, not previously forfeited, will be returned as soon as it is determined that the bids represented by the checks will receive no further consideration by the Division of Facilities Construction and Management.

12. **Time is of the Essence**

Time is of the essence in regard to all the requirements of the Contract Documents.

13. **Withdrawal of Bids**

Bids may be withdrawn on written request received from bidders prior to the time fixed for opening. Negligence on the part of the bidder in preparing the bid confers no right for the withdrawal of the bid after it has been opened.

14. **Product Approvals**

Where reference is made to one or more proprietary products in the Contract Documents, but restrictive descriptive materials of one or more manufacturer(s) is referred to in the Contract Documents, the products of other manufacturers will be accepted, provided they equal or exceed the standards set forth in the drawings and specifications and are compatible with the intent and purpose of the design, subject to the written approval of the Architect. **Requests for and information pertaining to said approval must be submitted to the Architect no later than four (4) working days (not including Saturday, Sunday or State holidays) prior to the bid opening.** The Architect's written approval will be in an issued Addendum. If the descriptive material is not restrictive, the products of other manufacturers specified will be accepted without prior approval provided they are compatible with the intent and purpose of the design as determined by the Architect.

15. **Financial Responsibility of Contractors, Subcontractors and Sub-subcontractors**

Contractor shall respond promptly to any inquiry in writing by the Owner to any concern of financial responsibility of the Contractor, Subcontractor or Sub-subcontractor.

LIST OF WARRANTIES

NOTE: The following is a listing and brief description of warranties and certifications required by the specification sections. It does not supersede the requirements of the sections nor is it necessarily complete. Refer to each section for actual requirements. Warranties are to be completed in behalf of the End User and submitted to the Project Manager / General Contractor as part of Project Close-out.

Section Title	Section – Article	Description
Concrete Waterproofing System	03053 – 1.03	Ten year system guarantee.
Cast In place Concrete	03300 - 1.5	Two-Year defective concrete guarantee.
Structural Steel	05120 - 1.4	Welder Certification
Steel Joists and Joist Girders	05220 - 1.3	Manufacturer's certification that joists comply with SJI "Specifications".
	05220 - 1.4	Qualify welding processes and welding operators.
Steel Deck	05310 - 1.4	Use qualified welding processes and welding operators.
Cold-formed Metal Framing	05400 - 1.4	Use qualified welders and comply with American Welding Society (AWS) D1.3.
Metal - Fabrications	05500 - 1.3	Welder certificates signed by Contractor.
	05500 - 1.4	Certify that each welder has satisfactorily passed AWS qualifications.
Metal Stairs	05510 - 1.4	Welder certificates signed by Contractor.
	05510 - 1.5	Certify that each welder has satisfactorily passed AWS qualifications.
Gratings	05530 - 1.4	Welders certificates.
Miscellaneous Carpentry	06105 - 1.3	Preservative Treatment certification for wood. Waterborne Preservative Treatment certification for wood.
Interior Architectural Woodwork	06402 - 1.3	Product certificates signed by woodwork manufacturer.
Sheet Membrane Waterproofing	07710 - 1.4	Certification that products comply with local VOC regulations.
Joint Sealants	07901 - 1.4	Certificate attesting compliance with specification requirements and suitable for the use indicated.
Aluminum Windows	08520 - 1.8	Three-year aluminum window warranty.
Vinyl Windows	08521 - 1.8	Three-year vinyl window warranty.
Glazing	08800 - 1.9	Ten-year warranty on insulating glass.

Visual Display Boards	10100 - 1.3,	Certification that tackboard materials comply with requirements specified for flame spread ratings.
Toilet and Bath Accessories	10800 - 1.6	15-year warranty for silver spoilage of mirrors. 1-year mechanical parts and accessories.
Metal Building Systems	13125 - 1.5 E	Letter of Design Certification
	13125 - 1.5 F	Welding Certificates
	13125 - 1.5 G	Erector Certificates
	13125 - 1.5 H	Manufacturer Certificates
	13125 - 1.5 K	Product Test Reports
	13125 – 1.10 A	General Warranty
	13125 – 1.10 B	Special Warranty on Panels – 5 years
	13125 – 1.10 C	Special Warranty on Panel Finishes – 20 years
	13125 – 1.10 D	Special Warranty on Standing Seam Roof Panel Weather Tightness – 20 years
Pipe and Pipe Fittings	15060 - 3.28	Welders certification.
Air-cooled Condensing Unit	15671 - 1.4	Five-year warranty on compressors.
Refrigerant Piping Systems	15753 - 1.3	Refrigerant piping installation by state licensed contractor.
Electrical General Provisions	16001 - 1.9	Certificate of approval from inspection authority at completion of the work.

SECTION 01010 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 PROJECT DESCRIPTION

A. The project consists of a new maintenance complex located in Hurricane, Utah, as described in the Contract Documents prepared by Sargent Design Group, dated February 2009.

1. The following description is an outline of the work to be accomplished and not meant to be a definitive scope of work; scope of work is defined by the complete set of contract documents.

B. The Work consists of construction of a new maintenance complex which includes a Maintenance Building, Storage Building, Wash Racks, Sand Racks, Retention Pond, Detention Pond and Salt Storage Building as indicated in the Contract Documents prepared by Sargent Design Group. The Maintenance Building consists of a one-story structure designed to store and provide facilities for the maintenance of vehicles. Installation of fixed equipment (provided as part of the work unless otherwise noted), utility connections and fees, excavation, grading and other site improvements are required as part of the work.

1. The Work includes site preparation, excavation, concrete, masonry walls, structural steel, steel bar joists, metal roof deck, architectural woodwork, waterproofing, metal roofing, roof accessories, sheet metal, hollow metal doors and frames, hardware, glazing, interior finishes and furnishings, plumbing, fire protection, heating and ventilation systems, electrical systems, lighting, and communication-alarm-signal systems.
2. Interior finishing and related construction, including interior partitions and permanent doors, casework, equipment, and mechanical and electrical installations are required.
3. Exterior work includes utilities, waste oil storage and other site work as defined in the Contract Documents.
4. There will be a Base Bid.

1.3 CONTRACTOR USE OF PREMISES

A. General: During the construction period the Contractor and subcontractors shall have use of the premises for construction operations. The use of the premises is limited only by the End User's right to perform construction operations with its own forces or to employ separate contractors on portions of the project.

1. Confine operations to areas within Contract limits indicated. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.

2. Keep driveways and entrances serving the premises clear and available to the Owner and the Owner's employees at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

1.4 END USER OCCUPANCY

A. Partial Occupancy: The End User reserves the right to occupy and to place and install equipment in completed areas of the building, prior to Substantial Completion provided that such occupancy does not interfere with completion of the Work. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.

B. Prior to End User occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy the End User will provide operation and maintenance of mechanical and electrical systems in occupied portions of the building.

1.5 END USER CONSTRUCTED WORK

A. Coordinate with the Owner and Project Manager/General Contractor where construction in this contract interfaces with work performed by the End User.

B. Repair any damage to End User constructed items which occurs during the course of construction as a result of construction activity. Replace damaged items when repair is not possible to restore to the original undamaged condition or when required by Owner.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01010

SECTION 01027 - APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements governing Applications for Payment submitted to Project Manager/General Contractor.

1. Coordinate the Schedule of Values and Applications for Payment with the Construction Schedule and Submittal Schedule.

B. The Construction Schedule and Submittal Schedule are included in Section "Submittals".

1.3 SCHEDULE OF VALUES

A. Coordinate preparation of the Schedule of Values with preparation of the Contractors' Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
   a. Contractor's construction schedule.
   b. Application for Payment form.
   c. List of products.
   d. List of principal suppliers and fabricators.
   e. Schedule of submittals.

2. Submit the Schedule of Values to the Project Manager/General Contractor at the earliest feasible date, but in no case later than 7 days before the date scheduled for submittal of the initial Application for Payment.

3. Sub-Schedules: Where the Work is separated into phases that require separately phased payments, provide sub-schedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values.

1. Identification: Include the following Project identification on the Schedule of Values:
   a. Project name and location.
   b. Project Manager/ General Contractor's name and address.
   c. Date of submittal.

2. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:
   a. Generic name.
   b. Related Specification Section.
   c. Name of manufacturer or fabricator.
   d. Name of supplier.

e. Change Orders (numbers) that have affected value.
f. Dollar value.

3. Round amounts off to the nearest whole dollar; the total shall equal the subcontractor's Contract Sum.
4. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
5. Schedule Updating: Update and resubmit the Schedule of Values when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT:

A. Each Application for Payment shall be consistent with previous applications and payments.

B. Payment Application Times: The date to submit initial application for payment is at the subcontractor's discretion, and subsequent applications for payment as set forth by the Project Manager/General Contractor but no later than 30 days thereafter.

C. Payment Application Format: Use format consistent with Schedule of Values.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
2. Include amounts of Change Orders issued prior to the last day of the construction period covered by the application.

D. Transmittal: Submit 3 executed copies of each Application for Payment to the Project Manager/General Contractor by means ensuring receipt within 24 hours; one copy shall be complete, including waivers of lien and similar attachments, when required.

1. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Project Manager/General Contractor.

E. Waivers of Mechanics Lien: With each Application for Payment submit waivers of mechanics liens from subcontractors or sub- subcontractors and suppliers for the construction period covered by the previous application.

1. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.

2. When an application shows completion of an item, submit final or full waivers.

3. The Owner reserves the right to designate which entities involved in the Work must submit waivers.

4. Waiver Delays: Submit each Application for Payment with the Contractor's waiver of mechanics lien for the period of construction covered by the application.
   a. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of Work covered by the application who could lawfully be entitled to a lien.

5. Waiver Forms: Submit waivers of lien on forms, and executed in a manner, acceptable to Owner.

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

1. List of principal suppliers and fabricators.
2. Schedule of Values.
3. Schedule of principal products.
4. Submittal Schedule (preliminary if not final).
5. List of staff assignments.
6. Certificates of insurance and insurance policies as applicable.

G. Final Payment Application: Administrative actions and submittals which must precede or coincide with submittal of the final payment Application for Payment include the following:

1. Completion of Project closeout requirements.
2. Completion of items specified for completion after Substantial Completion.
3. Assurance that unsettled claims will be settled.
4. Assurance that Work not complete and accepted will be completed without undue delay.
5. Transmittal of required Project construction records to Owner.
6. Proof that taxes, fees and similar obligations have been paid.
7. Removal of temporary facilities and services.
8. Removal of surplus materials, rubbish and similar elements.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01027

SECTION 01035 - MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to this section.

1.2 SUMMARY

A. This section specifies administrative and procedural requirements for subcontractors for handling and processing Contract modifications to be submitted to Project Manager/General Contractor.

B. Related Sections: The following sections contain requirements that relate to this section:
1. Division 1 Section "Application for Payment" for administrative procedures governing applications for payment.
2. Division 1 Section "Product Substitutions" for administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 CHANGE ORDER PROPOSAL REQUESTS

B. Owner-Initiated Proposal Requests: Proposed changes in the Work that will require adjustment to the Contract Sum or Contract Time will be issued by the Project Manager/General Contractor, with a detailed description of the proposed change and supplemental or revised Drawings and Specifications, if necessary.

1. Proposal requests issued by the Project Manager/General Contractor are for information only. Do not consider an them instruction either to stop work in progress, or to execute the proposed change.
2. Unless otherwise indicated in the proposal request, within 15 days of receipt of the proposal request, submit to the Project Manager/General Contractor for review an estimate of cost necessary to execute the proposed change.

a. Include a list of quantities of products to be purchased and unit costs, along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.

C. Subcontractor-Initiated Change Order Proposal Requests: When latent or other unforseen conditions require modifications to the Contract, the subcontractor may propose changes by submitting a request for a change to the Project Manager/General Contractor.

1. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.
2. Include a list of quantities of products to be purchased and unit costs along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Comply with requirements in Section "Product Substitutions" if the proposed change in the

Work requires the substitution of one product or system for a product or system specified.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01035

SECTION 01040 - PROJECT COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:

1. Coordination.
2. General installation provisions.
3. Cleaning and protection.

B. Field engineering is included in Section "Field Engineering".

C. Coordination meetings and pre-installation conferences are included in Section "Project Meetings".

1.3 COORDINATION

A. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.

1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.

2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.

B. Where necessary, prepare memoranda for distribution to each party involved to be submitted to Project Manager/General Contractor, outlining special procedures required for coordination.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Installation and removal of temporary facilities.
2. Delivery and processing of submittals.
3. Project Close-out activities.

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

1.4 SUBMITTALS

A. Coordination Drawings: Prepare and submit coordination Drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of

space for efficient installation of different components.

1. Show the interrelationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.
3. Comply with requirements contained in Section "Submittals."
4. Refer to Division-15 Section "Basic Mechanical Requirements," and Division-16 Section "Basic Electrical Requirements" for specific coordination Drawing requirements for mechanical and electrical installations.

B. Staff Names: Within 15 days of Notice to Proceed, submit a list of principal staff assignments, including the trade Foreman and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

D. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

E. Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Architect for final decision.

F. Recheck measurements and dimensions, before starting each installation.

G. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

H. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

I. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

3.2 CLEANING AND PROTECTION

A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from

damage or deterioration at Substantial Completion.

B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Thermal shock.
5. Air contamination or pollution.
6. Water.
7. Solvents.
8. Chemicals.
9. Light.
10. Puncture.
11. Abrasion.
12. Heavy traffic.
13. Soiling, staining and corrosion.
14 Bacteria.
15. Rodent and insect infestation.
16. Combustion.
17. Electrical current.
18. High speed operation,
19. Improper lubrication,
20. Unusual wear or other misuse.
21. Contact between incompatible materials.
22. Destructive testing.
23. Misalignment.
24. Excessive weathering.
25. Unprotected storage.
26. Improper shipping or handling.
27. Theft.
28. Vandalism.

END OF SECTION 01040

SECTION 01045 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for cutting and patching.

B. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1. Requirements of this Section apply to mechanical and electrical installations. Refer to Division-15 and Division-16 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.
2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
3. List products to be used and firms or entities that will perform Work.
4. Indicate dates when cutting and patching is to be performed.
5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
6. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.
7. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

1.4 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.

B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in

occupied spaces, in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 INSPECTION

A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.

1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished

side into concealed surfaces.

3. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.
4. Comply with requirements of applicable Sections of Division-2 where cutting and patching requires excavating and backfilling.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance.

   a. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken containing the patch, after the patched area has received primer and second coat.

4. Patch, repair or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

3.4 CLEANING

A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION 01045

SECTION 01050 - FIELD ENGINEERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. General: This Section specifies administrative and procedural requirements for field engineering services, including, but not necessarily limited to, the following:

1. Land survey Work.
2. Civil engineering services.
3. Structural engineering services.

1.3 SUBMITTALS

A. Certificates: Submit a certificate signed by the Land Surveyor or Professional Engineer certifying that the location and elevation of improvements comply with the Contract Documents.

B. Final Property Survey: Submit 6 copies of the final property survey, one reproducible copy, and the CAD files on 3-1/2" diskettes. Software format as required by Owner.

C. Project Record Documents: Submit a record of Work performed and record survey data as required under provisions of Sections "Submittals" and "Project Closeout".

1.4 QUALITY ASSURANCE

A. Surveyor: Engage a Registered Land Surveyor registered in the State where the project is located, to perform land surveying services required.

B. Engineer: Engage a Professional Engineer of the discipline required, registered in the state in which the Project is located, to perform required engineering services.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing control points are noted on Contract Documents.

B. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks before proceeding to layout the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.

1. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points, or requirements to relocate reference points because of necessary changes in grades or locations.
2. Promptly replace lost or destroyed project control points. Base replacements on the

original survey control points.

C. Establish and maintain a minimum of two permanent benchmarks on the site, referenced to data established by survey control points.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

D. Existing utilities and equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction.

1. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer and water service piping.

3.2 PERFORMANCE

A. Working from lines and levels established by the property survey, establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to properly locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.

1. Advise entities engaged in construction activities, of marked lines and levels provided for their use.
2. As construction proceeds, check every major element for line, level and plumb.

B. Surveyor's Log: Maintain a surveyor's log of control and other survey Work. Make this log available for reference.

1. Record deviations from required lines and levels, and advise the Architect when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.
2. On completion of foundation walls, major site improvements, and other Work requiring field engineering services, prepare a certified survey showing dimensions, locations, angles and elevations of construction and sitework.

C. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes and invert elevations by instrumentation and similar appropriate means.

D. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels and control lines and levels required for mechanical and electrical Work.

E. Existing Utilities: Furnish information necessary to adjust, move or relocate existing lines, services or other appurtenances located in, or affected by construction. Coordinate with local authorities having jurisdiction.

F. Final Property Survey: Before Substantial Completion, prepare a final property survey showing significant features (real property) for the Project. Include on the survey a certification, signed by the Surveyor, to the effect that principal metes, bounds, lines and levels of the Project are accurately positioned as shown on the survey.

END OF SECTION 01050

SECTION 01095 - REFERENCE STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Division 1 Specification Sections, apply to this Section.

B. References to standards are incorporated into Project Manuel by reference and each reference is the latest edition at date shown on Contract Documents, including amendments and supplements.

1.2 DEFINITIONS

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

B. Indicated: The term indicated refers to graphic representations, notes, or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as Ashown@, Anoted@, Ascheduled@, and Aspecified@ are used to help the reader locate the reference. There is no limitation on location.

C. Approved: When used in conjunction with the A/E=s action on the Contractor=s submittals, applications and requests Aapproval@ is limited to the Architect=s duties and responsibilities as stated in the General Conditions.

C. Regulations: The term regulations includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

D. Furnish: The term furnish means supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations but not installation.

E. Install: The term install describes operations at the Project site including the actual unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

F. Provide: The term provide means to furnish and install, complete and ready for the intended use.

G. Installer: An Installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. Trades: Using terms such as carpentry is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as carpenter. It also does not imply that requirements specified apply exclusively to trades persons of the corresponding generic name.
2. Experienced: When used with the term Installer, requires minimum of five previous projects similar in size and scope to this project, being familiar with the special requirements indicated and having complied with requirements of the authority having jurisdiction.

H. Project site: is the space available to the Contractor for performing construction activities either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

I. Testing Agencies: A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

K. Exposed: An item or surface, interior or exterior which is visible outside or inside building usable space, during building normal activity.

L. Including and such as: To be used in the most inclusive sense; example, Aincluding, but not necessarily limited to@, and Asuch as, but not necessarily limited to@.

M. Not-in Contact (NIC): Work not included in this contract.

N. Product: Material, equipment or system.

O. Reinstall: Operation involving existing materials and equipment, including handling, assembly, setting, placing, anchoring, protecting, cleaning and similar operations as applicable in each instance.

P. Remove: Disassemble, dismantle or demolish and transport away from Project site or Owners property.

Q. Salvage: Contractor shall dismantle existing materials or assemblies carefully, provide protection suitable for maintaining existing conditions of materials and store salvaged materials for re-installation or other use as directed by Owner.

R. Shown and indicated: Used as a cross reference to information on Drawings or Specifications elsewhere in project manual. No limitation of location is intended except as may be specifically noted.

S. Suitable Reasonable B Proper B Correct B Necessary: As stated for purpose intended by Contract Documents, subject to interpretation of Architect.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 16-Division format and MASTERFORMAT numbering system.

B. Specification Content: This Specification uses certain conventions regarding the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

1. Abbreviated Language: Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words that are implied, but not stated, shall be interpolated as the sense requires. Singular words will be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to

describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.

a. The words "shall be" are implied wherever a colon (:) is used within a sentence or phrase.

1.4 INDUSTRY STANDARDS

A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

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

C. Conflicting Requirements: Where compliance with two or more standards is specified and where the standards may establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different but apparently equal and other uncertainties to the Architect for a decision before proceeding.
General: In case of an inconsistency between Drawings and Specifications or within either Document not clarified specifically by the Architect; more specific provision will take precedence over less specific; more stringent will take precedence over less stringent. Better quality or greater quantity of Work shall be provided in compliance with Architect=s interpretation.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.

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

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

E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations, as referenced in Contract Documents, are defined to mean the associated names. Names and addresses are subject to change and are believed, but not ensured, to be accurate and up to date as of the date of Contract Documents. The following is a partial list consisting of names most frequently used. For those not listed, refer to the "Encylopedia of Associations," published by Gale Research Co., available in most libraries.

AA Aluminum Association
900 19th St., NW, Suite 300
Washington, DC 20006 (202) 862-5100

AABC Associated Air Balance Council
1518 K St., NW
Washington, DC 20005 (202) 737-0202

AAMA	American Architectural Manufacturers Assoc. 1540 E. Dundee Road, Suite 310 Palatine, IL 60067 (708) 202-1350
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol St., Suite 225 Washington, DC 20001 (202) 624-5800
ACI	American Concrete Institute P.O. Box 19150 Detroit, MI 48219 (313) 532-2600
ACPA	American Concrete Pipe Assoc. 8300 Boone Blvd., Suite 400 Vienna, VA 22182 (703) 821-1990
ADC	Air Diffusion Council One Illinois Center, Suite 200 111 East Wacker Drive Chicago, IL 60601-4298 (312) 616-0800
AI	Asphalt Institute Research Park Drive P.O. Box 14052 Lexington, KY 40512-4052 (606) 288-4960
AIA	American Institute of Architects 1735 New York Ave., NW Washington, DC 20006 (202) 626-7300
AISC	American Institute of Steel Construction One East Wacker Drive, Suite 3100 Chicago, IL 60601-2001 (312) 670-2400
AISI	American Iron and Steel Institute 1101 17th Street, NW, Suite 1300 Washington, DC 20036-4700 (202) 463-6573
ALSC	American Lumber Standards Committee P.O. Box 210 Germantown, MD 20875 (301) 972-1700
AMCA	Air Movement and Control Assoc. 30 W. University Drive Arlington Heights, IL 60004-1893 (708) 394-0150
ANSI	American National Standards Institute 11 West 42nd Street, 13th Floor New York, NY 10036 (212) 642-4900

APA	American Plywood Assoc. P.O. Box 11700 Tacoma, WA 98411 (206) 565-6600
ARI	Air Conditioning and Refrigeration Institute 1501 Wilson Blvd., 6th Floor Arlington, VA 22209 (703) 524-8800
ASA	Acoustical Society of America 500 Sunnyside Blvd. Woodbury, NY 11797 (516) 349-7800
ASC	Adhesive and Sealant Council 1627 K Street, NW, Suite 1000 Washington, DC 20006-1707 (202) 452-1500
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers 1791 Tullie Circle, NE Atlanta, GA 30329 (404) 636-8400
ASME	American Society of Mechanical Engineers 345 East 47th St. New York, NY 10017 (212) 705-7722
ASPE	American Society of Plumbing Engineers 3617 Thousand Oaks Blvd., Suite 210 Westlake, CA 91362 (805) 495-7120
ASSE	American Society of Sanitary Engineering P.O. Box 40362 Bay Village, OH 44140 (216) 835-3040
ASTM	American Society for Testing and Materials 1916 Race St. Philadelphia, PA 19103-1187 (215) 977-9679
AWI	Architectural Woodwork Institute P.O. Box 1550 13924 Braddock Rd., Suite 100 Centreville, VA 22020 (703) 222-1100
AWPA	American Wood-Preservers' Assoc. 4128-1/2 California Ave. SW, No. 171 Seattle, WA 98116 (206) 937-5338
AWPB	American Wood Preservers Bureau 4 E. Washington St. Newnan, GA 30263 (404) 254-9877

AWS	American Welding Society 550 LeJeune Road, NW P.O. Box 351040 Miami, FL 33135 (305) 443-9353
AWWA	American Water Works Assoc. 6666 W. Quincy Ave. Denver, CO 80235 (303) 794-7711
BHMA	Builders' Hardware Manufacturers Assoc. 355 Lexington Ave., 17th Floor New York, NY 10017 (212) 661-4261
CISPI	Cast Iron Soil Pipe Institute 5959 Shallowford Road, Suite 419 Chattanooga, TN 37421 (615) 892-0137
CRSI	Concrete Reinforcing Steel Institute 933 Plum Grove Rd. Schaumburg, IL 60173 (708) 517-1200
CTI	Ceramic Tile Institute of America 700 N. Virgil Ave. Los Angeles, CA 90029 (213) 660-1911
DHI	Door and Hardware Institute 14170 New Brook Drive Chantilly, VA 22022 (703) 222-2010
DLPA	Decorative Laminate Products Assoc. 600 S. Federal St., Suite 400 Chicago, IL 60605 (312) 922-6222
EIA	Electronic Industries Assoc. 2001 Pennsylvania Ave., NW Washington, DC 20006-1813 (202) 457-4900
EJMA	Expansion Joint Manufacturers Assoc. 25 N. Broadway Tarrytown, NY 10591 (914) 332-0040
FGMA	Flat Glass Marketing Assoc. White Lakes Professional Bldg. 3310 S.W. Harrison Topeka, KS 66611-2279 (913) 266-7013
FM	Factory Mutual Research Organization 1151 Boston-Providence Turnpike P.O. Box 9102 Norwood, MA 02062 (617) 762-4300

GA	Gypsum Association 810 First Street, NE, Suite 510 Washington, DC 20002 (202) 289-5440
HMA	Hardwood Manufacturers Assoc. 400 Penn Center Blvd. Pittsburgh, PA 15235 (412) 829-0770
HPMA	Hardwood Plywood Manufacturers Assoc. 1825 Michael Farraday Drive P.O. Box 2789 Reston, VA 22090-2789 (703) 435-2900
ICEA	Insulated Cable Engineers Association, Inc. P.O. Box 440 South Yarmouth, MA 02664 (508) 394-4424
IEC	International Electrotechnical Commission (Available from ANSI) 1430 Broadway New York, NY 10018 (212) 354-3300
IEEE	Institute of Electrical and Electronic Engineers 345 E. 47th St. New York, NY 10017 (212) 705-7900
IESNA	Illuminating Engineering Society of North America 345 E. 47th St. New York, NY 10017 (212) 705-7926
IGCC	Insulating Glass Certification Council c/o ETL Testing Laboratories, Inc. P.O. Box 2040 Route 11, Industrial Park Cortland, NY 13045 (607) 753-6711
ISA	Instrument Society of America P.O. Box 12277 67 Alexander Drive Research Triangle Park, NC 27709 (919) 549-8411
LPI	Lightning Protection Institute 3365 North Arlington Heights Rd., Suite J Arlington Heights, IL 60004 (708) 255-3003
MBMA	Metal Building Manufacturer's Assoc. c/o Charles M. Stockinger Thomas Associates, Inc. 1300 Sumner Ave. Cleveland, OH 44115-2851 (216) 241-7333

NAAMM National Association of Architectural
Metal Manufacturers
600 S. Federal St., Suite 400
Chicago, IL 60605 (312) 922-6222

NAIMA North American Insulation Manufacturers Assoc.
44 Canal Center Plaza, Suite 310
Alexandria, VA 22314 (703) 684-0084

NAPA National Asphalt Pavement Assoc.
NAPA Building
5100 Forbes Blvd.
Lanham, MD 20706-4413 (301) 731-4748

NCMA National Concrete Masonry Assoc.
P.O. Box 781
Herndon, VA 22070-0781 (703) 435-4900

NEC National Electrical Code (from NFPA)

NECA National Electrical Contractors Assoc.
7315 Wisconsin Ave.
Bethesda, MD 20814 (301) 657-3110

NEMA National Electrical Manufacturers Assoc.
2101 L St., NW, Suite 300
Washington, DC 20037 (202) 457-8400

NETA International Electrical Testing Assoc.
P.O. Box 687
Morrison, CO 80465 (303) 467-0526

NFPA National Fire Protection Assoc.
One Batterymarch Park
P.O. Box 9101
Quincy, MA 02269-9101 (617) 770-3000
(800) 344-3555

N.F.P.A. National Forest Products Assoc.
1250 Connecticut Ave., NW, Suite 200
Washington, DC 20036 (202) 463-2700

NLGA National Lumber Grades Authority
1055 W. Hastings St., Suite 260
Vancouver, British Columbia
Canada V6E 2E9 (604) 687-2171

NPA National Particleboard Assoc.
18928 Premiere Court
Gaithersburg, MD 20879 (301) 670-0604

NRCA	National Roofing Contractors Assoc. 10255 W. Higgins Rd., Suite 600 Rosemont, IL 60018-5607 (708) 299-9070
NSF	National Sanitation Foundation 3475 Plymouth Rd. P.O. Box 1468 Ann Arbor, MI 48106 (313) 769-8010
PCA	Portland Cement Assoc. 5420 Old Orchard Road Skokie, IL 60077 (708) 966-6200
RFCI	Resilient Floor Covering Institute 966 Hungerford Drive, Suite 12-B Rockville, MD 20805 (301) 340-8580
RMA	Rubber Manufacturers Assoc. 1400 K St., NW Washington DC 20005 (202) 682-4800
SDI	Steel Deck Institute P.O. Box 9506 Canton, OH 44711 (216) 493-7886
S.D.I.	Steel Door Institute 30200 Detroit Road Cleveland, OH 44145 (216) 889-0010
SGCC	Safety Glazing Certification Council c/o ETL Testing Laboratories Route 11, Industrial Park Cortland, NY 13045 (607) 753-6711
SIGMA	Sealed Insulating Glass Manufacturers Assoc. 401 N. Michigan Chicago, IL 60611 (312) 644-6610
SJI	Steel Joist Institute 1205 48th Avenue North, Suite A Myrtle Beach, SC 29577 (803) 449-0487
SMACNA	Sheet Metal and Air Conditioning Contractors National Association 4201 Lafayette Center Dr. Chantilly, VA 22021 (703) 803-2980
SSPC	Steel Structures Painting Council 4400 Fifth Ave. Pittsburgh, PA 15213-2683 (412) 268-3327

TCA Tile Council of America
P.O. Box 326
Princeton, NJ 08542 (609) 921-7050

TIMA Thermal Insulation Manufacturers Assoc.
29 Bank Street
Stamford, CT 06901 (203) 324-7533
(Standards now issued by NAIMA)

UL Underwriters Laboratories, Inc.
333 Pfingsten Rd.
Northbrook, IL 60062 (708) 272-8800

WCLIB West Coast Lumber Inspection Bureau
P.O. Box 23145
Portland, OR 97223 (503) 639-0651

WRI Wire Reinforcement Institute
1101 Connecticut Ave. NW, Suite 700
Washington, DC 20036-4303 (202) 429-5125

WSC Water Systems Council
600 S. Federal St., Suite 400
Chicago, IL 60605 (312) 922-6222

WWPA Western Wood Products Assoc.
Yeon Building
522 SW 5th Avenue
Portland, OR 97204-2122 (503) 224-3930

W.W.P.A. Woven Wire Products Assoc.
2515 N. Nordica Ave.
Chicago, IL 60635 (312) 637-1359

F. Federal Government Agencies: Names and titles of federal government standard- or Specification-producing agencies are often abbreviated. The following acronyms or abbreviations referenced in the Contract Documents indicate names of standard- or Specification-producing agencies of the federal government. Names and addresses are subject to change but are believed to be, but are not assured to be, accurate and up to date as of the date of the Contract Documents.

CFR Code of Federal Regulations
(Available from the Government Printing Office)
N. Capitol St. between G and H St. NW
Washington, DC 20402 (202) 783-3238
(Material is usually first published in the "Federal Register")

CPSC Consumer Product Safety Commission
5401 Westbard Ave.
Bethesda, MD 20207 (301) 492-6580
(800) 638-2772

DOC	U.S. Department of Commerce 14th St. and Constitution Ave., NW Washington, DC 20230 (202) 482-2000
DOT	Department of Transportation 400 Seventh St., SW Washington, DC 20590 (202) 366-4000
EPA	Environmental Protection Agency 401 M St., SW Washington, DC 20460 (202) 382-2090
FCC	Federal Communications Commission 1919 M St., NW Washington, DC 20554 (202) 632-7000
FS	Federal Specification (from GSA) Specifications Unit (WFSIS) 7th and D St., SW Washington, DC 20407 (202) 708-9205
GSA	General Services Administration F St. and 18th St., NW Washington, DC 20405 (202) 708-5082
NIST	National Institute of Standards and Technology (U.S. Department of Commerce) Gaithersburg, MD 20899 (301) 975-2000
OSHA	Occupational Safety and Health Administration (U.S. Department of Labor) N3647 200 Constitution Ave., NW Washington, DC 20210 (202) 219-8148
USDA	U.S. Department of Agriculture 14th St. and Independence Ave., SW Washington, DC 20250 (202) 447-2791

1.5 SUBMITTALS

A. Permits, Licenses, and Certificates: For the Owner's and End User=s records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01095

SECTION 01096 - MATERIAL KEYNOTE LEGEND

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 EXAMPLES

A. Examples used herein are for illustrative purposes only, the keynote, notes and descriptions do not necessarily correspond to those used on the drawings.

1.3 KEYNOTE EXPLANATION AND FORMAT

A. Keynote Explanation: The Drawings utilize a keynoting system which references the keynote to the 5-digit specification section in which the item is specified. Such reference is for keynote clarity and organization; and does not restrict or control the Contractor in dividing the Work among subcontractors or in establishing the extent of Work to be performed by any trade.

B. Keynote Format: The keynote system uses a format which includes a prefix and suffix. The prefix is the 5-digit specification section that specifies the material or product. The suffix is an alphanumeric designation connected only to the material or product through the Keynote Legends on the drawings. The suffix has no symbolic connection to the specifications.

1. Example: 06100.D is the keynote placed on the drawings (plan, elevation, section, detail). The Material Keynote Legend identifies the material as 2 x 4 STUD. Section 06100, Rough Carpentry, is the section in which studs are specified. D is the suffix used to distinguish 2 x 4 STUD from other materials specified in Section 06100 and does not reference any specific paragraph within the specification section.

C. Keynote Qualifiers: Many keynotes are qualified by information placed in parentheses following the keynote. The type of information is indicated on the Material Keynote Legend and includes, but is not limited to, the following: SIZE, SPACING, THICKNESS, GAGE, WEIGHT, FINISH. Information is presented in this format to reduce the complexity of the keynoting system.

1. Example: 09255.A1 (5/8") is a keynote placed on the drawings. The Material Keynote Legend identifies the material as GYPSUM BOARD (THICKNESS). Alphanumeric characters, such as A1 in this example, are used to group similar materials, products, and systems. The qualifier, (THICKNESS), in the keynote description indicates information which further clarifies the material or product, and is found on the drawing following the keynote. In this example, the keynote requires 5/8" Gypsum Board.

2. Keynote descriptions which indicate a qualifier do not always have the qualifying information placed adjacent the keynote on the drawing, but remain valid keynotes. Where the qualifier is not included, the information is to be found elsewhere on the drawings or in the specifications.

1.4 GENERAL NOTES AND NOTES

A. Project General Notes: Notes on the drawings related to the entire project are organized by discipline: Civil, Architectural, Structural, Mechanical, Electrical, etc. and are placed at or near the front of each section of the drawings under the heading PROJECT GENERAL NOTES.

1. Example:
   1. Unless noted otherwise, dimensioning on plans is to face of studs (F.O.S.).
   2. Contractor to verify all dimensioning and conditions at site.

B. General Notes: Notes that are specific to individual sheets within the set of drawings are referred to as GENERAL NOTES and listed in the title block below the Material Keynote Legend. These notes are often used to reference and facilitate the process of finding the information.

1. Example:
   1. Re: A901 for Partition Types.
   2. Re: A1001 for Door Schedule.

C. Notes: Notes that are specific to a drawing (plan, elevation, section, detail, etc.) are referred to as NOTES and are located in the title block under the Material Keynote Legend and/or the General Notes. This type of note is used to further clarify a specific drawing on the sheet and is indicated on the actual drawing as NOTE followed by a number with a leader drawn to the applicable location.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01096

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for project meetings including but not limited to:

1. Pre-Construction Conference.
2. Coordination Meetings.

B. Construction schedules are specified in another Division-1 Section.

1.3 PRE-CONSTRUCTION CONFERENCE

A. Attend a pre-construction conference and organizational meeting, scheduled by Owner, at the project site or other convenient location no later than 5 days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.

B. Attendees: The Owner, Project Manager/General Contractor, Architect and their consultants, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.

C. Proposed Agenda: Parties attending the Pre-Construction Meeting shall be familiar with the project to discuss items of significance that could affect progress including such topics as:

1. Tentative construction schedule.
2. Critical Work sequencing.
3. Designation of responsible personnel.
4. Procedures for processing field decisions and Change Orders.
5. Procedures for processing Applications for Payment.
6. Distribution of Contract Documents.
7. Submittal of Shop Drawings, Product Data and Samples.
8. Preparation of record documents.
9. Use of the premises.
10. Office, Work and storage areas.
11. Equipment deliveries and priorities.
12. Safety procedures.
13. First aid.
14. Security.
15. Housekeeping.
16. Working hours.

1.4 SUBCONTRACTOR COORDINATION MEETINGS

A. Participation in project coordination meetings is required. Meeting shall be held at regularly scheduled times convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings.

B. Project Manager/General Contractor will notify applicable subcontractor for representation at coordination meetings.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01200

SECTION 01300 - SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including;

1. Submittal procedures.
2. Shop Drawings.
3. Product Data.
4. Samples.

B. Administrative Submittals: Refer to other Division-1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:

1. Permits.
2. Applications for payment.
3. Insurance certificates.

C. The Schedule of Values submittal is included in Section "Applications for Payment."

D. Inspection and test reports are included in Section "Quality Control Services."

1.3 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

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

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

a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

3. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for re-submittals.

a. Allow ten days for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Architect will promptly advise the Contractor when a submittal being processed must be delayed for coordination.
b. If an intermediate submittal is necessary, process the same as the initial submittal.

c. Allow ten days for reprocessing each submittal.
d. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.

B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

1. Provide a space approximately 4" x 5" on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.

2. Include the following information on the label for processing and recording action taken.

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name and address of Contractor.
e. Name and address of subcontractor.
f. Name and address of supplier.
g. Name of manufacturer.
h. Number and title of appropriate Specification Section.
i. Drawing number and detail references, as appropriate.

C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Architect using a transmittal form. Submittals received from sources other than the Contractor will be returned without action.

1. Identify each submittal with a submittal number consisting of a chronological submittal number followed by the Specification Section number and an alphabetical submission designation letter. Designate initial submission with an "A". Example: 2-03300-A indicates second submittal for the project, item submitted is in section 03300, and it is the first submittal for the item.

2. On the transmittal record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.

3. Indicate required return date on transmittal form. For submittals needed prior to allotted review period specified above, mark clearly on transmittal form: "URGENT" and indicate return date.

4. Transmittal Form: Use the sample form at the end of this Section for transmittal of submittals.

D. Re-submittals: Indicate original submittal number with letter designation in alphabetical order for each re-submittal. "B" for first re-submittal, "C" for second re-submittal and so forth.

1.4 SHOP DRAWINGS

D. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared

without specific reference to the Project is not considered Shop Drawings.

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

1. Dimensions.
2. Identification of products and materials included.
3. Compliance with specified standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurement.
6. Sheet Size: Except for templates, patterns and similar full- size Drawings, submit Shop Drawings on 8-1/2" x 11", 11" X 17", or 24" x 36" sheets.
   a. One of the prints returned shall be marked-up and maintained as a "Record Document".

7. Number of Copies: Submit three opaque (bond) copies of each submittal. Architect will return two copies.
8. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

1.5 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:

   a. Manufacturer's printed recommendations.
   b. Compliance with recognized trade association standards.
   c. Compliance with recognized testing agency standards.
   d. Application of testing agency labels and seals.
   e. Notation of dimensions verified by field measurement.
   f. Notation of coordination requirements.

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

3. Submittals: Submit 3 copies of each required submittal. The Architect will retain 1, and will return the other copies marked with action taken and corrections or modifications required.

4. Distribution: Furnish copies of reviewed submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.

   f. Do not proceed with installation until an applicable copy of Product Data applicable is in the installer's possession.
   g. Do not permit use of unmarked copies of Product Data in connection with construction.

B. Project Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location.

1. Number of copies: Submit three copies of product schedule or list, unless otherwise indicated. Architect will return two copies.

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

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of appropriate Specification Section.

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

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

a. Number of Samples: Submit two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return one submittal with options selected and retain the other.

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

a. Number of Samples: Submit two sets of Samples. Architect will retain one Sample set; remainder will be returned.

1.6 ARCHITECT'S ACTION

A. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Architect will review each submittal, mark to indicate action taken, and return promptly.

1. Compliance with specified characteristics is the Contractor's responsibility.

B. Action Stamp: The Architect will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:

1. Final Unrestricted Release: Where submittals are marked "Reviewed, no exceptions noted," that part of the Work covered by the submittal may proceed provided it

complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.

2. Final-But-Restricted Release: When submittals are marked "Reviewed, exceptions noted," that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.
   a. When marked "Resubmittal required," resubmission is for record, clarification, or for purposes of confirming the information contained in the submittal. The submittal shall be considered as not acceptable until such time as the written response is accepted by the Architect.
   b. When marked "Re-submittal not required," no further submittal action is required.

3. Returned for Re-submittal: When submittal is marked "Rejected, re-submittal required," do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.

   a. Do not permit submittals marked "Rejected, re-submittal required" to be used at the Project site, or elsewhere where Work is in progress.

4. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "Re-submittal Not required."

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION (Not Applicable).

END OF SECTION 01300

CONTRACTOR SUBMITTAL FORM

CONTRACTOR:
ADDRESS:

PROJECT: UDOT Maintenance Station
Jordan Landing, Utah

SUBMITTAL NO: _____

TO: Archiplex Group
1135 South West Temple
Salt Lake City, Utah 84101

DATE: _

Archiplex Group Project No. 0400010.01

ATTN:_____

No. of Copies	**Description**	**Source** (Mfg., Supplier, Subcontractor)	**Spec. Section or Drawing Reference**

Remarks:

_____

_____

_____

_____

_____

Signature of the General Contractor certifies that the material or equipment contained in this submittal has been checked for compliance with the Contract Documents, and that dimensions have been checked.

Signature

SECTION 01400 - QUALITY CONTROL SERVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for quality control services.

B. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by the Architect.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.

D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

1. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as customized fabrication and installation procedures.
2. Inspections, test and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.
3. Requirements for the Contractor to provide quality control services required by the Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 RESPONSIBILITIES

A. Owner Responsibilities: The Owner will provide inspections, tests and similar quality control services, specified in individual Specification Sections and required by governing authorities, except where they are specifically indicated to be the Contractor's responsibility.

1. The Owner will engage and pay for the services of an independent agency to perform inspections and tests specified as the Owner's responsibility.

a. Where the Owner has engaged a testing agency or other entity for testing and inspection of a part of the Work, and the Contractor is also required to engage an entity for the same or related element, the Contractor shall not employ the entity engaged by the Owner, unless otherwise agreed in writing with the Owner.

2. Retesting: The Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.

   a. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.

3. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:

   a. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
   b. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
   c. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
   d. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
   e. Security and protection of samples and test equipment at the Project site.

B. Owner Responsibilities: The Owner will provide inspections, tests and similar quality control services specified to be performed by independent agencies and not by the Contractor, except where they are specifically indicated as the Contractor's responsibility or are provided by another identified entity. Testing by Owner include, but are not limited to, tests noted in the following Sections:

   Section 02200-1.5.B
   Section 02200-3.18.A
   Section 03300-1.4.B
   Section 03300-3.17.A
   Section 04200-1.5.C
   Section 04200-3.11.A
   Section 05120-1.4.C
   Section 05120-3.2.A

2. The Owner will employ and pay for the services of an independent agency, testing laboratory or other qualified firm to perform services which are the Owner's responsibility.

C. Duties of the Testing Agency: The independent testing agency engaged to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections shall cooperate with the Architect and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.

1. The agency shall notify the Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents, or approve or accept any portion of the Work.
3. The agency shall not perform any duties of the Contractor.

D. Coordination: The Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

1.4 SUBMITTALS

A. The independent testing agency shall submit a Owner certified written report of each inspection, test or similar service, to the Owner & Architect, in duplicate, unless the Contractor is responsible for the service. If the Contractor is responsible for the service, submit a certified written report of each inspection, test or similar service through the Contractor, in duplicate.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
2. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:
   a. Date of issue.
   b. Project title and number.
   c. Name, address and telephone number of testing agency.
   d. Dates and locations of samples and tests or inspections.
   e. Names of individuals making the inspection or test.
   f. Designation of the Work and test method.
   g. Identification of product and Specification Section.
   h. Complete inspection or test data.
   i. Test results and an interpretations of test results.
   j. Ambient conditions at the time of sample-taking and testing.
   k. Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements.
   l. Name and signature of laboratory inspector.
   m. Recommendations on retesting.

1.5 QUALITY ASSURANCE

A. Qualification for Service Agencies: For testing which is not the specific responsibility of the Owner, engage inspection and testing service agencies, including independent testing laboratories, which are pre-qualified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the State of Utah.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including

deficiencies in visual qualities of exposed finishes. Comply with Contract Document requirements for "Cutting and Patching."

B. Protect construction exposed by or for quality control service activities, and protect repaired construction.

C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION 01400

SECTION 01500 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.

B. Temporary utilities required include but are not limited to:

1. Water service and distribution.
2. Temporary electric power and light.
3. Telephone service and fax.

C. Temporary construction and support facilities required include but are not limited to:

1. Field office and storage sheds.
2. Sanitary facilities, including drinking water.
3. Dewatering facilities and drains.
4. Temporary project identification signs and bulletin boards.
5. Waste disposal services.
6. Construction aids and miscellaneous services and facilities.

D. Security and protection facilities required include but are not limited to:

1. Barricades, warning signs, lights.
2. Enclosure fence around buildings.
3. Environmental protection.

1.3 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations if authorities having jurisdiction, including but not limited to:

1. Building Code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, Fire Department and Rescue Squad rules.
5. Environmental protection regulations.

B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities."

1. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", prepared jointly by AGC and ASC, for industry recommendations.
2. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).

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

1.4 PROJECT CONDITIONS

A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of the permanent service.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials; if acceptable to the Architect, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.

B. Lumber and Plywood: Comply with requirements in Division-6 Section "Rough Carpentry."

1. For job-built temporary sheds within the construction area, provide UL labeled, fire treated lumber and plywood for framing, sheathing and siding.
2. For signs and directory boards, provide exterior type, Grade B-B High Density Concrete Form Overlay Plywood conforming to PS-1, of sizes and thickness indicated.
3. For safety barriers and similar uses, provide minimum 5/8" thick exterior plywood.

C. Roofing Materials: Provide UL Class "A" standard weight asphalt shingles complying with ASTM D3018, or UL Class "C" mineral surfaced roll roofing complying with ASTM D 249 on roofs of job-built temporary offices, shops and sheds.

D. Paint: Comply with requirements of Division 9 Section "Finish Painting."

1. For sign panels and applying graphics, provide exterior grade alkyd gloss enamel over exterior primer.

E. Tarpaulins: Provide waterproof, fire-resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures provide translucent nylon reinforced laminated polyethylene or polyvinyl chloride fire retardant tarpaulins.

F. Water: Provide potable water approved by local health authorities.

2.2 EQUIPMENT

A. General: Provide new equipment; if acceptable to the Architect, undamaged, previously used

equipment in serviceable condition may be used. Provide equipment suitable for use intended.

B. Water Hoses: Provide 3/4" heavy-duty, abrasion-resistant, flexible rubber hoses 100 ft. long, with pressure rating greater than the maximum pressure of the water distribution system; provide adjustable shut-off nozzles at hose discharge.

C. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.

D. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.

E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.

F. Temporary Offices: Provide mobile unit (trailer) with lockable entrances, operable windows, and serviceable finishes. Provide heated and air-conditioned units on foundations adequate for normal loading.

G. Temporary Toilet Units: Provide self-contained single-occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material.

H. First Aid Supplies: Comply with governing regulations.

I. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.

1. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's

recommendations.

1. Arrange with the company and existing users for a time when service can be interrupted, where necessary, to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
3. Obtain easements to bring temporary utilities to the site, where the Owner's easements cannot be used for that purpose.
4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Architect, and will not be accepted as a basis of claims for a Change Order.

B. Water Service: Install water service and distribution piping of sizes and pressures adequate for construction using permanent water service on-site.

1. Sterilization: Sterilize temporary water piping prior to use.

C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period or earlier if existing service is available. Include meters, transformers, overload protected disconnects, automatic ground-fault interrupters and main distribution switch gear.

1. Except where overhead service must be used, install electric power service underground.
2. Power Distribution System: Install wiring overhead, and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, AC 20 ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.

D. Temporary Lighting: Whenever overhead floor or roof deck has been installed, provide temporary lighting with local switching.

1. Install and operate temporary lighting that will fulfill security and protection requirements, without operating the entire system, and will provide adequate illumination for construction operations and traffic conditions.

E. Temporary Telephones: Provide temporary telephone service for all personnel engaged in construction activities, throughout the construction period. Install telephone on a separate line for each temporary office and first aid station. Where an office has more than two occupants, install a telephone for each additional occupant or pair of occupants.

1. At each telephone, post a list of important telephone numbers.

3.3 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

A. Locate field offices, storage sheds, sanitary facilities and other temporary construction and support facilities for easy access.

1. Maintain temporary construction and support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

B. Provide incombustible construction for offices, shops and sheds located within the construction area, or within 30 feet of building lines. Comply with requirements of NFPA 241.

C. Field Offices: Provide insulated, weathertight temporary offices of sufficient size to accommodate required office personnel at the Project site. Keep the office clean and orderly for use for small progress meetings. Furnish and equip offices as follows:

1. Furnish with a desk and chairs (for 8-10 persons), plan table and plan rack.

D. Storage and Fabrication Sheds: Install storage and fabrication sheds, sized, furnished and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere on the site.

E. Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with regulations and health codes for the type, number, location, operation and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.

1. Provide toilet tissue, paper towels, paper cups and similar disposable materials for each facility. Provide covered waste containers for used material.

F. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.

G. Drinking Water Facilities: Provide containerized tap-dispenser bottled-water type drinking water units, including paper supply.

1. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F (7 to 13 deg C).

H. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, provide dewatering procedures, temporary trenches and field drains as needed to maintain the site, excavations and construction free of water.

I. Temporary Enclosures: Provide temporary enclosure for protection of construction in progress and completed, from exposure, foul weather, other construction operations and similar activities.

1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

2. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 square feet or less with plywood or similar materials.

3. Close openings through floor or roof decks and horizontal surfaces with load-bearing wood-framed construction.

J. Temporary Exterior Lighting: Install exterior yard and sign lights so that signs are visible when Work is being performed.

K. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C).

Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer as requested by the Architect.

B. Temporary Fire Protection: Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers," and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations."

1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
4. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.

C. Barricades, Warning Signs and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.

D. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.5 OPERATION, TERMINATION AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24-hour day basis where required to achieve indicated results and to avoid possibility of damage.
2. Protection: Prevent water filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces and

replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of the Contractor. The Owner reserves the right to take possession of Project identification signs.

2. At Substantial Completion, clean and renovate permanent facilities that have been used during the construction period, including but not limited to:
   a. Replace air filters and clean inside of ductwork and housings.
   b. Replace significantly worn parts and parts that have been subject to unusual operating conditions.
   c. Replace lamps that are burned out or noticeably dimmed by substantial hours of use.

END OF SECTION 01500

SECTION 01600 - MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

B. The Contractor's Construction Schedule and the Schedule of Submittals are included under Section "Submittals."

C. Standards: Refer to Section "Definitions and Standards" for applicability of industry standards to products specified.

D. Administrative procedures for handling requests for substitutions made after award of the Contract are included under Section "Product Substitutions."

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms such are self-explanatory and have well recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

a. "Named Products" are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.

2. "Materials" are products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.

3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

1.4 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.

1. When specified products are available only from sources that do not or cannot produce a quantity adequate to complete project requirements in a timely manner, consult with the Architect for a determination of the most important product qualities before proceeding. Qualities may include attributes relating to visual appearance, strength, durability, or compatibility. When a determination has been made, select

products from sources that produce products that possess these qualities, to the fullest extent possible.

B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
   a. Name of product and manufacturer.
   b. Model and serial number.
   c. Capacity.
   d. Speed.
   e. Ratings.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft.

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.
3. Deliver products to the site in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
4. Inspect products upon delivery to ensure compliance with the Contract Documents, and to ensure that products are undamaged and properly protected.
5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.

1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous project experience. Procedures governing product selection include the following:

1. Semiproprietary Specification Requirements: Where two or more products or manufacturers are named, provide one of the products indicated. No substitutions will be permitted.
   a. Where products or manufacturers are specified by name, accompanied by the term "or equal," or "or approved equal" comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.

2. Non-Proprietary Specifications: When the Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.

3. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.

4. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.
   a. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.

5. Compliance with Standards, Codes and Regulations: Where the Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.

6. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.
   a. Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category, or for noncompliance with specified requirements.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS:

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01600

SECTION 01631 - PRODUCT SUBSTITUTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling requests for substitutions made after award of the Contract.

B. The Contractor's Construction Schedule and the Schedule of Submittals are included under Section "Submittals."

C. Standards: Refer to Section "Definitions and Standards" for applicability of industry standards to products specified.

D. Procedural requirements governing the Contractor's selection of products and product options are included under Section "Materials and Equipment."

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor after award of the Contract are considered requests for "substitutions." The following are not considered substitutions:

1. Substitutions requested by Bidders during the bidding period, and accepted prior to award of Contract, are considered as included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
2. Revisions to Contract Documents requested by the Owner or Architect.
3. Specified options of products and construction methods included in Contract Documents.
4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.4 SUBMITTALS

A. Substitution Request Submittal: Requests for substitution will be considered if received within 10 days after commencement of the Work. Requests received more than 10 days after commencement of the Work may be considered or rejected at the discretion of the Architect.

1. Submit 3 copies of each request for substitution for consideration. Submit requests in the form and in accordance with procedures required for Change Order proposals.

2. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide

complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:

a. Product Data, including Drawings and descriptions of products, fabrication and installation procedures.
b. Samples, where applicable or requested.
c. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.
d. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractors, that will become necessary to accommodate the proposed substitution.
e. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
f. Cost information, including a proposal of the net change, if any in the Contract Sum.
g. Certification by the Contractor that the substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated. Include the Contractor's waiver of rights to additional payment or time, that may subsequently become necessary because of the failure of the substitution to perform adequately.

3. Architect's Action: Within one week of receipt of the request for substitution, the Architect will request additional information or documentation necessary for evaluation of the request. Within one weeks of receipt of the request, or one week of receipt of the additional information or documentation, which ever is later, the Architect will notify the Contractor of acceptance or rejection of the proposed substitution. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name. Acceptance will be in the form of a Change Order.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Conditions: The Contractor's substitution request will be received and considered by the Architect when one or more of the following conditions are satisfied, as determined by the Architect; otherwise requests will be returned without action except to record noncompliance with these requirements.

1. Extensive revisions to Contract Documents are not required.

2. Proposed changes are in keeping with the general intent of Contract Documents.

3. The request is timely, fully documented and properly submitted.

4. The request is directly related to an "or equal" clause or similar language in the Contract Documents.

5. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities

properly.

6. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.

7. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar considerations.

8. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.

9. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.

10. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provide the required warranty.

B. The Contractor's submittal and Architect's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01631

SECTION 01700 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:

1. Inspection procedures.
2. Project record document submittal.
3. Operating and maintenance manual submittal.
4. Submittal of warranties.
5. Final cleaning.

B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions-2 through -16.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.

1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
   a. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.
2. Advise Owner of pending insurance change-over requirements.
3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
4. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities; include occupancy permits, operating certificates and similar releases.
5. Submit record drawings, maintenance manuals, final project photographs, damage or settlement survey, property survey, and similar final record information.
6. Deliver tools, spare parts, extra stock, and similar items.
7. Make final change-over of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of change-over in security provisions.
8. Complete start-up testing of systems, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
9. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

B. Inspection Procedures: On receipt of a request for inspection, the Architect will either proceed with inspection or advise the Contractor of unfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection, or advise the

Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The Architect will repeat inspection when requested and assured that the Work has been substantially completed.
2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit a certified copy of the Architect's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Architect.
4. Submit final meter readings for utilities and similar data as of the date of Substantial Completion, or when the Owner took possession of and responsibility for corresponding elements of the Work.
5. Submit consent of surety to final payment.
6. Submit a final liquidated damages settlement statement.
7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Reinspection Procedure: The Architect will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Architect.

1. Upon completion of reinspection, the Architect will prepare a certificate of final acceptance, or advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
2. If necessary, reinspection will be repeated.

1.5 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Architect's reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.
2. Mark new information that is important to the Owner, but was not shown on Contract

Drawings or Shop Drawings.

3. Note related Change Order numbers where applicable.
4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.

1. Upon completion of the Work, submit record Specifications to the Architect for the Owner's records.

D. Record Product Data: Maintain one copy of each Product Data submittal. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the Work which cannot otherwise be readily discerned later by direct observation. Note related Change Orders and mark-up of record drawings and Specifications.

1. Upon completion of mark-up, submit complete set of record Product Data to the Architect for the Owner's records.

E. Record Sample Submitted: Immediately prior to the date or dates of Substantial Completion, the Contractor will meet at the site with the Architect and the Owner's personnel to determine which of the submitted Samples that have been maintained during progress of the Work are to be transmitted to the Owner for record purposes. Comply with delivery to the Owner's Sample storage area.

F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Architect for the Owner's records.

G. Maintenance Manuals: Organize operating and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual heavy-duty 2-inch, 3-ring vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Submit 5 copies. Include the following types of information:

1. Emergency instructions.
2. Spare parts list.
3. Copies of warranties.
4. Wiring diagrams.
5. Recommended "turn around" cycles.
6. Inspection procedures.
7. Shop Drawings and Product Data.

8. Fixture lamping schedule.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES

A. Operating and Maintenance Instructions: Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:

1. Maintenance manuals.
2. Record documents.
3. Spare parts and materials.
4. Tools.
5. Lubricants.
6. Identification systems.
7. Control sequences.
8. Hazards.
9. Cleaning.
10. Warranties and bonds.
11. Maintenance agreements and similar continuing commitments.

B. As part of instruction for operating equipment, demonstrate the following procedures:

1. Start-up.
2. Shutdown.
3. Emergency operations.
4. Noise and vibration adjustments.
5. Safety procedures.
6. Economy and efficiency adjustments.
7. Effective energy utilization.

3.2 FINAL CLEANING

A. General: General cleaning during construction is required by the General Conditions and included in Section "Temporary Facilities".

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.
   a. Remove labels that are not permanent labels.
   b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
   c. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors

broom clean. Vacuum carpeted surfaces.

d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.

e. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.

C. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

D. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

1. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

END OF SECTION 01700

SECTION 01740 - WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers standard warranties on products and special warranties.

1. Refer to the General Conditions for terms of the Contractor's special warranty of workmanship and materials.

2. General closeout requirements are included in Section "Project Closeout".

3. Specific requirements for warranties for the Work and products and installations that are specified to be warranted, are included in the individual Sections of Divisions-2 through -16.

4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 DEFINITIONS

A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.4 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

E. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.5 SUBMITTALS

A. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.

1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within fifteen days of completion of that designated portion of the Work.

B. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Architect for approval prior to final execution.

1. Refer to individual Sections of Divisions-2 through -16 for specific content requirements, and particular requirements for submittal of special warranties.

C. Form of Submittal: At Final Completion compile three copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

D. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.
2. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS, the Project title or name, and the name of the Contractor.
3. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION (Not Applicable).

END OF SECTION 01740

SECTION 02055

SOILS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Subsoil materials.
   2. Topsoil materials.

B. Related Sections:
   1. Geotechnical Study.
   2. Section 02060 - Aggregate.
   3. Section 02311 - Rough Grading.
   4. Section 02320 - Backfill.
   5. Section 02324 - Trenching.
   6. Section: Subbase preparation.

1.2 REFERENCES
A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   2. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

1.3 SUBMITTALS
A. Section 01300 - Submittals: Requirements for submittals.
B. Materials Source: Submit name of imported materials source.
C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE
A. Furnish each subsoil material from single source throughout the Work.

PART 2 – PRODUCTS

2.1 SUBSOIL MATERIALS
A. Subsoil Type S1:
   1. Excavated and re-used material.
   2. Graded.
   3. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
   4. Conforming to ASTM D2487 Group Symbol GP.

2.2 SOURCE QUALITY CONTROL
A. Section 01400 - Quality Control Services: Testing and Inspection Services Testing and analysis of soil material.
B. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D1557.
C. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D1557.
D. When tests indicate materials do not meet specified requirements, change material and retest.

E. Furnish materials of each type from same source throughout the Work.

PART 3 – EXECUTION

3.1 EXCAVATION
A. Excavate subsoil from areas designated. Strip topsoil to full depth of topsoil in designated areas.
B. Stockpile excavated material meeting requirements for subsoil materials.
C. Remove excess excavated materials not intended for reuse, from site.
D. Remove excavated materials not meeting requirements for subsoil materials from site.

3.2 STOCKPILING
A. Stockpile materials on site at locations designated by Architect/Engineer.
B. Stockpile in sufficient quantities to meet Project schedule and requirements.
C. Separate differing materials with dividers or stockpile apart to prevent mixing.
D. Stockpile topsoil 8 feet high maximum.
E. Prevent intermixing of soil types or contamination.
F. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
G. Stockpile unsuitable or hazardous materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.3 STOCKPILE CLEANUP
A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 02060

AGGREGATE

PART 1 - GENERAL

1.1 SUMMARY
- A. Section Includes:
  1. Coarse aggregate materials.
  2. Fine aggregate materials.

- B. Related Sections:
  1. Geotechnical Study.
  2. Section 02055 - Soils: Fill and grading materials.
  3. Section 02311 - Rough Grading.
  4. Section 02320 - Backfill.
  5. Section 02324 - Trenching.
  6. Section 02512 - Site Water Distribution.
  7. Section 02538 - Sanitary Sewer System.
  8. Section 02540 - Septic Tank Systems.
  9. Section 02551 - Natural Gas Distribution.
  10. Section 02630 - Storm Drainage.
  11. Section 02721 - Aggregate Base Course.
  12. Section: Subbase preparation.

1.2 REFERENCES
- A. American Association of State Highway and Transportation Officials:
  1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses.
- B. ASTM International:
  1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  2. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
  3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
  4. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.3 SUBMITTALS
- A. Section 01300 - Submittals: Requirements for submittals.
- B. Materials Source: Submit name of imported materials suppliers.
- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE
- A. Furnish each aggregate material 5 from single source throughout the Work.

PART 2 - PRODUCTS

2.1 COARSE AGGREGATE MATERIALS
- A. Coarse Aggregate Type A1: Natural stone or crushed rock; free of clay, shale, organic matter; graded in accordance with ANSI/ASTM C136, ASTM D2487 Group Symbol GM, GC; to the following limits:
  1. Minimum Size: 1/2 inch (25 mm)
  2. Maximum Size: 1 1/2 inch (50 mm)

  Use for free draining gravel material, pipe foundation material as indicated on the Drawings.

B. Coarse Aggregate Type A2: 1 ½ inch minus angular, crushed, free of shale, clay, friable material and debris; graded in accordance with ANSI/ASTM C136, Group Symbol GW; within the following limits: (Alternative gradations will be considered)

Sieve Size	Percent Passing
1 ½ inch	100
1 inch	80 to 95
3/4 inch	75 to 85
1/2 inch	60 to 80
3/8 inch	55 to 75
No. 4	35 to 60
No. 10	25 to 45
No. 50	8 to 25
No. 200	2 to 8

Use for untreated base course material, structural foundation material and as shown on the Drawings.

C. Coarse Aggregate Type A3: ¾ inch minus angular, crushed, free of shale, clay, friable material and debris; graded in accordance with ANSI/ASTM C136; within the following limits: (Alternative gradations will be considered)

Sieve Size	Percent Passing
3/4 inch	100
1/2 inch	75 to 95
3/8 inch	65 to 85
No. 4	40 to 65
No. 10	25 to 50
No. 50	10 to 25
No. 200	2 to 8

Use for pipe bedding material, pipe zone backfill and as shown on the Drawings.

D. Coarse Aggregate Type A4: Durable material free of shale, clay, organic matter, friable material and debris meeting the following limits: (Alternative gradations will be considered)

Sieve Size	Percent Passing
6 inches	100
4 inches	98 to 100
3 inches	95 to 100
2 inches	75 to 100
1 inch	40 to 80
No. 4	25 to 60
No. 200	5 to 12

Use for the granular base course, import trench backfill, structure backfill, site fill material, and where specified elsewhere and shown on the Drawings.

E. Aggregate Type A5: Native material, free of organic material, friable materials and debris.
Maximum allowable size is three (3) inches.
Use for trench backfill and structure backfill.

2.2 FINE AGGREGATE MATERIALS

A. Fine Aggregate Type A6 (Sand): Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter; graded in accordance with ASTM C136 ASTM D2487 Group Symbol SW SP; within the following limits:

Sieve Size	Percent Passing
No.4	100
No.14	10 to 100
No.50	5 to 90
No.100	4 to 30
No.200	0

2.3 SOURCE QUALITY CONTROL

A. Section 01400 - Quality Control Services: Testing and inspection services.
B. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D1557, ASTM D4318, ASTM C136.
C. Fine Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D1557. ASTM D4318. ASTM C136.
D. When tests indicate materials do not meet specified requirements, change material and retest.

PART 3 – EXECUTION

3.1 EXCAVATION

A. Stockpile excavated material meeting requirements for coarse aggregate materials and Fine aggregate materials.
B. Remove excess excavated materials not intended for reuse, from site.
C. Remove excavated materials not meeting requirements for coarse aggregate materials and fine aggregate materials from site.

3.2 STOCKPILING

A. Stockpile materials on site at locations designated by Architect/Engineer.
B. Stockpile in sufficient quantities to meet Project schedule and requirements.
C. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.
D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
E. Stockpile unsuitable and hazardous materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.3 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 02081

MANHOLES AND STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY
- A. Section Includes:
  1. Modular precast concrete manhole with tongue-and-groove joints, covers, anchorage, and accessories.
  2. Bedding and cover materials.
- B. Related Sections:
  1. Section 02205 - Soil Materials: Backfill soil materials.
  2. Section 02207 - Aggregate Materials: Aggregate for backfill in trenches.
  3. Section 02223 - Backfilling for Pipelines and Structures.
  4. Section 02225 - Trenching for Pipelines.

1.2 REFERENCES
- A. American Concrete Institute:
  1. ACI 318 - Building Code Requirements for Structural Concrete.
  2. ACI 530/530.1 - Building Code Requirements for Masonry Structures and Specifications for Masonry Structures.
- B. ASTM International:
  1. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
  2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  3. ASTM A536 - Standard Specification for Ductile Iron Castings.
  4. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
  5. ASTM C55 - Standard Specification for Concrete Brick.
  6. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale).
  7. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
  8. ASTM C497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
  9. ASTM C913 - Standard Specification for Precast Concrete Water and Wastewater Structures.
  10. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
  11. ASTM D3753 - Standard Specification for Glass-Fiber-Reinforced Polyester Manholes.

1.3 DESIGN REQUIREMENTS
- A. Equivalent strength: Based on structural design of reinforced concrete as outlined in ACI 318.
- B. Design of Lifting Devices for Precast Components: In accordance with ASTM C913.
- C. Design of Joints for Precast Components: In accordance with ASTM C913; maximum leakage of 0.025 gallons per hour per foot of joint at 3 feet of head.

1.4 SUBMITTALS
- A. Section 01330 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit cover and frame construction, features, configuration, dimensions.

1.5 QUALIFICATIONS
- A. Manufacturer: Company specializing in manufacturing products specified in this Section

with minimum three years experience.

1.6 DELIVERY, STORAGE AND HANDLING

A. Section 01600 - Product Requirements: Product storage and handling requirements.
B. Comply with precast concrete manufacturer's instructions for unloading, storing and moving precast manholes.
C. Store precast concrete manholes to prevent damage to Owner's property or other public or private property. Repair property damaged from materials storage.
D. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers shown on Drawings to indicate its intended use.

PART 2 PRODUCTS

2.1 MANHOLES AND STRUCTURES

A. Manhole and Structure Sections: Reinforced precast concrete in accordance with ASTM C478 with gaskets in accordance with ASTM C923.

2.2 FRAMES AND COVERS

A. Manufacturers:
1. D & L Foundry Model A-1005
2. Barry Pattern and Foundry Co., Inc.
3. Campbell Foundry Co.
4. McKinley Iron Works
5. Neenah Foundry Co.
6. Substitutions: Section 01600 - Product Requirements Not Permitted.

B. Product Description: ASTM A48/A48M, Class 30B Cast iron construction, machined flat bearing surface, removable open checkerboard grille; cover molded with identifying name.

2.3 COMPONENTS

A. Manhole and Structure Steps: Formed rungs; 3/4 inch diameter.

2.4 CONFIGURATION

A. Shaft Construction: Concentric with eccentric flat top section; lipped male/female dry joints; sleeved to receive pipe conduit and sections.
B. Shape: Cylindrical.
C. Clear Inside Dimensions: As indicated on Drawings.
D. Design Depth: As indicated on Drawings.
E. Clear Cover Opening: 26 inches diameter. As indicated on Drawings.
F. Steps: 12 inches wide, 16 inches on center vertically, set into manhole and structure wall.

2.5 BEDDING AND COVER MATERIALS

A. Bedding: Fill Type A2 .
B. Cover: Fill Type A3,.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Verification of existing conditions before starting work.
B. Verify items provided by other sections of Work are properly sized and located.
C. Verify built-in items are in proper location, and ready for roughing into Work.
D. Verify correct size of manhole and structure excavation.

3.2 PREPARATION

A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

B. Do not install structures where site conditions induce loads exceeding structural capacity of structures.
C. Inspect precast concrete structures immediately prior to placement in excavation to verify structures are internally clean and free from damage. Remove and replace damaged units.

3.3 INSTALLATION
A. Excavation and Backfill:
1. Excavate for manholes and structures in accordance with Section 02315 in location and to depth shown. Provide clearance around sidewalls of structure for construction operations.
2. When groundwater is encountered, prevent accumulation of water in excavations. Place manholes and structures in dry trench.
3. Where possibility exists of watertight structure becoming buoyant in flooded excavation, anchor structure to avoid flotation.
B. Place base pad, trowel top surface level.
C. Place manhole and structure sections plumb and level, trim to correct elevations, anchor to base pad.

3.4 PRECAST CONCRETE MANHOLE AND STRUCTURE INSTALLATION
A. Lift precast components at lifting points designated by manufacturer.
B. When lowering manholes and structures into excavations and joining pipe to units, take precautions to ensure interior of pipeline and structure remains clean.
C. Set precast structures bearing firmly and fully on crushed stone bedding, compacted in accordance with provisions of Section 02315 02320 or on other support system shown on Drawings.
D. Assemble multi-section structures by lowering each section into excavation. Lower, set level, and firmly position base section before placing additional sections.
E. Remove foreign materials from joint surfaces and verify sealing materials are placed properly. Maintain alignment between sections by using guide devices affixed to lower section.
F. Joint sealing materials may be installed on site or at manufacturer's plant.
G. Verify manholes and structures installed satisfy required alignment and grade.
H. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe. Fill annular space with mortar.
I. Cut pipe to finish flush with interior of structure.
J. Shape inverts through manhole and structures as shown on Drawings.

3.5 FRAME AND COVER INSTALLATION
A. Set frame and cover 2 inches above finished grade for manholes and structures with covers located within unpaved areas to allow area to be graded away from cover beginning 1 inch below top surface of frame.

3.6 FIELD QUALITY CONTROL
A. Section 01400 - Quality Requirements 01700 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.
B. Test cast-in-place concrete in accordance with Section 03300.

END OF SECTION

SECTION 02230

SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY
- A. Section Includes:
  1. Removing surface debris.
  2. Removing designated paving, curbs, and slabs.
  3. Removing designated trees, shrubs, and other plant life.
  4. Removing abandoned utilities.
- B. Related Sections:
  1. Section 02311 - Rough Grading.

1.2 SUBMITTALS
- A. Section 01300 - Submittals: Requirements for submittals.

1.3 QUALITY ASSURANCE
- A. Conform to applicable code for environmental requirements and disposal of debris.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 EXAMINATION
- A. Section 01040 – Project Coordination: Verification of existing conditions before starting work.
- B. Verify existing plant life designated to remain is tagged or identified.

3.2 PREPARATION
- A. Call Local Utility Line Information service at 800-662-4111 not less than two working days before performing Work.
  1. Request underground utilities to be located and marked within and surrounding construction areas.

3.3 PROTECTION
- A. Locate, identify, and protect utilities indicated to remain, from damage.
- B. Protect trees, plant growth, and features designated to remain, as final landscaping.
- C. Protect bench marks, survey control points, and existing structures from damage or displacement.

3.4 REMOVAL
- A. Remove debris, rock, and extracted plant life from site.
- B. Partially remove paving, curbs, and, slabs as indicated on Drawings. Neatly saw cut edges at right angle to surface.
- C. Remove abandoned utilities. Indicated removal termination point for underground utilities on Record Documents.
- D. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.
- E. Do not burn or bury materials on site. Leave site in clean condition.

END OF SECTION

SECTION 02311

ROUGH GRADING

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
1. Excavating subsoil.
2. Cutting, grading, filling, rough contouring, compacting, site for site structures, building pads, drainage and pavement.
B. Related Sections:
1. Section 02055 - Soils.
2. Section 02060 - Aggregate.
3. Section 02230 - Site Clearing: Excavating topsoil.
4. Section 02315 - Excavation and Fill: Building excavation.
5. Section 02320 - Backfill: General building area backfilling.
6. Section 02324 - Trenching: Trenching and backfilling for utilities.

1.2 REFERENCES
A. ASTM International:
1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics Of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
3. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head).
4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS
A. Section 01300 - Submittals: Requirements for submittals.
B. Materials Source: Submit name of imported materials suppliers.
C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS
A. Section 01700 – Project Closeout: Requirements for submittals.
B. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.5 QUALITY ASSURANCE
A. Perform Work in accordance with ASTM C136, ASTM D2419, and ASTM D2434.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Subsoil Fill: Type S1 as specified in Section 02055.
B. Structural Fill: Type S1 A2 A4 as specified in Section 02055, 02060.
C. Granular Fill: Type A1 A2 A3 A4 A5 as specified in Section 02060.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Section 01040 – Project Coordination: Verification of existing conditions before starting

work.

B. Verify site conditions under provisions of Section 02230

C. Verify survey bench mark and intended elevations for the Work are as indicated on Drawings.

3.2 PREPARATION

A. Call Local Utility Line Information service at 800 662-4111 not less than two working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum.

C. Protect utilities indicated to remain from damage.

D. Protect bench marks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be further excavated, relandscaped, or regraded.

B. Do not excavate wet subsoil.

C. When excavating through roots, perform Work by hand and cut roots with sharp axe.

D. Remove excess subsoil not intended for reuse, from site.

3.4 FILLING

A. Fill areas to contours and elevations with unfrozen materials.

B. Place fill material in continuous layers and compact in accordance with schedule at end of this section.

C. Place material in continuous layers as follows:
   1. Subsoil Fill: Maximum 8 inches compacted depth. 95% max density.
   2. Structural Fill: Maximum 8 inches compacted depth. 95% max density.
   3. Granular Fill: Maximum 8 inches compacted depth. 95% max density.

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.

F. Make grade changes gradual. Blend slope into level areas.

G. Repair or replace items indicated to remain damaged by excavation or filling.

3.5 TOLERANCES

A. Section 01400 - Quality Control Services: Tolerances.

B. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

3.6 FIELD QUALITY CONTROL

A. Section 01400 - Quality Control Services: Testing and inspection services.

B. Perform laboratory material tests in accordance with ASTM D1557.

C. Perform in place compaction tests in accordance with the following:
   1. Density Tests: or ASTM D2922.
   2. Moisture Tests: ASTM D3017.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Frequency of Tests: Pavement and Slabs - 1 test per lift per 1000 square feet
   Trenches - 1 test mid and top trench per 100 feet of trench.

END OF SECTION

SECTION 02324

TRENCHING

PART 1 - GENERAL

1.1 SUMMARY
- A. Section Includes:
  1. Excavating trenches for utilities from 5 feet outside building to utility service.
  2. Compacted fill from top of utility bedding to subgrade elevations.
  3. Backfilling and compaction.
- B. Related Sections:
  1. Geotechnical Study.
  2. Section 02055 - Soils.
  3. Section 02060 - Aggregate.
  4. Section 02311 - Rough Grading: Topsoil and subsoil removal from site surface.
  5. Section 02512 - Site Water Distribution: Water piping and bedding from building to booster pump.
  6. Section 02538 - Sanitary Sewer System: Sanitary sewer piping and bedding from building to Manhole/septic tank
  7. Section 02551 - Natural Gas Distribution: Gas piping and bedding from building to storage tank.
  8. Section 02630 - Storm Drainage: Storm sewer piping and bedding from building to drain outlet
  9. Section 03300 - Cast-in-Place Concrete: Concrete materials.

1.2 REFERENCES
- A. ASTM International:
  1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  2. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
  3. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  4. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 DEFINITIONS
- A. Utility: Any buried pipe, duct, conduit, or cable.

1.4 SUBMITTALS
- A. Section 01300 - Submittals: Requirements for submittals.
- B. Materials Source: Submit name of imported fill materials suppliers.
- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 FIELD MEASUREMENTS
- A. Verify field measurements prior to fabrication.

1.6 COORDINATION
- A. Section 01040 – Project Coordination: Coordination and project conditions.
- B. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 - PRODUCTS

2.1 BEDDING MATERIALS

A. Type B1 - Pea Gravel: Natural stone; free of clay, shale, organic matter; graded in accordance with ANSI/ASTM C136, to the following:
   1. Minimum Size: 1/4 inch
   2. Maximum Size: 5/8 inch.
B. Type B2 - Sand: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, or organic matter; uniform in size with no material larger than 3/4".

2.2 FILL MATERIALS
A. Subsoil Fill: Type S1 as specified in Section 02055.
B. Structural Fill: Type S1 A2 A4 as specified in Section 02055. 02060.
C. Granular Fill: Type A1 A3 as specified in Section 02060.

PART 3 - EXECUTION

3.1 LINES AND GRADES
A. Lay pipes to lines and grades indicated on Drawings.
   1. Architect/Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.
B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.2 PREPARATION
A. Call Local Utility Line Information service at 800 662-4111 not less than two working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.
B. Identify required lines, levels, contours, and datum locations.
C. Protect plant life, lawns, and other features remaining as portion of final landscaping.
D. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
E. Maintain and protect above and below grade utilities indicated to remain.
F. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.3 TRENCHING
A. Excavate subsoil required for utilities to utility service.
B. Remove lumped subsoil, boulders, and rock up of 1/6 cubic yard, measured by volume.
C. Perform excavation within 36 inches of existing utility service in accordance with utility's requirements.
D. Do not advance open trench more than 200 feet ahead of installed pipe.
E. Cut trenches 12" wider than the outer diameter of the utility. Remove water or materials that interfere with Work.
F. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and utilities.
G. Do not interfere with 45 degree bearing splay of foundations.
H. When Project conditions permit, slope side walls of excavation as OSHA requires. When side walls can not be sloped, provide sheeting and shoring to protect excavation as specified in this section.
I. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by Architect/Engineer until suitable material is encountered.
J. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Fill Type A4 and compact to density equal to or greater than requirements for subsequent backfill material.
K. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.
L. Correct areas over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Architect/Engineer.
M. Remove excess subsoil not intended for reuse, from site.

3.4 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.
B. Support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.
C. Design sheeting and shoring to be removed at completion of excavation work.
D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.
E. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.5 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen fill materials.
B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
C. Place material in continuous layers as follows:
   1. Subsoil Fill: Maximum 8 inches compacted depth.
   2. Structural Fill: Maximum 8 inches compacted depth.
   3. Granular Fill: Maximum 8 inches compacted depth.
D. Employ placement method that does not disturb or damage, utilities in trench.
E. Maintain optimum moisture content of fill materials to attain required compaction density.
F. Do not leave more than 50 feet of trench open at end of working day.
G. Protect open trench to prevent danger to Owner.

3.6 TOLERANCES

A. Section 01400 - Quality Control Services: Tolerances.
B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.
C. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.7 FIELD QUALITY CONTROL

A. Section 01400 - Quality Control Services: Testing and inspection services.
B. Perform laboratory material tests in accordance with ASTM D1557.
C. Perform in place compaction tests in accordance with the following:
   1. Density Tests: or ASTM D2922.
   2. Moisture Tests: ASTM D3017.
D. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.
E. Frequency of Tests: 1 Test mid and top of trench every 100 feet.

3.8 PROTECTION OF FINISHED WORK

A. Section 01700 – Project Closeout: Protecting finished work.
B. Reshape and re-compact fills subjected to vehicular traffic during construction.

3.9 SCHEDULE

A. Storm, Sanitary Piping and Utilites:
   1. Cover pipe and bedding with Fill Type S1,A4,A5: To subgrade elevation.
   2. Compact uniformly to minimum 95 percent of maximum density.

END OF SECTION

SECTION 02511

ASPHALTIC CONCRETE PAVING (ZERO VOIDS MIX)

PART 1 - GENERAL

1.1 SUMMARY
- A. Section Includes:
  1. Subgrade preparation.
  2. Prime coat.
  3. Tack coat.
  4. Asphaltic finish courses.
  5. Full depth asphalt paving.
- B. Related Sections:
  1. Section 02576 Asphalt Slurry Seal Coat

1.2 REFERENCES
- A. Reference Standards:
  1. ASTM D 1559-76.
  2. Utah Dept. of Transportation (UDOT) Standards (UDOT SPEC), latest edition.

1.3 SUBMITTALS
- A. Quality Control Submittals:
  1. Certificates: Submit oil supplier's written certification that quality of asphaltic binder conforms to requirements of this Section.
  2. Certificate: Submit supplier's written certification supported by weight tickets indicating following:
     - a. Calculation indicating minimum amount of asphaltic concrete materials required for total area to be paved.
     - b. Amounts actually installed.
  3. Mixes: Submit asphalt concrete mixes design from accepted testing laboratory in accordance with ASTM 1559-76. Include information used in designing mixes. Include the cost of the above test in the unit bid price for asphaltic concrete paving.

1.4 QUALITY ASSURANCE
- A. Record or Work: Keep record listing time and date of placement of asphalt work. Retain until completion of Project and make available to Architect for examination at any time.
- B. Inspection of Batching Plants: Architect shall be offered uninterrupted access to batching plant while Work is in progress.
- C. Testing: Samples and tests shall be in accordance with approved ASTM procedures.
  1. Materials not conforming to specified requirements are defective.
  2. Reject defective materials whether or not in place.

1.5 PROJECT CONDITIONS
- A. Environmental Requirements:
  1. Do not install asphalt paving when temperature is below 50 degrees F without specific notification of Architect.

PART 2 - PRODUCTS

2.1 MATERIALS
- A. Base Course, Prime Coat, Tack Coat, and Asphaltic Concrete: Comply with UTAH SPEC.
  1. Prime coat: UDOT SPEC, Section 403, Bituminous Prime Coat
  2 Tack coat: UDOT SPEC, Section 404, Bituminous Tack Coat.
  3. Asphaltic concrete surface course: UTAH SPEC, Section 704 and 402
- B. Contractor shall provide the following:

1. Prime coat: Grade MC-250 Liquid Asphalt.
2. Tack coat: Grade CSS-1h Emulsified Asphalt.
3. Asphaltic concrete surface course mix design: dense graded, central plant-mix.
   a. Binder: PG64-28 grade asphalt cement.
   b. Mineral aggregate grading and percent asphalt binder: Job-mix formula determined by Marshall Method of Mix Design, ASTM D1559.
   c. Mineral aggregate grading: Fall within ranges required by designation minus 3/4" as indicated by following tabulation:

	Percent Passing	
	2 Inch Gradation	3/4 Inch Gradation
Sieve Size		
¾	---	100
2	100	---
3/8	---	84-94
No. 4	70-84	63-89
No. 16	38-56	34-53
No. 50	19-33	17-32
No. 200	8-15	8-15

   d. Percentage of wear: Maximum 40.
   e. Stability: 1800 pounds minimum.
   f. Flow: 8 to 16.
   g. Air voids: 0 - 2 percent.
   h. Retained strength: 60 percent minimum.
   i. Asphalt cement content: 6.5 - 9.0 percent

PART 3 - EXECUTION

3.1 PAVEMENT DESIGN
A. Pavement Thicknesses: See plans for thickness of base course and asphaltic concrete.

3.2 INSTALLATION
A. General: Comply with UTAH SPEC
B. Prime Coat: Comply with UDOT SPEC Section 403, Bituminous Prime Coat.
   1. Preparation: Before applying prime coat, remove loose material from surface.
      a. Surface: Dry and in satisfactory condition.
   2. Placing:
      a. Place prime coat by means of pressure distributor capable of applying prime coat uniformly.
      b. Apply at rate of 0.1 gal/sq yd.
      c. Apply prime coat carefully.
      d. Allow prime coat to cure for minimum of 24 hours prior to paving operation.
C. Asphaltic concrete:
   1. Compact to at least 90 percent of maximum Marshall density, ASTM D1559.
   2. Maximum lift thickness: 3 inches for pavement section.
   3. Remove coarse aggregate which has surfaced due to raking in hand raked areas.
   4. No rubber tire rollers will be allowed to be used to compact the asphaltic surface. All rollers need to be of the metallic wheel type.

3.3 FIELD QUALITY CONTROL
A. Field Testing: Schedule and cooperate fully with those making the tests. The Owner will provide testing for the following.
   1. Compaction Testing Frequency: Ten random tests for basin and pad.
   2. Gradation and Oil Content Testing Frequency: Three random tests per day.

END OF SECTION

SECTION 02516

DISINFECTION OF WATER DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY
- A. Section includes disinfection of potable water distribution system; and testing and reporting results.
- B. Related Sections:
  1. Section 02512 - Site Water Distribution Product and Execution requirements for installation, testing, of site domestic water distribution piping.
  2. Section 15410 - Plumbing Fixtures: Disinfection of building domestic water piping system.

1.2 REFERENCES
- A. American Water Works Association:
  1. AWWA B300 - Hypochlorites.
  2. AWWA B302 - Ammonium Sulfate.
  3. AWWA B303 - Sodium Chlorite.
  4. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
  5. AWWA C651 - Disinfecting Water Mains.

1.3 SUBMITTALS
- A. Section 01300 - Submittals: Requirements for submittals.
- B. Product Data: Submit procedures, proposed chemicals, and treatment levels for review.
- C. Test Reports: Indicate results comparative to specified requirements.
- D. Certificate: Certify cleanliness of water distribution system meets or exceeds specified requirements.

1.4 CLOSEOUT SUBMITTALS
- A. Section 01700 – Project Closeout: Requirements for submittals.
- B. Disinfection Report:
  1. Type and form of disinfectant used.
  2. Date and time of disinfectant injection start and time of completion.
  3. Test locations.
  4. Name of person collecting samples.
  5. Initial and 24 hour disinfectant residuals in treated water in ppm for each outlet tested.
  6. Date and time of flushing start and completion.
  7. Disinfectant residual after flushing in ppm for each outlet tested.
- C. Bacteriological Report:
  1. Date issued, project name, and testing laboratory name, address, and telephone number.
  2. Time and date of water sample collection.
  3. Name of person collecting samples.
  4. Test locations.
  5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
  6. Coliform bacteria test results for each outlet tested.
  7. Certify water conforms, or fails to conform, to bacterial standards of authority having jurisdiction.
- D. Water Quality Certificate: Certify water conforms to quality standards of City of Brigham City, suitable for human consumption.

1.5 QUALITY ASSURANCE
- A. Perform Work in accordance with AWWA C651.

1.6 QUALIFICATIONS

A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this section with minimum three years documented experience.

B. Testing Firm: Company specializing in testing potable water systems, certified by State of Utah.

C. Submit bacteriologist's signature and authority associated with testing.

PART 2 - PRODUCTS

2.1 DISINFECTION CHEMICALS

A. Chemicals: AWWA B300, Hypochlorite, AWWA B301, Ammonium Sulfate, and AWWA B303, Sodium Chlorite.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01040 – Project Coordination: Verification of existing conditions before starting work.

B. Verify piping system has been cleaned, inspected, and pressure tested.

C. Perform scheduling and disinfecting activity with start-up, water pressure testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

3.2 INSTALLATION

A. Provide and attach required equipment to perform the Work of this section.

B. Perform disinfection of water distribution system and installation of system and pressure testing. Refer to Section 02512.

C. Introduce treatment into piping system.

D. Maintain disinfectant in system for 24 hours.

E. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water.

F. Replace permanent system devices removed for disinfection.

3.3 FIELD QUALITY CONTROL

A. Section 01050 – Field Engineering: Field inspecting, testing, adjusting, and balancing.

B. Disinfection, Flushing, and Sampling:

1. Disinfect pipeline installation in accordance with AWWA C651. Use of liquid chlorine is not permitted
2. Upon completion of retention period required for disinfection, flush pipeline until chlorine concentration in water leaving pipeline is no higher than that generally prevailing in existing system or is acceptable for domestic use.
3. Legally dispose of chlorinated water. When chlorinated discharge may cause damage to environment, apply neutralizing chemical to chlorinated water to neutralize chlorine residual remaining in water.
4. After final flushing and before pipeline is connected to existing system, or placed in service, employ an approved independent testing laboratory to sample, test and certify water quality suitable for human consumption.

END OF SECTION

SECTION 02538

SANITARY SEWER PIPING

PART 1 GENERAL

1.1 SUMMARY
- A. Section Includes:
  1. Gravity sanitary sewage pipe.
  2. Low pressure sanitary sewage pipe.
  3. Underground pipe markers.
  4. Bedding and cover materials.
- B. Related Sections:
  1. Section 02060 - Aggregate: Aggregate for backfill in trenches.
  2. Section 02324 - Trenching: Execution requirements for trenching required by this section.

1.2 REFERENCES
- A. ASTM International:
  1. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
  2. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
  3. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
  4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
  6. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
  7. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
  8. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DRPR) Based on Controlled Outside Diameter.
  9. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

1.3 DEFINITIONS
- A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.4 SUBMITTALS
- A. Section 01300 - Submittals: Requirements for submittals.
- B. Product Data: Submit data on pipe materials, pipe fittings, valves and accessories.
- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS
- A. Section 01700 – Project Closeout: Requirements for submittals.
- B. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 FIELD MEASUREMENTS
- A. Verify field measurements and elevations are as indicated.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Section 01600 – Materials and Equipment: Requirements for transporting, handling, storing, and protecting products.
B. Deliver and store valves in shipping containers with labeling in place.

1.8 COORDINATION
A. Section 01040 – Project Coordination: Coordination and project conditions.
B. Coordinate the Work with termination of sanitary sewer connection outside building, connection to municipal sewer utility service, and trenching.

PART 2 PRODUCTS

2.1 GRAVITY SANITARY SEWAGE PIPE
A. Plastic Pipe: ASTM D3034, Type PSM, Poly (Vinyl Chloride) (PVC) material; inside nominal diameter as indicated on the plans, bell and spigot style rubber ring sealed gasket joint.
1. Fittings: PVC.
2. Joints: ASTM F477, elastomeric gaskets.

2.2 UNDERGROUND PIPE MARKERS
A. Magnetic Locator Tape: Identification tape shall be furnished with white or black printing on a blue color field having the words CAUTION: Name of Utility - BELOW. All pipe shall include a 3-inch magnetic locator tape installed in the pipeline trench approximately 12 inches below ground surface.

2.3 CLEANOUTS
A. Sewer pipe cleanouts are for Gravity Sanitary Sewage Pipe and are to be constructed of the same class and specification of materials as the pipe they serve.
B. Cleanouts are to be constructed as shown on Detail in Drawings.
C. Cleanouts for 4” pipe are to be spaced no more than every 100 feet.

2.4 BEDDING AND COVER MATERIALS
A. Bedding: Fill Type A3, B1, B2 as specified in Section 02055, 02060, 02324.
B. Cover: Fill Type A2, A3, A4, A5, A6, as specified in Section 02060.
C. Soil Backfill from Above Pipe to sub grade: Soil Type S1, A2, A3, A4, A5 as specified in Section 02055,2060.

PART 3 EXECUTION

3.1 EXAMINATION
A. Section 01040 – Project Coordination: Verification of existing conditions before starting work.
B. Verify trench cut excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on Drawings.

3.2 PREPARATION
A. Correct over excavation with fine aggregate.
B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

3.3 BEDDING
A. Excavate pipe trench in accordance with Section 02324 for Work of this Section.
B. Backfill around sides and to top of pipe in accordance with Section 02324.
C. Maintain optimum moisture content of fill material to attain required compaction density.
D. Place fill material in accordance with Section 02324.

3.4 INSTALLATION - GRAVITY SANITARY SEWAGE PIPE

A. Install Gravity Sanitary Sewage Pipe, fittings, and accessories in accordance with ASTM D2321. Seal joints watertight.
B. Lay Gravity Sanitary Sewage Pipe to slope gradients noted on Drawings; with maximum variation from indicated slope of 1/8 inch in 10 feet.
C. Install bedding at sides and over top of pipe to minimum compacted thickness of 12 inches.
D. Refer to Section 02324 for backfilling and compacting requirements. Do not displace or damage pipe when compacting.
E. Install a 3-inch magnetic locator tape in the pipeline trench approximately 8 inches below ground surface.
F. Install site sanitary sewage system piping to 5 feet of building. Connect to building sanitary waste system. Refer to Plumbing Specifications.
G. Install cleanouts in laterals at a maximum of 100’ apart and as shown on drawings.
H. All sanitary sewer construction to be according to Hurricane City and Ash Creek Improvement District requirements and specifications.

3.5 FIELD QUALITY CONTROL

A. Section 01400 - Quality Control Services and 01700 – Project Closeout: Field inspecting, testing, adjusting, and balancing.
B. Compaction Testing for Bedding: In accordance with ASTM D1557. ASTM D2922. ASTM D3017.
C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
D. Frequency of Compaction Tests: See Section 02324.

3.6 PROTECTION OF FINISHED WORK

A. Section 01700 – Project Closeout: Requirements for protecting finished Work.
B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 02552

FUEL VAULT

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
1. New fuel vault.
B. Related Sections:
1. Section 02324 – Trenching.
2. Section 03300 – Concrete.
3. ConVault - Lightning Protection Installation Instructions – at the end of this section.
4. Convault – Fuel Vault Installation Guide Document – at the end of this section.

1.2 SYSTEM DESCRIPTION
A. Minimize amount of fuel in tank.
B. Install precast concrete slab platform.
C. Move fuel vault and related electrical facilities.

1.3 CLOSEOUT SUBMITTALS
A. Section 01700 – Project Closeout: Closeout procedures.
B. Project Record Documents: Record actual locations of vent, conduits and system components.

1.4 QUALITY ASSURANCE
A. Perform Work in accordance with State of Utah DAS Fuel Network standard, ConVault Lightning Protection Installation Instructions and ConVault – Fuel Vault Installation Guide Document.
B. All electrical wiring and conduits to be installed as per Electrical Specifications as shown on Electrical Site Plan.

1.5 PRE-INSTALLATION MEETINGS
A. Section 01200 – Project Meetings: Pre-installation meeting.
B. Convene minimum one week prior to commencing work of this section.

1.6 FIELD MEASUREMENTS
A. Verify field measurements and vault size and weight prior to ordering of precast concrete slab.

1.7 COORDINATION
A. Section 01040 – Project Coordination: Requirements for coordination.
B. Coordinate with Steve Canning with State of Utah DAS Fuel Network (801) 619-7232.

PART 2 - PRODUCTS

2.1 CONDUIT
A. See Electrical Specifications.

2.2 UNDERGROUND CONDUIT MARKERS
A. Magnetic Locator Tape: Identification tape shall be furnished with white or black printing on a blue color field having the words CAUTION: Name of Utility - BELOW. All pipe shall include a 3-inch magnetic locator tape installed in the pipeline trench approximately 12 inches below ground surface.

2.3 BEDDING AND COVER MATERIALS

A. Bedding: Fill Type A3, B1, B2 as specified in Section 02060, 02055, 02324.
B. Cover: Fill Type A2, A3, A4, A5, A6, as specified in Section 02060.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Install conduit per electrical specifications and in accordance with Section 02324.

3.2 PREPARATION
A. Install precast concrete slab on 4” thick bed of Type A3 fill as specified in Section 02060.
B. Minimize amount of fuel in vault through use or transfer.

3.3 PROTECTION
A. Protect vault from damage.

PART 4 - LIGHTNING PROTECTION INSTALLATION INSTRUCTIONS

4.1. Introduction
Convault tanks should be grounded to provide lightning protection in accordance with NFPA 780 Standard for the Installation of Lightning Protection Systems latest edition. Each Convault tank is provided with two grounding lugs or grounding bolts to meet the lightning protection requirements of Section 4-4.1 of NFPA 780 for “Aboveground Tanks at Atmospheric Pressure Containing Flammable Vapors or Liquids that Can Give Off Flammable Vapors”.

4.2. Priority of Codes, Rules and Regulations
Use the following list as your order of priority:
1. Local jurisdiction codes, rules and regulations.
2. Applicable state codes, rules, and regulations.
3. Applicable regional and national codes, rules and regulations.
4. Component manufacturer’s recommended installation, maintenance and operating procedure
5. These Convault Installation Instructions for Lightning Protection.

4.3. Conductor Cable Materials Specifications
Conductor cable material, cross sectional area, size of each strand and weight per length shall be in accordance with Section 3-1 & 3-2 and table 3-1.1 (a) and 3-1.1(b) of NFPA 780.

4.4. Ground Rods.
Ground rods shall be not less than ½ in. (12.7 mm) in diameter and 8 ft (2.4 m) long. Grounding Rod materials specification and installation shall be in accordance with section 3-13 Ground Terminal of NFPA 780.

4.5. Ground Rod Termination
The down conductor shall be attached to the ground rod by bolting, brazing, welding or using high-compression connectors listed for the purpose. Clamps shall be suitable for direct soil burial. Lightning installation shall be in accordance with section 3-13.1.1 through 3-13.1.5 and figures 3-13.1.2, 3 and 5 of NFPA780.

END OF SECTION

SECTION 02721

AGGREGATE BASE COURSE

PART 1 - GENERAL

1.1 WORK INCLUDED
A. Subgrade preparation to lines and grades shown on the plan.
B. Place, grade and compact base and sub-base course materials.
C. Dust and surface water control.

1.2 RELATED WORK
A. Section 02740 – Asphaltic Concrete Paving.

1.3 REFERENCES
A. American Society for Testing Materials (ASTM).
B. American Association of Safety and Highway Transportation Officials (AASHTO)

PART 2 - PRODUCTS

2.1 BASE COURSE MATERIAL
A. Granular base for Pavement Preparation:
1. Shall be untreated natural stone.
2. Shall not be lumpy or frozen.
3. Shall be free from noticeable concentrations of alkali, salt, shale, and petroleum products, all roots, sod, limbs, and other vegetative matter, slag, cinders, ashes and rubbish, or other material that, in the opinion of the Engineer, is objectional or deleterious.
4. Shall be graded within the following limits:

Sieve Size	Percent Passing By Weight
1”	100
½”	70 - 100
No. 4	41- 68
No. 16	21- 41
No. 40	10 - 27
No. 200	4 - 13

PART 3 - EXECUTION

3.1 PREPARATION OF SUBGRADE
A. Prior to placing base course materials, the subgrade shall be scarified to a depth of not less than 6”, moistened or dried to optimum moisture content, and compacted to at least 95% maximum Modified Proctor Density as determined in accordance with ASTM D1557 (AASHTO T-180), and shall be within 2% of optimum moisture content.
B. The subgrade shall then be proof rolled in the presence of the Engineer by passing loaded rubber-tired construction equipment uniformity over the surface at a constant rate. At least two (2) passes shall be made over all subgrade areas.
C. If excessively soft, loose, or disturbed soils are encountered, they shall be removed as directed by the Engineer to a maximum depth of two feet (2’) and replaced and recompacted to 95% maximum Modified Proctor Density using approved subgrade stabilizing material.
D. Ensure subgrade is to required lines and elevations.

3.2 PLACEMENT OF BASE COURSE

A. Protect against “pumping” moisture to surface by limiting travel on exposed subgrade. Where it is determined by the Owner that construction vehicle traffic (other than proof rolling) has caused subgrade instability, remove disturbed soils and replace with sand backfill at no additional cost to the Owner.
B. Apply water soluble herbicide for nonselective control of annual and perennial weeds in strict accordance with manufacturer’s instructions and all laws and regulations.
C. Place base course material on the prepared and accepted subgrade. The material shall be back-dumped and spread in a uniform lift thickness.
D. Handle and spread materials in a manner that will prevent segregation of sizes. When vibrating or other acceptable types of compaction equipment are used, the entire course may be placed in one layer, provided the ability of the equipment to achieve specified compaction to the full layer depth is demonstrated. In no case shall compacted lift thickness be greater than 8”.
E. When base course is constructed in more than one layer, the previously placed layer shall be cleaned of loose and foreign matter. Upper layer of base course shall not be less than 1-1/2”, nor shall fine materials be added to reach final grade.
F. Overstressing the subgrade soil and base course shall be avoided by utilizing equipment in spreading and dumping that exerts only moderate pressure on the soil. Avoid excessive travel on lower base course lifts. Severe rutting, cracking or yielding is an indication of overstressing the soil. Any ruts or cracks which develop in the base course during spreading or compacting shall be repaired as directed at no additional cost to Owner.
G. Base course shall be compacted to no less than 95% maximum Modified Proctor Density, as determined by ASTM D1557 (AASHTO T-180). Moisture content shall be maintained to within 1.5% of optimum throughout placing and compaction operations.
   1. Compaction shall always be commenced along the edge of the area to be compacted and the roller shall gradually advance toward the center of the area to be compacted.
   2. Compaction equipment shall be operated along lines parallel or concentric with the centerline of the road being constructed, and no material variation therefrom will be permitted.
H. Base course shall be substantially true to line and grade as indicated on the drawings. The surface shall be within ½” of required grade. Completed thickness of base course shall be within ½” of indicated thickness, with average thickness not less than that indicated.
I. The top surface of compacted base course shall be finished by blading or rolled with equipment designed for that purpose.
J. Temporary Graded Surface
   1. When allowed by the local jurisdiction having authority, where trenches are excavated in paved traffic lanes, the surface course may be temporarily replaced by a surface consisting of base course material. The base course shall be removed and replaced with pavement as soon as conditions permit, or as required by local jurisdiction having authority.
   2. The surface shall be maintained to provide for a smooth flow of traffic without holes, bumps, etc. until final acceptance of the work.

3.3 DUST AND SURFACE WATER CONTROL
A. Dust control measures shall be implemented by application of water to all work areas, storage areas, haul and access roads, or other areas affected by work.
B. All work shall be in compliance with the Federal, State and local air pollution standards, and not cause a hazard or nuisance to personnel and the public in the vicinity of the work.
C. Provide and operate at least one (1) mobile tank sprinkling unit during the contract period.

D. Other methods of dust control for hail and access roads may include chemical treatment, light bituminous treatment or other method as approved by the Owner.

E. Surface water shall be controlled to the extent that the areas to receive pavement, walks or slabs are not allowed to become wet from runoff from adjacent areas. Surface water shall be directed away from these areas but not directed toward adjacent property, buildings, or any improvement that may be amaged by water. Surface water shall not be allowed to enter sanitary sewers.

3.4 FIELD QUALITY CONTROL

A. Testing and inspection of placed Base Course will be provided by the Owner. Tests provided by the Owner are as follows:

Item	Type	Frequency
Base Course Aggregate Sampling	ASTM D75	Each day or 1 test/ 500 sq. yd., or as required.
Atterberg Limits	ASTM D2419, D423, and D424	As required
Sieve Analysis	ASTM C136	As required
Bearing Ratio	ASTM D1883	As required
Maximum Density	ASTM D1557, Method D	As required
In-place Density	ASTM D2167, D2922 and D3017	As required

B. If tests indicate that sub-base and/or base course do not meet specified requirements, remove defective work, replace and retest at no cost to Owner.

END OF SECTION

SECTION 02740

ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.1 WORK INCLUDED
- A. Proof roll base course to reveal soft and yielding spots.
- B. Place and compact asphaltic concrete paving.
- C. Protection of newly placed pavement.

1.2 RELATED WORK
- A. Section 02721 – Aggregate Base Course
- B. Section 02763 – Pavement Marking

1.3 QUALITY ASSURANCE
- A. Do not place asphaltic concrete paving when the air temperature in the shade and/or the roadbed temperature are below 50° F, or during rain, when the base course surface is wet, or during other adverse weather conditions.
- B. Do not place tack coat when air temperature in the shade and the roadbase temperature are below 50° F, or during rain, fog, or other adverse weather conditions.
- C. All work shall be performed by experienced and qualified workmen with equipment standard with the industry.
- D. Approval by Engineer of sources of supply of materials shall be obtained prior to delivery of materials.
- E. Comply with federal, state and/or local codes and regulations.

1.4 REFERENCES
- A. American Society for Testing Materials (ASTM):
  1. D1557, “Tests for Moisture – Density Relationship of Soils using 10 lb (4.5 kg) Rammer in 18 inch (457 mm) Drop”.
  2. D1559, “Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus”.
  3. D2041, “Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures”.
  4. D2170, “Kinematic Viscosity of Asphalts (Bitumens)”.
- B. THE ASPHALT INSTITUTE (A.I.) Specification Series No. 2 (SS-2).
- C. American Association of State Highway and Transportation Officials (AASHTO):
  1. Materials and compaction tests.
     - a. AASHTO T-180
- D. Utah Department of Transportation, “2005 Standard Specifications For Road and Bridge Construction”.
  1. Section 02741 Hot Mix Asphalt (HMA).

1.5 SUBMITTALS
- A. An asphaltic concrete paving mix design prepared by a certified laboratory and materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements shall be submitted for review and approval at least one week prior to commencement of the work.
- B. Written certification of compliance for pavement marking paint.
- C. Product Data: Submit data for herbicide. Indicate compliance with applicable codes for environmental protection.

1.6 WARRANTY
- A. See General Conditions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Asphaltic cement:

1. Viscosity Graded original, AC-10, conforming to requirements of ASTM D-3381 (AASHTO M-226, Table 2), and Section 02741 – Utah Department of Transportation, "2005 Standard Specifications For Road and Bridge Construction".
2. Shall not foam when heated to 350° F.

B. Mineral Aggregate:

1. Shall consist of crushed stone, crushed gravel, or crushed slag, or a combination thereof; free of clay, silt, organic matter or other deleterious materials.
2. Gradation shall be in accordance with the following:

a. Asphaltic concrete surface course:

Sieve Size	Percent Passing by Weight
1/2"	100
3/8"	70 - 100
#4	50 - 78
#16	30 - 48
#50	18 - 31
#200	7 – 13

b. Asphaltic concrete base course:

Sieve Size	Percent Passing by Weight
3/4"	100
3/8"	75 – 91
#4	60 - 80
#16	28 - 38
#50	11 - 23
#200	5 – 9

3. Course aggregate, retained on the No. 4 sieve shall consist of clean, hard, rough, durable and sound fragments, with not less than 50 percent of particles by weight with at least one mechanically fractured face or clean angular face.
4. Fine aggregate passing the No. 4 sieve may be either a natural or manufactured product. The aggregate shall be clean, hard grained and moderately sharp, and shall contain not more than 2 percent by weight of vegetable matter or other deleterious substances.
5. That portion of the fine aggregate passing the No. 40 sieve be nonplastic when tested in accordance with ASTM D-424.
6. The weight of minus 200 mesh material retained in the aggregate, as determined by the difference in percent passing a No. 200 sieve by washing and dry sieving without washing, shall not exceed 6 percent of the total sample weight. That portion of the fine aggregate passing the No. 200 sieve shall be determined by washing with water in accordance with ASTM C-117.
7. The aggregate shall be of uniform density and quality and shall have a rodded weight of not less than 100 pounds per cubic foot when tested in accordance with ASTM C-29.
8. The aggregate shall have a percentage of wear not exceeding forty when tested in accordance with ASTM C-131 and C-535.
9. The aggregate shall have a weighted loss not exceeding 12 percent by weight when subject to five cycles of sodium sulfate and tested in accordance with ASTM C-88, D-1073, D-692.

2.2 ASPHALTIC CONCRETE PAVING MIXTURE

A. Combine mineral constituents and asphalt cement in proportions per mix design at a central plant to produce an asphaltic concrete pavement mix.
B. Mix design shall be based on the Marshall Method. The combined mineral aggregate plus any approved additives when mixed with the asphaltic cement in accordance with ASTM D-1559 shall conform to the following requirements:

Requirement	Value
Percentage of Wear:	40
Marshall Stability:	1200 lb. Minimum
Flow (0.01 inch):	10 -18
Air Voids:	1.5% to 3.0%
Retained Strength:	60% Minimum
Asphalt Cement Content:	4.0% to 6.0% by weight

C. The asphaltic cement shall be heated at the mixing plant to a temperature at which it can be applied uniformly to the aggregate.
D. Coarse and fine aggregate shall be stored separately at the mixing plant in a manner that will prevent intermingling.
E. When it is necessary to blend aggregates from one or more sources to produce the combined gradation, each source or size of aggregate shall be stockpiled individually. Aggregate from the individual stockpiles shall be fed through separate bins to the cold elevator feeders. They shall not be blended in the stockpile.
F. Cold aggregates shall be fed carefully to the plant so that surpluses and shortages will not occur and cause breaks in the continuous operation.
G. The aggregate shall be dried and heated to provide a paving mixture temperature in conformance with placing conditions, but not to exceed 163°C (325°F).
H. The heated and dried aggregates shall not contain enough moisture to cause the mixture to slump, the asphalt to foam, or the aggregate to segregate during hauling and placing.
I. The shortest mixing time consistent with satisfactory coating of the aggregate shall be used. The mineral aggregate shall be considered satisfactorily coated with asphaltic cement when all of the particles passing the No. 4 sieve and 96 percent of the particles retained on the No. 4 sieve are coated with asphaltic cement. The required mixing time, as determined above, shall be in accordance with ASTM D-2489.
J. If a dryer drum mixing process is used, the mineral aggregate shall be considered satisfactorily coated with asphaltic cement when all of the particles passing the No. 4 sieve and 98 percent of the particle retained on the No. 4 sieve are coated with asphaltic cement. The moisture content of the asphaltic cement sampled behind the laydown machine prior to compaction shall not exceed 1 percent by weight.

2.3 UDOT ASPHALTIC CONCRETE PAVING MIXTURE
A. In accordance with UDOT 2005 standard specification 02741.

2.4 TACK COAT
A. Emulsified asphalt CSS-1H or SS-1H.

2.5 FABRICS – Not required.

PART 3 - EXECUTION

3.1 PREPARATION
A. Clean overlay area in accordance with Section 02230.
B. Install risers for manholes, valves and cleanouts to match finished grade of asphalt surface course.
C. Sawcut all asphalt edges to a clean straight line when patching.

3.2 TRANSPORTING THE ASPHALTIC CONCRETE PAVEMENT
A. Transport time from the mixing plant to the job site shall not exceed 1 hour.
B. Hauling truck shall have no direct frame contact with the paver or bear down on the paver during dumping operations.

3.3 TACK COAT

A. Prior to placing pavement, tack coat shall be applied to the vertical edges of concrete and "cold" pavement (over ½ hour old) which will be in contact with new pavement. Tack coat shall extend 12 inches onto adjacent base course material. The tack coat shall be carefully applied at a rate of 0.15 gal/SY. Tack coat shall be applied uniformly at the same rate to the horizontal top surface of each lift of bituminous pavement prior to placing the next lift of bituminous pavement to promote a bond between the two courses of pavement. None of the material shall penetrate into the pavement and for this reason the application should be limited.

B. Prior to applying the material, the surface to be treated shall be swept or flushed free of dust or other foreign material.

C. Protect all surfaces not required to receive tack coat from any inadvertent application.

D. The temperature range of the tack coat at the time of application shall be such that the viscosity will be between 50 and 100 centistokes as determined in accordance with ASTM Designation D-2170.

E. Under no circumstances shall traffic be permitted to travel over the tacked surface. If detours cannot be provided, restrict operation to a width that will permit at least one-way traffic over the remaining portion of the roadbed. If one-way traffic is provided, the traffic shall be controlled in accordance with governing authority.

F. After application of tack coat, sufficient time shall be given to allow for complete separation of asphalt and water before paving operations begin. The tack coat shall be applied on only as many surfaces as will be paved against in the same day.

3.4 PLACEMENT OF ASPHALTIC CONCRETE PAVEMENT

A. Place asphalt pavement to provide a compacted depth as indicated on the plans. Placing the pavement shall be a continuous operation. The machine shall spread mixture and shall strike a finish that is smooth, true to cross section, uniform in density and texture, and free from hollows and other irregularities. If any irregularities occur, they shall be corrected before final compaction of the mixture. The paving machine shall be selfpropelled, equipped with hoppers, distributing screws, adjustable screeds and equalizing devices, capable of spreading hot asphaltic concrete paving mixture without tearing, shoving or gouging, and of producing a finished surface of specified quality. Place inaccessible and small areas by hand.

B. Ensure asphalt pavement temperature is between 150 and 300 centistokes as determined with ASTM D-2170 when mixing with a pugmill, or between 220°F and 260°F when using the dryer-drum mixing process, immediately after placing and prior to initial rolling.

C. Ensure joints made during paving operations are straight, clean, vertical and free of broken or loose material. Carefully make joints to insure a continuous bond between old and new pavement, or between successive day's work. A continuous bond between adjoining work is required.

D. If more than ½ hour elapses between adjacent paving passes, the "cold joint" shall have tack coat applied to the "cold" pavement prior to placing the adjacent pass.

3.5 COMPACTION

A. Roll and compact to specified density before temperature of the mixture drops below 180°F.

B. Compact asphalt paving course to required density, with a steel wheeled tandem roller steel three-wheeled roller, vibratory roller, or a pneumatic-tired roller, weighing not less than five tons. Start compaction as soon as pavement will bear equipment without checking or undue displacement. Speed of the roller shall be slow enough to avoid displacement of hot mixture, and any displacements occurring as a result of changing the direction of the roller, or from any other cause, shall at once be corrected by the use of rakes and of fresh mixture where required. Ensure each pass of roller overlaps previous passes by at least ½ of the roller width to ensure smooth surface free of roller marks. Keep roller wheels sufficiently moist so as not to pick up material. Rolling shall continue

until roller marks are eliminated and no further compression is possible. The finished compacted pavement shall have a density of 91% minimum, (no test less than 91% of the density determined in accordance with ASTM D-2041), as determined by ASTM D2170.

C. Leave pavement with a uniform, dense surface.

D. Perform hand tamping in areas not accessible to rolling equipment. Thorough compaction must be achieved, and joints between curbs, headers, manholes and similar structures must be effectively sealed.

E. Do not allow vehicular traffic on newly paved areas until surface has cooled to atmospheric temperature.

3.6 PLACEMENT OF UDOT ASPHALTIC CONCRETE PAVEMENT

A. Place pavement in accordance with UDOT Standard Specification 02741.

3.7 SCHEDULE

A. Asphalt type and thickness:

1. Trench Patching – 4 inches minimum, Regular Asphaltic Surface Course
2. Patching on interior of Salt Storage Pond – 4 inches minimum, Zero Voids Surface Course
3. Driveway and parking area – 4 inches, Regular Asphaltic Surface Course

END OF SECTION

SECTION 02763

PAVEMENT MARKING

PART 1 - GENERAL

1.1. SUMMARY
- A. Section Includes:
  - 1. Pavement and curb markings.

1.2 QUALITY ASSURANCE
- A. Regulatory Requirements – Paint handicap spaces to conform to ADA Standards and local code requirements.

1.3. PROJECT/ SITE CONDITIONS
- A. Environmental Requirements
  - 1. Apply only on dry surfaces and during favorable weather, and when damage by rain, fog, or condensation not anticipated.
  - 2. Latex Paint –
    - a. Atmospheric temperature above 50°F.
    - b. When temperature is not anticipated to drop below 50°F during drying period.
  - 3. Alkyd or Chlorinated Rubber Paint.
    - a. Atmospheric temperature above 40°F.
    - b. When temperature is not anticipated to drop below 40°F during drying period.

PART 2 - PRODUCTS

2.1. MATERIAL
- . Paint
  - 1. State of Utah #780.
  - 2. Colors.
    - a. Yellow – Parking stripes, crosswalk stripes, and safety markings.
    - b. Blue & White – Handicapped markings, Staff Parking Areas
    - c. Red – Fire lanes and no parking zones.

PART 3 - EXECUTION

3.1. PREPARATION
- A. Do not apply acrylic latex systems until new paving has cured 7 days minimum. Do not apply alkyd or chlorinated rubber until paving has cured 3 months minimum.
- B. Surfaces shall be dry and free of grease and loose dirt particles. Scrape and wire brush chipped or damaged paint on existing curbs.
- C. Perform layout with chalk or lumber crayon only.

3.2. APPLICATION
- A. Site tolerances
  - 1. General – Make lines parallel, evenly spaced, and with sharply defined edges.
  - 2. Line Widths -
    - a. Plus or minus ¼ inch variance on straight segments.
    - b. Plus or minus ½ inch variance on curved alignments.
- B. Coat with coverage of 103-113 sq ft/gal.
- C. Thickness – Minimum paint thickness 7 mil dry.

3.3. CLEANING

A. Remove drips, overspray, improper markings, and paint material tracked by traffic by sand blasting, wire brushing, or other method approved by Architect prior to performance.

END OF SECTION

SECTION 03053 – CONCRETE WATERPROOFING ADMIXTURE

PART 1 - GENERAL

1.1 DESCRIPTION

A. SECTION INCLUDES:

1. This section specifies an integral concrete waterproofing system of the slab on grade, wall curbs, and stem walls of the facility. This system utilizes a concrete densifier and sealer in an admixture Floor Treatment: A combination of chemicals that produces complete hydration resulting in a denser cement paste that produces an impermeable concrete that is hard non-dusting and safe for portable water.
2. This section includes: Furnishing of all labor, materials, services and equipment necessary for the supply and installation of waterproofing placement as indicated on drawings and as specified. Related Work: Documents affecting work of this Section include, but are not necessarily limited to: General Conditions, Supplementary Conditions, and Sections in Division 1 of these specifications.
3. This section includes: provision of concrete curing, hardening, and sealing and cleaning of concrete surface.

B. RELATED SECTIONS:

1. Section 03300 – Cast In Place Concrete
2. Section 03054 – Oliphobic Sealer
2. Section 07901 - Caulking and Sealants

1.2 QUALITY ASSURANCE:

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts, and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

B. No satisfactory chemical or cleaning procedure is available to remove petroleum stains from the concrete surface. Prevention is therefore essential.

1. All hydraulic powered equipment must be diapered to avoid staining of the concrete.
2. No trade will park vehicles on the inside slab. If necessary to complete their scope of work, drop cloths will be placed under vehicles at all times.
3. No pipe cutting machine will be used on the inside floor slab.
4. Steel will not be placed on interior slab to avoid rust staining.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Section 01300.

B. Product data: Within 35 calendar days after the contractor has received the owner's notice to proceed, submit the following material:

1. Materials list of items proposed to be provided under this section.
2. Manufacturer's specifications, test data and other data required to prove compliance with the specified requirements.
3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation

procedures used on the work.

1.4 PRODUCT HANDLING:

A. Protect the materials of this Section before and after installation. Protect the work and materials of all other trades.

B. In the event of damage, immediately make replacements and repairs to the approval of the Architect and at no additional cost to the owners.

C. Store materials in clean, dry area in accordance with manufacturer's instructions. Keep containers sealed until ready for use. Keep from freezing.

D. Safety – Use approved safety glasses, rubber gloves, coveralls and work boots. Protect animals, vegetation and food items. Refer to the Material Safety Data Sheet (MSDS) for details.

PART 2- PRODUCTS

2.1 HARDENING/SEALING AGENT:

A. Where concrete cure, hardener and sealer is called for on the Drawing or is specified herein, provide one of the products as follows:

1. "Anti-Hydro" or "Anti-Hydro R" Waterproof Concrete
Anti-Hydro International
45 River Road
Flemington, NJ
800-777-1773

Salt Lake City:
Bruce Hutchinson
(801) 518-3770

2. Or, pre-approved equal.

B. Chemical Resistance: The manufacturer shall provide a chemical resistance guide listing test results by independent laboratories.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS:

A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 MIXING:

A. The mix shall consist of Type I/II portland cement, clean, well grated, fine and coarse aggregates designed for maximum strength and denseness with a minimum of 3,000 psi compressive strength. Each cubic yard shall contain a minimum of 5.6 bags of Type I/II portland cement and 1-1/2 gallons of Concrete Waterproofing Admixture shall be added with the mixing water or o the concrete while partially mixed and mixed for a minimum 1

minute per cubic yard. Addition of Concrete Waterproofing Admixture shall be done at the jobsite. Limit quantity of premixed concrete to 6 CY per truck for a front dump mixer as per manufacturer's recommendation

3.3 INSTALLATION:

A. Placing Concrete: All concrete shall be properly vibrated or consolidated and wood spreaders must be removed as the concrete rises in the forms. Whenever possible, concrete shall be placed continuously until the placement is completed. Construction joints shall be keyed with a 2"x4" key. When placing is about to be resumed, the joint shall be thoroughly cleaned and treated with a slush coat composed of 1 part Concrete Waterproof Admixture, 3 parts water and sufficient Type I/II portland cement to form a thick, creamy mixture. Concrete shall be placed before the slush coat dries. Refer to A.C.I. 201 "Guide to Durable Concrete" for recommended concreting practices.

B. Wall Finishing: After the forms are removed, all ties or spreaders shall be cut back on both walls faces to a depth of approximately 1-1/2". Any cracks or honey combed concrete shall be cut back to sound concrete. These areas shall be treated with Concrete Waterproofing Admixture slush coat, then filled with a mortar consisting of 1 part Type I/II portland cement and 2 parts sand, mixed with a solution of 1 part Concrete Waterproofing Admixture to 10 parts water.

C. Addition of Concrete Waterproofing Admixture shall be done at the jobsite. No concrete shall be placed on wet or soggy ground without first laying and compacting a bed of broken stone or gravel of adequate thickness to prevent the mud from mixing with the concrete. A pump of sufficient capacity to keep water below the placement and for a least 24 hours thereafter. The excavated area must be so prepared that the water will easily drain to the pump without washing cement out of the newly placed concrete.

D. If saw cutting is required, as soon as it is completed, the curing compound applied, and the area is clean and dry, apply masking tape over all saw cuts to keep dirt and debris out. Wait 28 days for sufficient vapor reduction and fill all saw cuts with approved crack filler.

E. For greater slump than 4", add Concrete Waterproofing Admixture or approved equal in lieu of additional water.

F. Water Pressure: In dealing with any structure subject to hydrostatic pressure, careful consideration must be given to the design of the members. Thickness and reinforcing must be capable of withstanding maximum potential heads. Possibly flotation should be checked.

G. Placing and Curing Under Adverse Conditions: If concrete slabs are to be placed at temperatures over 80 degrees F, in the direct rays of the sun, or exposed to drying winds, care should be taken to prevent water loss and premature setting of the concrete. "Anti-Hydro R" should be used to maintain a normal concrete set time. Additionally, dampen sub-base, erect wind barriers, finish concrete promptly, and start curing immediately by the use of curing compound, water curing, or sheet materials. Continue curing for a minimum of 14 days.

4.1 WARRANTY:

Upon Completion of the work, as a condition of its acceptance, furnish the owner a written 5 year warranty signed by an officer of the manufacturer.

END OF SECTION

SECTION 03054 – OLIOPHOBIC SEALER

PART 1 - GENERAL

1.1 DESCRIPTION

A. SECTION INCLUDES:

1. This section specifies a topical concrete waterproofing system of the slab on grade, wall curbs, equipment pads of the Maintenance Building and the interior surfaces of the waste oil containment basin. This system utilizes a clear, breathable, high performance silane concrete sealer with an oliophobic additive for protecting new concrete surfaces. This low VOC compliant treatment forms an effective chloride screen that reduces surface erosion and corrosion of rebar and seals out water, chloride ions, and acids thereby reducing staining caused by motor oils and grease.

2. This section includes: Furnishing of all labor, materials, services and equipment necessary for the supply and installation of waterproofing placement as indicated on drawings and as specified. Related Work: Documents affecting work of this Section include, but are not necessarily limited to: General Conditions, Supplementary Conditions, and Sections in Division 1 of these specifications.

3. This section includes: provision of concrete curing, hardening, and sealing and cleaning of concrete surface.

B. RELATED SECTIONS:

1. Section 03300 – Cast In Place Concrete
2. Section 03053 – Concrete Waterproofing Admixture
3. Section 07901 - Caulking and Sealants

1.2 QUALITY ASSURANCE:

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts, and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

B. No satisfactory chemical or cleaning procedure is available to remove petroleum stains from the concrete surface. Prevention is therefore essential.

1. All hydraulic powered equipment must be diapered to avoid staining of the concrete.
2. No trade will park vehicles on the inside slab. If necessary to complete their scope of work, drop cloths will be placed under vehicles at all times.
3. No pipe cutting machine will be used on the inside floor slab.
4. Steel will not be placed on interior slab to avoid rust staining.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Section 01300.

B. Product data: Within 35 calendar days after the contractor has received the owner's notice to proceed, submit the following material:

1. Materials list of items proposed to be provided under this section.
2. Manufacturer's specifications, test data and other data required to prove compliance with the specified requirements.
3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation

procedures used on the work.

1.4 PRODUCT HANDLING:

A. Protect the materials of this Section before and after installation. Protect the work and materials of all other trades.

B. In the event of damage, immediately make replacements and repairs to the approval of the Architect and at no additional cost to the owners.

C. Store materials in clean, dry area in accordance with manufacturer's instructions. Keep containers sealed until ready for use. Keep from freezing.

PART 2- PRODUCTS

2.1 HARDENING/SEALING AGENT:

A. Where concrete hardener and sealer is called for on the Drawing or is specified herein, provide one of the products as follows:

1. Hydrozo 100 Plus
Degussa Building Systems
889 Valley Park Drive
Shakopee, MN 55379
(800) 433-9517

2. Stand Off SLX 100
Prosoco, Inc.
3741 Greenway Circle,
Lawrence, KS 66046
(800) 255-4255
FX (785) 830-9797

B. Or, pre-approved equal.

C. Chemical Resistance: The manufacturer shall provide a chemical resistance guide listing test results by independent laboratories.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS:

A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION:

A. Prepare the surface in strict accordance with the manufacturers recommendations as approved by the architect.

B. Cure concrete in accordance with manufacturer's instructions and as specified in Section 03300.

3.3 APPLICATION:

A. Test a small area of the surface at least 4' by 4' square on a representative area of concrete slab and stem wall. Allow 5 – 7 days for the product to fully react before evaluating for the desired results and coverage rates. Keep test area available for evaluation throughout the sealing project.

B. Application should be made once the concrete has achieved 3000 psi strength, and in accordance with manufacturer's instructions (typically within 14-28 days). This will help prevent temperature and hairline cracking.

C. Clean all surfaces of all sand, surface dust, and dirt, oil, grease, chemical films or coatings, and other contaminants prior to application. Use waterblast, sandblast, or shotblast as necessary to achieve a clean surface condition.

D. Crack control, caulking, patching, and expansion joint sealants should be installed prior to application of the sealer. Paint any line stripping prior to the application of product. Allow adequate curing time following sealant manufacturer's recommendations.

E. Application shall be made according to manufacturer's recommendations. Apply in a single, saturating application. Brush and/or broom drips and heavy runs thoroughly into the surface. All concrete surfaces shall be kept wet as required for complete coverage and penetration of product.

F. Achieve waterproofing without changing the natural appearance of the material, except for a latent waxy sheen on smooth troweled surfaces.

G. Do not dilute sealer.

H. Do not apply sealer if air temperature is expected to be above 90 degrees F or below 40 degrees F at the time of or within 24 hours after application or when rain is expected within 4 hours of application. Avoid application on hot, windy days.

I. Apply at least two applications of sealer. Apply the second coat within a few minutes after the first coat has penetrated and appears dry. Determine if additional applications of concrete sealer are necessary by testing surfaces in accordance with manufacturer's instructions.

J. Protect surfaces from traffic until sealer has cured.

4.1 WARRANTY:

Upon Completion of the work, as a condition of its acceptance, furnish the owner a written warranty signed by an officer of the manufacturer.

END OF SECTION

SECTION 03055 – CONCRETE WATERPROOFING SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. SECTION INCLUDES:

1. This section specifies an integral concrete waterproofing system of the concrete work on the Salt Building Add Alternate #1 only. All of the remaining project concrete will utilize Concrete Waterproofing Admixture Section 03053.
2. This section includes: Furnishing of all labor, materials, services and equipment necessary for the supply and installation of cementitious crystalline waterproofing mixed in concrete prior to placement as indicated on drawings and/or as specified.
3. This section includes crystalline waterproofing treatment of construction joints between successive concrete pours.
4. This section includes: Cleaning of concrete surface.

1.02 RELATED SECTIONS:

A. Section 03300 – Cast In Place Concrete

B. Section 03053 – Concrete Waterproofing Admixture

C. Section 03054 – Oliophobic Sealer

D. Section 07901 – Caulking and Sealants

1.03 SYSTEM DESCRIPTION

A. The complete systems include Cementitious Crystalline Waterproofing a blend of Portland cement, fine treated silica sand and active proprietary chemicals. When mixed with water and applied as an integral admixture, the active chemicals cause a catalytic reaction which generates a non-soluble crystalline formation of dendritic fibers within the pores and capillary tracts of concrete. This process causes concrete to become permanently sealed against the penetration of liquids from any direction in conjunction with the crystalline waterproofing treatment of construction joints between successive concrete pours. In addition, the completed systems shall be warranted for five (5) years as a total and complete system.

1.04 REFERENCES

A. ACI 305R - Hot Weather Concreting; 1999.

B. ACI 306R - Cold Weather Concreting; 1988.

C. ACI 308 - Standard Practice for Curing Concrete; 1992 (Re-approved 1997).

D. ASTM C 39/C 39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 1999.

E. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 1998a.

F. ASTM C 666 - Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing; 1997.

G. ASTM E 329 - Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction; 1998a.

H. COE CRD-C 48 - Standard Test Method for Water Permeability of Concrete; 1992.

I. NSF 61 - Drinking Water System Components - Health Effects; 2000a.

1.05 SUBMITTALS

A. Submittals shall comply with the General Conditions and Division-1 Specification Sections. Submit the following:

1. Submit under provisions of Section 01300.

2. Product Data: Manufacturer's printed data sheet, for specified products.

3. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

   i. Testing Agency: Independent laboratory meeting the requirements of ASTM E329 and certified by the United States Bureau of Standards, Army Corp of Engineers, and American Concrete Institute.

4. Certificates: Product certificates notarized by manufacturer certifying that:

   i. Materials comply with specified performance characteristics and physical requirements.

   ii. Installer is qualified and approved by manufacturer.

5. Manufacturer's installation instructions.

1.06 QUALITY ASSURANCE

A. MANUFACTURER QUALIFICATIONS: Minimum 10 years experience manufacturing and having at least 10 finished installations of crystalline waterproofing of the type and approximate project scope or greater specified.

B. CONCRETE BATCH OPERATOR QUALIFICATIONS: Certified by Manufacturer for mixing and use of Crystalline Waterproofing Admixture Products.

C. PRE-INSTALLATION MEETING: Prior to installation, conduct a meeting with the General Contractor, owner's representative, Architect, concrete installer, installers of adjacent work and work penetrating concrete, and admixture waterproofing manufacturer's representative to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements; notify the Owner and Architect at least one week in advance of meeting.

D. APPLICATOR: Waterproofing applicator shall be experienced in the installation of cementitious crystalline waterproofing materials as demonstrated by at least 10 previous successful installations, and shall be approved by the manufacturer in writing.

E. TECHNICAL CONSULTATION: Provide minimum of 1 person who shall be present during execution of Work, who shall be thoroughly experienced in installation of specified

materials, and who shall direct Work performed under this section. The waterproofing manufacturer's representative shall provide technical consultation on waterproofing application.

F. INSTALLER CERTIFICATION: Upon completion of application of waterproofing, submit certification that specified materials were applied in accordance with approved manufacturer's recommended procedures.

1.07 DELIVERY, STORAGE AND HANDLING

A. DELIVERY: Deliver packaged waterproofing materials to project site in original undamaged containers, with manufacturer's name, labels, product identification and seals intact.

B. STORAGE: Store all material in a secure, dry and temperature controlled area on pallets maintaining temperatures as recommended by the manufacturer's until installed.

C. HANDLING: A sufficient quantity of all materials including but not limited to waterproofing and construction joint products shall be stored on site or be readily available prior to starting the work to insure that the work will be continuous from start to completion without delay due to material shortage or unavailability.

1.08 WARRANTY

A. MANUFACTURER'S WARRANTY: Manufacturer's Warranty: Provide manufacturer's standard warranty document executed by authorized company official; warranty period: minimum Ten (10) years, commencing on Date of Substantial Completion.

B. APPLICATOR'S WARRANTIES: Applicator shall warrant the waterproofing and construction joint system(s) against defects caused by faulty workmanship or materials for a period of Five (5) years from Date of Substantial Completion. The warranty will cover the surfaces treated and will bind the applicator to repair, at his expense, any and all leaks through the treated surfaces which are not due to structural weaknesses or other causes beyond applicator's control such as fire, earthquake, tornado and hurricane.

PART 2 - PRODUCTS

2.01 MANUFACTURERS/ MATERIALS

A. The following candidate manufacturers are capable of producing equipment and/or products that will satisfy the requirements of this Section. This statement, however, shall not be construed as an endorsement of a particular manufacturer's product, nor shall it be construed that a named manufacturer's standard product will comply with the requirements of this Section. Candidate manufacturers include, listed below.

1. ACCEPTABLE MANUFACTURERS:
   Xypex Chemical Corporation
   13731 Mayfield Place
   Richmond, B.C., Canada
   V6V 2G9
   Tel: 800-961-4477 or 604-273-5265
   Fax: 604-270-0451

2. Or, pre-approved equal.

3. Obtain all waterproofing products from a single source.

2.02 PRODUCTS:

A. Waterproofing Admixture: Xypex Admix C-500, C-1000 or C-2000; compound of Portland cement, fine treated silica sand and active chemicals; provide product and mix ratio of at least 2% Xypex with up to 15% fly ash that produce concrete that complies with specified requirements in Section 03300 and the following:

1. Chemically Resistant for pH Levels of 3 to 11 constant contact and pH Levels of 2 to 12 periodic contact per ASTM C267-77, ASTM C672-76.

2. Potable Water Approved per National Safety Foundation (ANSI/NSF) 61.

3. Freeze-Thaw and De-icing Chemical Resistance per ASTM C672-76.

4. Radiation Resistance per USANI N69-1967

5. Crack Sealing ability for re-sealing cracks up to .04 mm (1/64”) per ASTM C856-88.

6. Withstand 175 PSI water pressure penetration test per U.S. Army Corps of Engineers CRD-C-48-73.

7. Concrete Admixture shall not decrease the compressive strength of the concrete mix design (28 day compressive strength test), ASTM C 39/C 39M.

2.03 MIXES

A. GENERAL: Mix waterproofing material by volume with clean water which is free from salt and deleterious materials. Mix waterproofing material in quantities that can be applied within 20 to 30 minutes from time of mixing. As mixture thickens, stir frequently, but do not add additional water. Do not mix bonding agents or admixtures with crystalline waterproofing materials.

PART 3 - EXECUTION

3.01 CONCRETE MIXING AND PLACING

A. Comply with requirements of Section 03300.

B. Add waterproofing admixture at time of batching and blend thoroughly, following manufacturer's instructions.

C. Hot weather comply with ACI 305R; Cold weather comply with ACI 306R.

D. Moist cure concrete in accordance with ACI 308; if moist curing is not possible, use Xypex Gamma Cure curing compound complying with ASTM C 309.

E. Consult Manufacturer for mixing instructions, set times and retardation applications.

3.02 CONSTRUCTION JOINTS

A. Comply with manufacturer's instructions, including product data, technical bulletins, catalog installation instructions, and product packaging labels.

B. Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions,

C. Mix materials in accordance with manufacturer's instructions.

D. Wet cold joint surface and saturate with clean water to enhance the crystalline formation process within concrete; remove excess surface water before application of slurry coat.

E. Apply slurry coat if needed uniformly with semi-stiff bristle brush or spray under conditions and application rate recommended by manufacturer.

F. Place subsequent pour while slurry coat is still green, but after reaching initial set.

3.03 FIELD QUALITY CONTROL

A. Do not cover admixture treated concrete with other construction until it has been observed by Manufacturer's field representative and Architect/Engineer.

B. After removal of forms, repair honeycombing, rock pockets, tie holes, faulty construction joints, cold joints, and cracks using waterproofing admixture Manufacturer's products and recommended procedures.

C. MANUFACTURER'S FIELD SERVICES: Provide Manufacturer's field service consisting of product use recommendations and periodic site visits for inspection of concrete batching and product installation in accordance with Manufacturer's and Engineer’s instructions.

D. FLOOD TESTING:

1. Plug or dam drains and fill area with water to a depth of two inches (50 mm) or to within 0.5 inch (12.5 mm) of top of waterproofing treatment.
2. Let water stand for 24 hours.
3. If leaks are discovered, make repairs and repeat test until no leaks are observed.

3.04 CLEANING AND PROTECTION

A. Protect installed concrete from damage during construction.

B. Do not apply paint or other coatings for at least 21 days; before applying coatings neutralize waterproofed surface as recommended by waterproofing manufacturer.

C. CLEANING: Clean spillage and soiling from adjacent surfaces using appropriate cleaning agents and procedures.

D. PROTECTION: Take measures to protect completed treated concrete from damage after application.

END OF SECTION 03055

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related Work Specified Elsewhere:
1. 03053 Concrete Waterproofing Admixture.
2. 03054 Oliophobic Topical Concrete Sealer

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.

B. Cast-in-place concrete includes but is not limited to the following:

1. Foundations and footings.
2. Slabs-on-grade.
3. Stem walls.
4. Equipment pads and bases.
5. Suspended slabs.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.

B. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, joint systems, curing compounds, and others if requested by Architect.

1. Letter from concrete supplier, certifying type of cement to be used in concrete mix.

C. Shop drawings for reinforcement detailing fabricating, bending, and placing concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, bent bar diagrams, and arrangement of concrete reinforcement. Include special reinforcing required for openings through concrete structures.

D. Samples of materials as requested by Architect, including names, sources, and descriptions, as follows:

1. Waterstops

E. Laboratory test reports for concrete materials and mix design test.

F. Material certificates in lieu of material laboratory test reports when permitted by Architect. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. International Building Code, Chapter 19.
2. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
3. ACI 318, "Building Code Requirements for Reinforced Concrete."
4. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."

B. Concrete Testing Service: Provide a qualified testing agency , acceptable to Architect, to provide pre-construction testing and material evaluation tests.

C. Materials and installed work may require testing and retesting at any time during progress of Work. Retesting of rejected materials for installed Work, shall be done at Contractor's expense.

D. Special Inspection: Owner will provide special inspection services for concrete work as required by Contract Documents.

1. General: Contractor to coordinate work with the special inspection requirements of this section, the latest edition in practice of the International Building Code, Chapter 17, and specific requirements of the Owner.

1.5 WARRANTY

A. Provide two year written guarantee to the End User, in form approved by the Architect to promptly remove and/or repair defective concrete (cracking, spalling, pitting or honeycombing) as directed by Architect and at Contractor's expense. New replacement work shall carry a similar new two year written guarantee. Guarantee shall start from Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.

1. Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete Form," Class I.

B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 mg/l volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

D. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than 1-1/2 inches to the plane of the exposed concrete surface.

1. Provide ties that, when removed, will leave holes not larger than 1 inch in diameter in the concrete surface.

E. Chamfer exterior corners and edges of permanently exposed concrete 3/4” by 3/4”.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Epoxy-Coated Reinforcing Bars: ASTM A 615, Grade 60, deformed bars, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.

C. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI specifications.

1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

2.3 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I/II.

1. Use one brand of cement throughout Project unless otherwise acceptable to Architect.

B. Fly Ash: Conform to ASTM C 618 Class C or F

C. Normal-Weight Aggregates: ASTM C 33 and as specified. Provide aggregates from a single source for exposed concrete.

1. For exposed exterior surfaces, do not use fine or coarse aggregates that contain substances that cause spalling.

D. Water: Potable.

E. Admixtures, General: Provide concrete admixtures that contain not more than 0.1 percent chloride ions.

F. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
   a. Air-Mix or Perma-Air, Euclid Chemical Co.
   b. Darex AEA or Daravair, W.R. Grace & Co.
   c. MB-VR or Micro-Air, Master Builders, Inc.
   d. Sika AER, Sika Corp.

G. Water-Reducing Admixture: ASTM C 494, Type A.

H. Water-Reducing, Accelerating Admixture: ASTM C 494, Type E.

I. Water-Reducing, Retarding Admixture: ASTM C 494, Type D.

2.4 RELATED MATERIALS

A. Sand Cushion: Clean, manufactured or natural sand.

B. Bonding Agent: Polyvinyl acetate or acrylic base.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
   a. Polyvinyl Acetate (Interior Only):
      1) Euco Weld, Euclid Chemical Co.
      2) Everweld, L&M Construction Chemicals, Inc.
      3) Ready Bond, Symons Corp.

   b. Acrylic or Styrene Butadiene:
      1) SBR Latex, Euclid Chemical Co.
      2) Daraweld C, W.R. Grace & Co.
      3) Everbond, L&M Construction Chemicals, Inc.
      4) Acryl-Set, Master Builders Inc.

C. Epoxy Adhesive: ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material type, grade, and class to suit Project requirements.
1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
   a. Euco Epoxy System #452 or #620, Euclid Chemical Co.
   b. Concresive Standard Liquid, Master Builders, Inc.
   c. Sikadur 32 Hi-Mod, Sika Corp.

D. Dress Coat: Second coat of water-based acrylic membrane curing compound, same product used for curing; see para. C. above.

2.5 PROPORTIONING AND DESIGNING MIXES

A. Prepare design mixes for each type and strength of concrete by laboratory trial batch. For the trial batch method, use an independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

1. Do not use the same testing agency for field quality control testing.

B. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of Work. Do not begin concrete production until proposed mix designs have been reviewed by Architect. Allow 14 days for review response.

C. Design mixes to provide normal weight concrete with the following properties as indicated on drawings and schedules:

1. Footings, 3,000-psi, 28-day compressive strength (minimum 5 bag mix); water-cement ratio: 0.53 maximum.
2. Foundations, 3,000-psi, 28-day compressive strength (minimum 5.6 bag mix); water-cement ratio: 0.53 maximum.
3. Salt storage building footing and foundations: 4,000-psi, 28-day compressive strength (minimum 6 bag mix); water-cement ratio: 0.50 maximum.

4. Slabs-on-grade and all other concrete: 4,000-psi, 28-day compressive strength (minimum 6 bag mix); water-cement ratio: 0.45 maximum.
5. Fly Ash Conform to ASTM C 618 Class C or F
6. For air-entrainment requirements see paragraph 2.6.C.

D. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as described below. Modification of slump limits shall not be made without prior approval from the Engineer.

1. Slabs: Not more than 4 inches.
2. Reinforced foundation systems: Not less than 2 inch and not more than 4 inches.

E. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted and accepted by Architect before using in Work.

2.6 ADMIXTURES

A. Use water-reducing admixture in concrete, as required, for placement and workability.

B. Use accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg F (10 deg C).

C. Use air-entraining admixture in exterior exposed concrete including foundation stem walls, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content of 6-1/2 percent plus or minus 1-1/2 percent.

D. Use admixtures for water reduction and set accelerating or retarding in strict compliance with manufacturer's directions.

2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements of ASTM C 94, and as specified.

1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 GENERAL

A. Coordinate the installation of joint materials, vapor barrier, and other related materials with placement of forms and reinforcing steel.

3.2 FORMS

A. General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347 limits:

1. Provide Class A tolerances for concrete surfaces exposed to view.
2. Provide Class C tolerances for other concrete surfaces.

B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the Work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.

C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal.

D. Provide temporary openings for clean-outs and inspections where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and set tightly to forms to prevent losing concrete mortar. Locate temporary openings in forms at inconspicuous locations.

E. Chamfer all exposed corners and edges unless noted otherwise, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

F. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

G. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

3.3 PLACING REINFORCEMENT

A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as specified.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Architect.

D. Place reinforcement to maintain minimum coverages as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

3.4 JOINTS

A. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to Architect.

B. Isolation Joints in Slabs-on-Grade: Construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Joint fillers and sealants are specified in Division 7 Section "Joint Sealants."

C. Shrinkage (Control) Joints in Slabs-on-Grade: Construct contraction joints in slabs-on-grade to form panels of patterns as shown on drawings. Depth and width of saw cut per details on drawings.

1. Contraction joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.
2. If joint pattern is not shown, provide joints not exceeding 15 feet in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third bays).
3. Joint fillers and sealants are specified in Division 7 Section "Joint Sealants."

3.5 INSTALLING EMBEDDED ITEMS

A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.

B. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

3.6 PREPARING FORM SURFACES

A. General: Coat contact surfaces of forms with an approved, non-residual, low-VOC, form-coating compound before placing reinforcement.

B. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.

1. Coat steel forms with a non-staining, rust-preventative material. Rust-stained steel formwork is not acceptable.

3.7 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.

D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than 24

inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.

E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.

1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
2. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
3. Maintain reinforcing in proper position on chairs during concrete placement.

F. Cold-Weather Placement: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

G. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.

1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

H. Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified. Concrete should not be placed when temperature is above 95□F unless approved by the Architect.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Architect.

I. Notify Architect/Engineer minimum 24 hours prior to commencement of operations.

3.8 FINISHING FORMED SURFACES

A. Rough-Formed Finish: Provide a rough-formed finish on formed concrete surfaces not exposed to view in the finished Work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.

B. Smooth-Formed Finish: Provide a smooth-formed architectural finish on formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or another similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas per Section 3.15 with fins and other projections completely removed and smoothed and voids repaired when forms are removed. Refer to drawings for tie pattern and placement.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.9 MONOLITHIC SLAB FINISHES

A. Scratch Finish: Apply scratch finish to monolithic slab surfaces to receive concrete floor topping or mortar setting beds for tile, and other bonded applied cementitious finish flooring material, and where indicated.

1. After placing slabs, finish surface to tolerances of F(F) 15 (floor flatness) and F(L) 13 (floor levelness) measured according to ASTM E 1155. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.

2. Do not apply curing compounds to surfaces which receive tile finishes or in any way interfere with concrete performance.

B. Trowel Finish: Apply a trowel finish to monolithic slab surfaces exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or another thin film-finish coating system.

1. After floating, begin first trowel-finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerances of F(F) 20 (floor flatness) and F(L) 17 (floor levelness) measured according to ASTM E 1155. Grind smooth any surface defects that would telegraph through applied floor covering system.

C. Non-slip Broom Finish: Apply a non-slip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete Work.

3.11 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete slabs from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.

B. Start initial slab curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.

C. Curing Methods: Wet cure all unformed concrete surfaces. Curing compound may be used only where its use will not adversely affect the application of hardners/sealers or finish floor covering, as approved by the Architect by submittal documenting compatibility prior to the application of the curing compound.

D. Provide moisture curing by the following methods:

1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.

2. Apply curing compound on exposed interior slabs and on exterior slabs, walks, and curbs as follows:

   a. Apply curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
   b. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete. Fugitive dye required in all curing compounds.

E. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces by leaving forms in place for the full curing period. Forms may be removed, but continue curing by an approved moisture curing method.

3.12 REMOVING FORMS

A. General: Formwork not supporting weight of concrete, such as sides of beams, walls,

columns, and similar parts of the work, may be removed after maintaining not less than 50 deg F (10 deg C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing operations are started and protection operations are maintained.

3.13 REUSING FORMS

A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use patched forms for exposed concrete surfaces except as acceptable to Architect.

3.14 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms to satisfaction of Architect.

B. Mix dry-pack mortar, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.

1. Cut out honeycombs, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.

2. For surfaces exposed to view, blend white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

C. Repairing Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or precast cement cone plugs secured in place with bonding agent.

1. Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.

1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other

objectionable conditions.

2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
3. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter and areas retaining more than 1/8" deep liquid to nearest designated joint, by cutting out and replacing with new concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

E. Repair isolated random cracks and single holes 1 inch or less in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Place dry-pack before bonding agent has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

F. Perform structural repairs with prior approval of Architect for method and procedure, using specified epoxy adhesive and mortar.

G. Repair methods not specified above may be used, subject to acceptance of Architect.

3.15 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. General: Owner to provide a testing agency to perform material tests, special inspections and to submit test reports. Contractor to coordinate with testing agency for sequence of work and inform testing agency when work is ready for testing and inspections.

B. Sampling and testing for quality control during concrete placement to include the following:

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

   a. Slump: ASTM C 143; one test at point of discharge for each 20 cu. yd. of each type of concrete; additional tests when concrete consistency seems to have changed.
   b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each 20 cu. yd. of each type of air-entrained concrete.
   c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below, when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
   d. Compression Test Specimen: ASTM C 31; one set of three standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
   e. Compressive-Strength Tests: ASTM C 39; one set of three cylinders for each 20 cu. yd. of each concrete class placed in any one day; one specimen tested at 7 days, one specimen tested at 28 days, and one specimen retained in reserve for later testing if required.

C. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured

cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

1. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.

D. Test results will be reported in writing to Owner, Architect, Structural Engineer, ready-mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

F. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed (see 1.4.C).

END OF SECTION 03300

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SUMMARY

A. Extent of structural steel work is shown on drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.

B. Related Sections:
1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
2. Miscellaneous Metal Fabrications are specified elsewhere in Division 5.

C. Definitions: Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown on drawings.

1.2 SUBMITTALS

A. Product Data: Submit producer's or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
1. High-strength bolts (each type), including nuts and washers.
2. Structural steel primer paint.
3. Shrinkage-resistant grout.

B. Shop Drawings: Submit shop drawings, including complete details and schedules for fabrication and assembly of structural steel members, procedures and diagrams.
1. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS A2.1 and A2.4 symbols, and show size, length, and type of each weld.
a. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of others sections.

C. Test Reports: Submit copies of reports of tests conducted on shop and field bolted and welded connections. Include data on type(s) of tests conducted and test results.

D. Surveys: Submit certified copies of each survey conducted by a registered professional engineer, showing elevations and locations of base plates and anchor bolts to receive structural steel, and final elevations and locations for major members. Indicate discrepancies between actual installation and contract documents.

1.3 QUALITY ASSURANCE

A. Source Quality Control: Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
1. Promptly remove and replace materials or fabricated components which do not comply.

B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.

1. Fabricator must participate in the AISC Quality Certification Program and be designated an AISC-Certified Plant as follows:
   a. Category: Category Cbd, complex steel building structures.
2. Fabricators without AISC Certification shall provide special inspectors and conduct special inspections as required by Authorities having jurisdication.
3. Other Certifications, other than AISC, may be acceptable but must be submitted and approved by Authorities having jurisdication prior to fabrication of any steel.

C. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.

D. Promptly notify Architect whenever design of members and connections for any portion of structure are not clearly indicated.

E. Codes and Standards:
1. Comply with provisions of following, except as otherwise indicated:
   a. AISC "Code of Standard Practice for Steel Buildings and Bridges", AISC "Code of Standard Practice for Steel Buildings and Bridges", excluding the following: Section 1.5.1, Section 3.3 (first sentence and last sentence), Section 3.4, Section 4.2, Section 4.2.1, Section 4.2.2, Section 6.3.2, Section 7.5.4, and Section 7.11.5.
2. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings", including "Commentary" and Supplements thereto as issued.
3. AISC "Specifications for Architecturally Exposed Structural Steel".
4. AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
5. American Welding Society (AWS) D1.1 "Structural Welding Code - Steel".
6. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".

F. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".
1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests within the last 12 months.
2. If recertification of welders is required, retesting will be Contractor's responsibility.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.
1. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not to delay work.

B. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
1. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Approved Manufacturers: Subject to compliance with requirements, provide one of the following:
1. Non-shrink Non-metallic Grout.
a. Euco N.S.; Euclid Chemical Co.
b. Masterflow 713; Master Builders
c. Five Star Grout; U.S. Grout Corp.

2.2 MATERIALS

A. Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.

B. Wide Flange Structural Steel Shapes: ASTM A 572, Grade 50 enhanced.
1. Other Structural Steel Shapes, Plates and Bars: ASTM A 36.

C. Cold-Formed Steel Tubing: ASTM A 500, Grade B.

D. Hot-Formed Steel Tubing: ASTM A 501.
1. Steel Pipe: ASTM A 53, Type E or S, Grade B; or ASTM A 501.
a. Finish: Black, except where indicated to be galvanized.

E. Steel Castings: ASTM A 27, Grade 65-35, medium-strength carbon steel.

F. Anchor Bolts: ASTM A 307, headed type unless otherwise indicated.

G. Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular low-carbon steel bolts and nuts.
1. Provide hexagonal heads and nuts for all connections.
2. Provide either hexagonal or square, heads and nuts, except use only hexagonal units for exposed connections.

H. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:
1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A 325.
2. Direct tension indicator washers may be used at Contractor's option.

I. Electrodes for Welding: Comply with AWS Code.

J. Structural Steel Primer Paint: SSPC - Paint 13.

K. Cement Grout: Portland cement (ASTM C 150, Type I or Type III) and clean, uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum water required for placement and hydration.

L. Non-metallic Shrinkage-Resistant Grout: Pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CE-CRD-C621.

2.3 FABRICATION

A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.
   1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
   2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

B. Connections: Weld or bolt shop connections, as indicated.
   1. Bolt field connections, except where welded connections or other connections are indicated.
   2. Provide high-strength threaded fasteners for principal bolted connections, except where unfinished bolts are indicated.
   3. Provide unfinished threaded fasteners for only bolted connections of secondary framing members to primary members (including purlins, girts, and other framing members taking only nominal stresses) and for temporary bracing to facilitate erection.

C. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" (RCRBSJ).

D. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.
   1. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.

E. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Where possible shop weld shear connectors, spaced as shown, to beams and girders in composite construction. Use automatic end welding of headed stud shear connectors in accordance with manufacturer's printed instructions.

2.4 SHOP PAINTING

A. General: Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on exposed portions and initial 2" of embedded areas only.

B. Do not paint surfaces which are to be welded or high-strength bolted with friction-type connections.

C. Apply 2 coats of paint to surfaces which are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

D. Surface Preparation: After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:
   1. SP-1 "Solvent Cleaning".
   2. At all exposed exterior steel and exposed interior steel prepare surface in accordance with commercial blast cleaning SSPC-SP6 with median surface profile of 1.5 to 2.0 mils.

E. Painting: Provide a one-coat shop applied paint system complying with Steel Structures Painting Council (SSPC)-Paint System Guide No. 7.00. Refer to Section 09900, Painting, for specific primer required on identified steel items.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surveys: Employ a registered professional engineer or land surveyor for accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Architect. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been agreed upon with Architect.

3.2 ERECTION

A. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds. Do not shore cambered steel beams unless otherwise indicated on drawings.
   1. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.

B. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
   1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.

C. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout. Install high strength washers under nuts at all anchor bolts.

D. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
   1. Comply with manufacturer's instructions.

E. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure within specified AISC tolerances.
   2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
   3. Splice members only where indicated and accepted on shop drawings.

F. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.

G. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
   1. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

H. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members which are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.

I. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to areas using same material as used for shop painting.
   1. Apply by brush or spray to provide minimum dry film thickness of 1.5 mils.

3.3 QUALITY CONTROL

A. Testing Agency: Owner will employ and pay a qualified independent testing agency to perform field quality-control testing services specified in this section.

B. Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.

C. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.

D. Testing agency may inspect structural steel at plant before shipment; however, Architect reserves right, at any time before final acceptance, to reject material not complying with specified requirements.

E. Correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

F. Shop Bolted Connections: Inspect or test in accordance with AISC specifications.

G. Shop Welding: Inspect and test during fabrication of structural steel assemblies, as follows:
   1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
   2. Perform visual inspection of all welds.
   3. Perform tests of welds as follows. Inspection procedures listed are to be used at Contractor's option.
      a. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T".
      b. Ultrasonic Inspection: ASTM E 164.
   4. Inspection of shop welding is not required if the fabricator complies with Section 1704.2.2 of the 2003 IBC.

H. Field Bolted Connections: Inspect in accordance with 2003 IBC Section 1704.3.3.

I. Field Welding: Inspect and test during erection of structural steel as follows:
   1. Comply with 2003 IBC Section 1704.3 and Table 1704.3.

2. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
3. Perform visual inspection of all welds.
4. Perform tests of welds as follows:
   a. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T".
   b. Ultrasonic Inspection: ASTM E 164.

3.4 CLEANUP

A. Refer to Section 01700.

END OF SECTION 05120

SECTION 05310 - STEEL DECK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Noncomposite form deck.

B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for concrete fill.
2. Division 5 Section "Structural Steel" for shop- and field-welded shear connectors.
3. Division 5 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
4. Division 9 painting Sections for repair painting of primed deck.
5. Division 16 Section "Underfloor Raceways" for preset inserts, activation kits, afterset inserts, service fittings, header ducts, and trench header ducts used with cellular floor-deck systems.

1.3 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

C. Product Certificates: For each type of steel deck, signed by product manufacturer.

D. Welding certificates.

E. Field quality-control test and inspection reports.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Power-actuated mechanical fasteners.

G. Research/Evaluation Reports: For steel deck.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.

B. Source Limitations for Electrified Cellular Floor Deck: Obtain cellular floor-deck units and compatible electrical components, such as preset inserts, activation kits, afterset inserts, service fittings, header ducts, and trench header ducts, from same manufacturer.

C. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

D. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations of applicable testing and inspecting agency.
2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.

E. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

F. Electrical Raceway Units: Provide UL-labeled cellular floor-deck units complying with UL 209 and listed in UL's "Electrical Construction Equipment Directory" for use with standard header ducts and outlets for electrical distribution systems.

G. FMG Listing: Provide steel roof deck evaluated by FMG and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - 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:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Deck:

    a. ASC Profiles, Inc.
    b. Canam Steel Corp.;The Canam Manac Group.
    c. Consolidated Systems, Inc.
    d. DACS, Inc.
    e. D-Mac Industries Inc.
    f. Epic Metals Corporation.
    g. Marlyn Steel Decks, Inc.
    h. New Millennium Building Systems, LLC.
    i. Nucor Corp.; Vulcraft Division.
    j. Roof Deck, Inc.
    k. United Steel Deck, Inc.
    l. Valley Joist; Division of EBSCO Industries, Inc.
    m. Verco Manufacturing Co.
    n. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

2.2 NONCOMPOSITE FORM DECK

A. Noncomposite Steel Form Deck: Fabricate ribbed-steel sheet noncomposite form-deck panels to comply with "SDI Specifications and Commentary for Noncomposite Steel Form Deck," in SDI Publication No. 30, with the minimum section properties indicated, and with the following:

1. Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33minimum.
    a. Painted Primed with top and underside surface shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
        1) Color: Manufacturer's standard

    b. Galvanized

2. Profile Depth: As indicated.
3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: As indicated.
5. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.3 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile indicated.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

I. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch- wide flanges and sloped recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.

J. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

K. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members as indicated.

B. Side-Lap and Perimeter Edge Fastening as indicated.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing as indicated, with end joints as follows:

1. End Joints: Lapped as indicated.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

F. Install piercing hanger tabs at 14 inches apart in both directions, within 9 inches of walls at ends, and not more than 12 inches from walls at sides, unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Division 9.

C. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Division 9.

D. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05310

SECTION 05400 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Interior load-bearing wall framing.
   2. Exterior non-load-bearing wall framing.
   3. Floor joist framing.
   4. Roof trusses.
   5. Roof rafter framing.
   6. Ceiling joist framing.

B. Related Sections include the following:

   1. Division 5 Section "Metal Fabrications" for masonry shelf angles and connections.
   2. Division 9 Section "Gypsum Board Assemblies" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.
   3. Division 9 Section "Gypsum Board Shaft-Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

   1. Design Loads: As indicated**.**

   2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
      a. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/240 of the wall height under a horizontal load of 5 lbf/sq. ft..
      b. Floor Joist Framing: Vertical deflection of 1/480 for live loads and l/240 for total loads of the span.
      c. Ceiling Joist Framing: Vertical deflection of 1/240 of the span.

   3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F .

4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

   a. Upward and downward movement of 1/2 inch.

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

   1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."

1.4 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

   1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification Data: For professional engineer and testing agency.

E. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

   1. Steel sheet.
   2. Power-actuated anchors.
   3. Mechanical fasteners.
   4. Vertical deflection clips.
   5. Horizontal drift deflection clips
   6. Miscellaneous structural clips and accessories.

F. Research/Evaluation Reports: For cold-formed metal framing.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for

installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

D. Product Tests: Mill certificates or data from a qualified independent testing agency**,** or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility**,** and metallic-coating thickness.

E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

F. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

G. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

H. Comply with AISI's "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:

1. Allied Studco.
2. AllSteel Products, Inc.
3. California Expanded Metal Products Company.
4. Clark Steel Framing.
5. Consolidated Fabricators Corp.; Building Products Division.
6. Craco Metals Manufacturing, LLC.
7. Custom Stud, Inc.
8. Dale/Incor.
9. Design Shapes in Steel.
10. Dietrich Metal Framing; a Worthington Industries Company.
11. Formetal Co. Inc. (The).
12. Innovative Steel Systems.
13. MarinoWare; a division of Ware Industries.
14. Quail Run Building Materials, Inc.
15. SCAFCO Corporation.
16. Southeastern Stud & Components, Inc.
17. Steel Construction Systems.
18. Steeler, Inc.
19. Super Stud Building Products, Inc.
20. United Metal Products, Inc.

2.2 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.
2. Coating: G60 or equivalent.

B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.
2. Coating: G90.

2.3 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As indicated.
2. Flange Width: As indicated.
3. Section Properties: As indicated.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

1. Minimum Base-Metal Thickness: As indicated.
2. Flange Width: As indicated.

C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, punched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: As indicated.
   2. Section Properties: As indicated.

D. Steel Double-L Headers: Manufacturer's standard L-shapes used to form header beams, of web depths indicated, and as follows:
   1. Minimum Base-Metal Thickness: As indicated.
   2. Section Properties: As indicated.

2.4 FLOOR JOIST FRAMING

A. Steel Joists: Manufacturer's standard C-shaped steel joists, of web depths indicated, punched**,** with stiffened flanges, and as follows:

   1. Minimum Base-Metal Thickness: As indicated.
   2. Flange Width: As indicated..
   3. Section Properties: As indicated.

B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

   1. Minimum Base-Metal Thickness: Matching steel joists.
   2. Flange Width: 1-5/8 inches, minimum.

2.5 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with stiffened flanges, and as follows:

   1. Minimum Base-Metal Thickness: As required by design.
   2. Flange Width: As required by design.
   3. Section Properties: As required by design.

2.6 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

   1. Supplementary framing.
   2. Bracing, bridging, and solid blocking.
   3. Web stiffeners.
   4. Anchor clips.
   5. End clips.
   6. Foundation clips.
   7. Gusset plates.
   8. Stud kickers, knee braces, and girts.

9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.7 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel headless, hooked bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

D. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

E. Welding Electrodes: Comply with AWS standards.

2.8 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.9 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.

2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation, specified in Division 7 Section "Building Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: As indicated.

B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: 16 inches.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced 48 inches. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of 2 screws into each flange of the clip angle for framing members up to 6 inches deep.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with a minimum end bearing of 3 inches.
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.

C. Space joists not more than 2 inches from abutting walls, and as follows:

1. Joist Spacing: As indicated.

D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated.

1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:

1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05400

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following metal fabrications:

B. Rough hardware.

C. Loose bearing and leveling plates.

D. Shelf and relieving angles.

E. Miscellaneous framing and supports for the following:

1. Overhead doors.
2. Hoist track and bracing. (Provided under Section 14620)
3. Applications where framing and supports are not specified in other sections.
4. Miscellaneous steel trim, including the following:
   a. Edgings.
   b. Loading dock edge angles.
   c. Floor plate and supports.
   d Pipe guards.
   e. Pipe bollards.

F. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 5 Section "Structural Steel" for structural steel framing system components.
2. Division 5 Section "Metal Stairs" for metal framed stairs with metal pan, metal plate, or grating treads, and for pipe handrails and railing systems.
3. Division 5 Section "Gratings" for metal gratings.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for prefabricated building columns, steel floor plate, paint products and grout.

C. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.

D. Samples representative of materials and finished products as may be requested by Architect.

E. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

F. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project name, addresses, names of architects and owners, and other information specified.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.

B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel," AWS D1.2 "Structural Welding Code--Aluminum," and AWS D1.3 "Structural Welding Code--Sheet Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification. See Section 05120.

1.5. PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2 - PRODUCTS

2.1 FERROUS METALS

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

B. Wide Flange Shapes: ASTM A992 (50ksi)

C. Other Shapes, Plates and Bars: ASTM A 36/A 36M.

D. Rolled Steel Floor Plates: ASTM A 786/A 786M.

E. Steel Tubing: Product type (manufacturing method) and as follows:

1. Cold-Formed Steel Tubing: ASTM A 500.
   a. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A 53.

F. Steel Pipe: ASTM A 53, standard weight (schedule 40), unless otherwise indicated, or another weight required by structural loads.

1. Galvanized finish for exterior installations and where indicated.

G. Gray-Iron Castings: ASTM A 48, Class 30.

H. Malleable-Iron Castings: ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010).

I. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.

J. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

2.2 ALUMINUM

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy 6063-T6.

B. Aluminum-Alloy Rolled Tread Plate: ASTM B 632 (ASTM B 632M) Pattern 1, alloy 6061-T6.

2.3 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

2.4 FASTENERS

A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), with hex nuts, ASTM A 563 (ASTM A 563M), and, where indicated, flat washers.

C. Machine Screws: ANSI B18.6.3.

D. Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8M).

E. Wood Screws: Flat head, carbon steel, ANSI B18.6.1.

F. Plain Washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M).

G. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Material: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with ASTM F 593 (ASTM F 738M) and ASTM F 594 (ASTM F 836M).

I. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as required.

2.5 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. Nonshrink, Nonmetallic Grouts:

a. B-6 Construction Grout; W. R. Bonsal Co.
b. Euco N-S Grout; Euclid Chemical Co.
c. Five Star Grout; Five Star Products.
d. Crystex; L & M Construction Chemicals, Inc.
e. Masterflow 928 and 713; Master Builders Technologies, Inc.

2.6 CONCRETE FILL

A. Concrete Materials and Properties: Comply with requirements of Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless higher strengths are indicated.

2.7 FABRICATION, GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

C. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.

1. Temperature Change (Range): 100 deg F (55.5 deg C).

D. Shear and punch metals cleanly and accurately. Remove burrs.

E. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Remove sharp or rough areas on exposed traffic surfaces.

G. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

K. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.8 ROUGH HARDWARE

A. Furnish bent, or otherwise custom-fabricated, bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 Sections.

B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts that bear on wood structural connections, and furnish steel washers elsewhere.

2.9 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of the required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.10 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the Work.

B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

a. Except as otherwise indicated, space anchors 24 inches (600 mm) o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long.

B. Galvanize miscellaneous framing and supports at exterior and interior locations.

2.11 FLOOR PLATE

A. Fabricate raised-pattern floor plates from rolled-steel floor plat of thickness and in pattern indicated below:

1. Thickness: 1/2 inch.
2. Pattern: As selected from manufacturer's standard patterns.

2.12 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices wherever possible.

B. Provide cutouts, fittings, and anchorages as required to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches (150 mm) from each end, 6 inches (150 mm) from corners, and 24 inches (600 mm) o.c., unless otherwise indicated.

C. Galvanize miscellaneous steel trim at exterior and interior locations.

2.13 CHAIN

A. Provide electric-welded, heat-treated alloy steel chain and hooks at sander racks.

1. Lead capacity: 1,500 pounds per chain.

2.14 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designing finishes.

B. Finish metal fabrications after assembly.

2.15 STEEL AND IRON FINISHES

A. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip

process complying with the following requirements:

1. ASTM A 153 for galvanizing iron and steel hardware.
2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch (0.76 mm) thick or thicker.

B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B): SSPC-SP 6 "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 3 "Power Tool Cleaning."

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.2 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

E. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so

that no roughness shows after finishing, and contour of welded surface matches those adjacent.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.3 SETTING LOOSE PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

B. Set loose leveling and bearing plates on wedges or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.

1. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 INSTALLING PIPE BOLLARDS

A. Anchor bollards in concrete as indicated on drawings.

B. Fill bollards solidly with concrete, mounding top surface.

3.5 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a 2.0-mil (0.05-mm) minimum dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 Section "Painting."

C. For galvanized surfaces, clean welds, bolted connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05500

SECTION 05510 - METAL STAIRS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following: Straight run, steel-framed stairs.

B. Related Sections: The following Sections contain requirements that relate to this Section.

1. Division 5 Section "Pipe and Tube Railings" for pipe and tube handrails and railing systems, including those attached to metal stairs.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Engineer, fabricate, and install steel stairs to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each component of steel stairs.

1. Treads of Steel Stairs: Capable of withstanding a uniform load of 100 lbf per sq. ft. (4.8 kN/sq. m) or a concentrated load of 300 lbf (1.35 kN) on a area of 4 sq. inches (26 sq. cm) located in the center of the tread, whichever produces the greater stress.
2. Platforms of Steel Stairs: Capable of withstanding a uniform load of 100 lbf per sq. ft. (4.8 kN/sq. m).
3. Stair Framing: Capable of withstanding stresses resulting from loads specified above as well as stresses resulting from railing system loads.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for metal stairs, prefilled metal pan stair treads, nonslip aggregates and nonslip aggregate surface finishes, cast nosings, extruded nosings, steel floor plate, paint products, and grout.

C. Shop drawings detailing fabrication and installation of steel stairs. Include plans, elevations, sections, and details of steel stairs and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections.

1. For installed steel stairs indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for their preparation.

D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing steel stairs similar to those indicated for this Project with a record of successful in-service performance and with sufficient production capacity to produce required units without delaying the Work.

B. Installer Qualifications: Arrange for steel stair installation specified in this Section by the same firm that fabricated them.

C. Engineer Qualifications: A professional engineer legally authorized to practice in jurisdiction where Project is located and experienced in providing engineering services of the kind indicated that have resulted in the installation of metal stairs (including handrails and railing systems) similar to this Project in material, design, and extent and that have a record of successful in-service performance.

D. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification. See Section 05120.

PART 2 - PRODUCTS

2.1 FERROUS METALS

A. Metal Surfaces, General: For surfaces exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, roughness, or, for steel sheet, variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.

B. Wide Flange Shapes: ASTM A992 (50ksi)

C. Other Shapes, Plates and Bars: ASTM A 36/A 36M.

D. Steel Pipe: ASTM A 53, standard weight (schedule 40), unless otherwise indicated, or another weight required by structural loads.

1. Galvanized finish for exterior installations and where indicated.

E. Rolled Steel Floor Plate: ASTM A 786/A 786M.

F. Steel Bars for Gratings: ASTM A 569/A 569M or ASTM A 36/A 36M.

G. Wire Rod for Grating Cross Bars: ASTM A 510 (ASTM A 510M).

H. Galvanized Steel Sheet: Quality as follows:

1. Structural Quality: ASTM A 446/A 446M; Grade A, G 90 (Z 275) coating, unless another grade is required for design loading.

I. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

2.2 FASTENERS

A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head type, ASTM A 325, with hex nuts, ASTM A 563 (ASTM A 563M), and, where indicated, harden washers.

C. Machine Screws: ANSI B18.6.3 (ANSI B18.6.7M).

D. Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8M).

E. Plain Washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M).

F. Lock Washers: Helical, spring type, carbon steel, ANSI B 18.21.1.

G. Expansion Anchors: Anchor bolt and sleeve assemblies of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Material: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

2.3 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

2.4 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

B. Available Products: Subject to compliance with requirements, nonshrink, nonmetallic grouts that may be incorporated in the Work include, but are not limited to, the following:

1. Euco N-S Grout; Euclid Chemical Co.
2. Five Star Grout; Five Star Products.
3. Crystex; L&M Construction Chemicals, Inc.
4. Masterflow 928 and 713; Master Builders Technologies, Inc.
5. Sealtight 588 Grout; W. R. Meadows, Inc.
6. Or, pre-approved equal.

2.5 FABRICATION, GENERAL

A. Form steel stairs from materials of size, thickness, and shapes indicated, but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

C. Shear and punch metals cleanly and accurately.

D. Remove sharp or rough areas on exposed surfaces.

E. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and welded surface matches contours of adjoining surfaces.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

H. Shop Assembly: Preassemble in shop to greatest extent possible to minimize field splicing and assembly. Use connections that maintain structural value of joined pieces. Clearly mark units for field assembly and coordinated installation.

I. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.6 STEEL-FRAMED STAIRS

A. General: Construct stairs to conform to sizes and arrangements indicated. Join pieces together by welding, unless otherwise indicated. Provide complete stair assemblies, including metal framing, hangers, columns, handrails, railing systems, newels, balusters, struts, clips, brackets, bearing plates, or other components necessary for the support of stairs and platforms, and as required to anchor and contain the stairs on the supporting structure.

1. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM "Metal Stair Manual" for class of stair designated, except where more stringent requirements are indicated.
   a. Architectural class where indicated.

B. Stair Framing: Fabricate stringers of structural steel channels, plates, or a combination thereof, as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to stringers; and bolt or weld newels and framing members to stringers and

headers. If using bolts, fabricate and join so bolts are not exposed on finish surfaces.

1. Where masonry walls support steel stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

C. Floor Grating Treads and Platforms: Provide patterns, spacing, and bar sizes indicated; fabricate to comply with ANSI/NAAMM MBG 531 "Metal Bar Grating Manual."

1. Fabricate treads from welded steel grating with 1-1/4-by-3/16-inch (32-by-4.8-mm) bearing bars at 15/16 inch (24 mm) o.c. and cross bars at 4 inches (100 mm) o.c., NAAMM designation: W-15-4 (1-1/4 x 3/16) STEEL.
2. Surface: Serrated.
3. Finish: Galvanized.

D. Fabricate grating treads with steel plate nosing and with steel angle or steel plate carrier at each end for stringer connections. Secure treads to stringers with bolts.

E. Fabricate grating platforms with nosing matching that on grating treads at all landings. Provide toe plates at open-sided edges of grating platform. Secure grating to platform frame with welds.

2.7 FINISHES

A. General: Finish metal stairs after assembly.

1. Comply with NAAMM "Metal Finishes Manual" for recommendations on application and designations of finishes.

B. Galvanizing: Hot-dip galvanize items indicated to be galvanized to comply with applicable standard listed below:

1. ASTM A 153 for galvanizing iron and steel hardware.

2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch (0.76 mm) thick and heavier.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, weld plates, and anchor bolts. Coordinate delivery of such items to Project site.

3.2 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing steel stairs to in-place construction; include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing steel stairs. Set units accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted field connections.

E. Field Welding: Comply with the following requirements:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on steel stairs are specified in Division 9 Section "Painting."

B. For galvanized surfaces, clean welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05510

SECTION 05521 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes steel pipe and tube handrails and railing systems.

B. Related Sections: Requirements relating to this Section are contained in the following Sections:

1. Division 5 Section "Metal Stairs" for steel pipe handrails and railing systems included with metal stairs.

1.3 DEFINITIONS

A. Definitions in ASTM E 985 for railing-related terms apply to this Section.

1.4 PERFORMANCE REQUIREMENTS

A. General: In engineering handrail and railing systems to withstand structural loads indicated, determine allowable design working stresses of materials based on the following:

1. Cold-Formed Structural Steel: AISI "Specification for the Design of Cold-Formed Steel Structural Members."

B. Structural Performance of Handrails and Railing Systems: Engineer, fabricate, and install handrails and railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials for handrails, railing systems, anchors, and connections. Apply each load to produce the maximum stress in each of the respective components comprising handrails and railing systems.

1. Top Rail of Guardrail Systems: Capable of withstanding the following loads applied as indicated:

a. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
b. Uniform load of 50 lbf per linear foot (730 N/m) applied horizontally and concurrently with uniform load of 50 lbf per linear foot (1460 N/m) applied vertically downward.
c. Concentrated and uniform loads above need not be assumed to act concurrently.

2. Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:

a. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
b. Uniform load of 50 lbf per linear foot (730 N/m) applied in any direction.
c. Concentrated and uniform loads above need not be assumed to act

concurrently.

3. Infill Area of Guardrail Systems: Capable of withstanding a horizontal concentrated load of 200 lbf (890 N) applied to 1 sq. ft. (0.09 sq. m) at any point in the system including panels, intermediate rails, balusters, or other elements composing the infill area.

   a. Above load need not be assumed to act concurrently with loads on top rails of railing systems in determining stress on guard.

C. Thermal Movements: Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in engineering, fabricating, and installing handrails and railing systems to prevent buckling, opening of joints, overstressing of components and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.

   1. Temperature Change (Range): 120 deg F (67 deg C) ambient 180 deg F (100 deg C) material surfaces.

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.5 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for mechanically connected handrails and railing systems, each kind of fitting, grout, anchoring cement, and paint products.

C. Shop drawings showing fabrication and installation of handrails and railing systems including plans, elevations, sections, details of components, and attachments to other units of Work.

   1. For installed handrails and railing systems indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for their preparation.

D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project names, addresses, names of architects and owners, and other information specified.

E. Product test reports from a qualified independent testing agency evidencing compliance of handrails and railing systems with requirements based on comprehensive testing of current products.

F. Test reports from an independent testing agency evidencing compliance of handrails and railing systems with ASTM E 985.

1.6 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain handrails and railing systems of each type and material from a single manufacturer.

B. Engineer Qualifications: Professional engineer legally authorized to practice in the jurisdiction where Project is located and experienced in providing engineering services of the kind indicated for handrails and railing systems similar to this Project in material, design, and

extent, and that have a record of successful in-service performance.

1.7 STORAGE

A. Store handrails and railing systems inside a well-ventilated area, away from uncured concrete and masonry and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.

1.8 PROJECT CONDITIONS

A. Field Measurements: Where handrails and railing systems are indicated to fit to other construction, check actual dimensions of other construction by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating handrails and railing systems without field measurements. Coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.

1.9 SEQUENCING AND SCHEDULING

A. Sequence and coordinate installation of wall handrails as follows:

1. Mount handrails only on completed walls. Do not support handrails temporarily by any means not satisfying structural performance requirements.

PART 2 - PRODUCTS

2.1 METALS

A. General: Provide metals free from surface blemishes where exposed to view in the finished unit. Exposed-to-view surfaces exhibiting pitting, seam marks, roller marks, stains, discolorations, or other imperfections on finished units are not acceptable.

B. Steel: Provide steel in the form indicated, complying with the following requirements:

1. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:

a. Galvanized finish for exterior installations and where indicated.
b. Type F, or Type S, Grade A, standard weight (schedule 40), unless otherwise indicated, or another weight, type, and grade required by structural loads.

2. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Brackets, Flanges, and Anchors: Cast or formed metal of the same material and finish as supported rails, unless otherwise indicated.

2.2 WELDING MATERIALS, FASTENERS, AND ANCHORS

A. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of the type, grade, and class required to produce connections that are suitable for anchoring railings to other types of construction indicated and capable of withstanding design loadings.

1. For steel railings and fittings, use plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.

C. Cast-in-Place and Postinstalled Anchors: Anchors of type indicated below, fabricated from corrosion-resistant materials, capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified, independent testing agency.

1. Cast-in-place anchors.
2. Expansion anchors.

2.3 PAINT

A. Shop Primer for Ferrous Metal and Galvanized Steel: Refer to Division 9 Section "Painting" for primers.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, complying with DOD-P-21035 or SSPC-Paint 20.

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

2.4 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

B. Available Products: Subject to compliance with requirements, nonshrink, nonmetallic grouts that may be incorporated in the Work include, but are not limited to, the following:

1. Euco N-S Grout; Euclid Chemical Co.
2. Five Star Grout; Five Star Products.
3. Crystex; L & M Construction Chemicals, Inc.
4. Masterflow 928 and 713; Master Builders Technologies, Inc.
5. Sealtight 588 Grout; W.R. Meadows, Inc.
6. Or, pre-approved equal.

2.5 FABRICATION

A. General: Fabricate handrails and railing systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of hollow members, post spacings, and anchorage, but not less than those required to support structural loads.

B. Assemble handrails and railing systems in the shop to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

C. Form changes in direction of members as follows:

1. By radius bends of radius indicated.
2. By bending.
3. By mitering at elbow bends.
4. By any method indicated above, applicable to change of direction involved.

D. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.

E. Welded Connections: Fabricate handrails and railing systems for connection of members by welding. For connections made during fabrication, weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At tee and cross intersections, cope ends of intersecting members to fit contour of pipe or tube to which end is joined, and weld all around.
5. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

F. Brackets, Flanges, Fittings, and Anchors: Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing system members to other construction.

G. Provide inserts and other anchorage devices to connect handrails and railing systems to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railing systems. Coordinate anchorage devices with supporting structure.

H. For railing posts set in concrete, provide preset sleeves of steel, not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (12 mm) greater than outside dimensions of post, and steel plate forming bottom closure.

I. For removable railing posts, fabricate slip-fit sockets from steel pipe whose inside diameter is sized for a close fit with posts and to limit deflection of post without lateral load, measured at top, to not more than 1/12 of post height. Provide socket covers designed and fabricated to resist accidental dislodgement.

1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

J. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

K. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing work.

L. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.

M. Provide weepholes, or another means to evacuate entrapped water, in hollow sections of railing members that are exposed to exterior or to moisture from condensation or other sources.

N. Fabricate joints that will be exposed to weather in a manner to exclude water.

O. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.

P. Toe Boards: Provide toe boards at railings around openings and at the edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

Q. Fillers: Provide steel sheet or plate fillers, of thickness and size indicated or required to support structural loads of handrails, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses to produce adequate bearing to prevent bracket rotation and overstressing substrate.

2.6 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering prior to shipment.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one half of the range of approved samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved samples and they are assembled or installed to minimize contrast.

D. Provide exposed fasteners with finish matching appearance, including color and texture, of handrails and railing systems.

2.7 STEEL FINISHES

A. Galvanized Finish: Hot-dip galvanize items indicated to be galvanized to comply with applicable standard listed below:

1. ASTM A 153 for galvanizing iron and steel hardware.
2. ASTM A 123 for galvanizing iron and steel products made from rolled, pressed, and forged steel shapes, castings, plates, bars, and strips.

B. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

C. For galvanized handrails and railing systems, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

D. Preparation for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

E. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed railings:

1. Interiors (SSPC Zone 1A): SSPC-SP 7 "Brush-Off Blast Cleaning."

F. Apply shop primer to prepared surfaces of handrails and railing components, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Refer to Division 9 Section "Painting" for primer specification for galvanized and un-galvanized surfaces.
2. Stripe paint all edges, corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installing anchorages, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors, that are to be embedded in concrete as masonry construction. Coordinate delivery of such items to Project site.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections accurately together to form tight, hairline joints.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing handrails and railing systems. Set handrails and railing systems accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.
1. Do not weld, cut, or abrade surfaces of handrails and railing components that have been coated or finished after fabrication and are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/4 inch in 12 feet (2 mm in 1 m).
3. Align rails so that variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (2 mm in 1 m).

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and welded surface matches contours of adjoining surfaces.

D. Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated but not less than that required by design loadings.

E. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing handrails and railing systems and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components by welding. Cope or butt components to provide 100 percent contact, or use fittings designed for this purpose.

3.4 ANCHORING POSTS

A. Anchor posts in concrete with pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, solidly fill annular space between post and sleeve with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's directions.

1. Nonshrink, nonmetallic grout.

B. Cover anchorage joint with a round steel flange attached to post as follows:

1. Welded to post after placement of anchoring material.

C. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

D. Install removable railing sections where indicated in slip-fit metal sockets cast into concrete. Accurately locate sockets to match post spacing.

3.5 ANCHORING RAIL ENDS

A. Anchor rail ends into concrete and masonry with round flanges connected to rail ends and anchored into wall construction with postinstalled anchors and bolts.

3.6 ATTACHING HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets and end fittings. Provide bracket with 1-1/2-inch (38-mm) clearance from inside face of handrail to finished wall surface.

B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets and wall return fittings to building construction as follows:

1. Use type of bracket with predrilled hole for exposed bolt anchorage.
2. For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.
3. For hollow masonry anchorage, use toggle bolts with square heads.

3.7 ADJUSTING AND CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9.

B. For Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

3.8 PROTECTION

A. Protect finishes of handrails and railing systems from damage during construction period with

temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05521

SECTION 05530 - GRATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Metal bar gratings.
2. Heavy-duty metal bar gratings.
3. Metal frames and supports for gratings.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 5 Section "Structural Steel" for structural steel framing system components.
2. Division 5 Section "Metal Stairs" for metal framed stairs with grating treads.
3. Division 5 Section "Pipe and Tube Railings" for metal pipe and tube handrails and railing systems.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Engineer, fabricate, and install gratings to withstand the following structural loads without exceeding the allowable design working stress of the grating materials, anchors, and connections.

1. Heavy-Duty Metal Bar Gratings: H-20 loading.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for formed metal plank grating, manufacturer's clips and anchorage devices for gratings, and paint products.

C. Shop drawings detailing fabrication and erection of gratings. Include plans, sections, and details of connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections.

1. For installed gratings indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for their preparation.

D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" Article.

E. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project name, addresses and names of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing gratings similar to that indicated for this Project with a record of successful in-service performance and with sufficient production capacity to produce required units without delaying the Work.

B. Engineer Qualifications: A professional engineer legally authorized to practice in jurisdiction where Project is located and experienced in providing engineering services of the kind indicated that have resulted in the installation of gratings similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance.

C. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel," AWS D1.2 "Structural Welding Code--Aluminum," and AWS D1.3 "Structural Welding Code--Sheet Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.6 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which gratings must fit by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating gratings without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2 - PRODUCTS

2.1 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Bars for Gratings: ASTM A 569/A 569M or ASTM A 36/A 36M.

C. Wire Rod for Grating Cross Bars: ASTM A 510 (ASTM A 510M).

D. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

2.2 ALUMINUM

A. Extruded Bars and Shapes: ASTM B 221 (ASTM B 221M), alloys as follows:

1. 6061-T6 or 6063-T6 for bearing bars of gratings and shapes.
2. 6061-T1 for grating cross bars.

2.3 PAINT

A. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

B. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

2.4 FASTENERS

A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

B. Fasteners for Aluminum Gratings: Provide fasteners of aluminum, nonmagnetic stainless steel, zinc-plated steel, or other material warranted by the manufacturer to be noncorrosive and compatible with aluminum gratings and other components.

1. Provide hinges as recommended by manufacturer, where indicated.

C. Expansion Anchors: Anchor bolt and sleeve assemblies of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Material: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

2.5 FABRICATION

A. General: Form from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support.

1. Shear and punch metals cleanly and accurately.
2. Remove sharp or rough areas on exposed traffic surfaces.
3. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated.

B. Welding: Comply with AWS recommendations and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

C. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.

D. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

2.6 METAL BAR GRATINGS

A. General: Produce metal bar gratings of description indicated per NAAMM marking system that comply with the following:

1. Metal Bar Grating Standard: "Standard Specifications for Metal Bar Grating and Metal Bar Grating Treads" published in ANSI/NAAMM MBG 531 "Metal Bar Grating Manual."
2. Heavy-Duty Metal Bar Grating Standard: "Guide Specifications for Heavy Duty Metal Bar Grating" published in ANSI/NAAMM MBG 532 "Heavy Duty Metal Bar Grating Manual."

B. Fabricate welded steel gratings to comply with requirements indicated below:

1. Grating Mark W-15-4: Welded grating with bearing bars 15/16 inch (24 mm) o.c. and cross bars 4 inches (100 mm) o.c.
2. Bearing Bar Size: 1-1/4 inches (32 mm) by 3/16 inch (5 mm).
3. Location: Wash rack platform.

C. Fabricate pressure-locked rectangular bar aluminum gratings to comply with requirements indicated below:

1. Grating Mark P-19-4: Pressure-locked grating with bearing bars 1-3/16 inches (30 mm) o.c. and cross bars 4 inches (100 mm) o.c.
2. Bearing Bar Size: 1-1/2 inches (38 mm) by 3/16 inch (5 mm).
3. Location: Lube pit floor.

D. Fabricate welded heavy-duty steel gratings to comply with requirements indicated below:

1. Location: Trench drain and wash rack drain.
   a. Grating Mark W-22-2: Welded grating with bearing bars 1-3/8 inches (35 mm) o.c. and cross bars 2 inches (50 mm) o.c.
   b. Bearing Bar Size: 2-1/4 inches (47 mm) by 1/4 inch (6 mm).

2. Location: Lube reel pit cover.
   a. Grating Mark W-22-4: Welded grating with bearing bars 1-3/8 inches (35 mm) o.c. and cross bars 4 inches (100 mm) o.c.
   b. Bearing Bar Size: 1-3/4 inches (44 mm) by 3/8 inches (10 mm).
   c. Refer to Division 5 Section "Metal Fabrications" for floor plate welded to top of grating.

E. Traffic Surface for Steel Bar Gratings: Plain.

F. Traffic Surface for Aluminum Bar Gratings: Serrated.

G. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.7 oz. per sq. ft. (515 g/sq. m) of coated surface.

H. Aluminum Finish: Class I, clear, anodized finish.

I. Available Manufacturers: Subject to compliance with requirements, manufacturers offering metal bar gratings that may be incorporated in the Work include, but are not limited to, the following:

1. IKG Borden.
2. Ohio Gratings, Inc.
3. Seidelhuber Metal Products, Inc.
4. Or, pre-approved equal.

2.7 GRATING FRAMES AND SUPPORTS

A. General: Provide steel frames and supports, where indicated.

B. Fabricate units to sizes, shapes, and profiles indicated and required to receive gratings. Fabricate from structural steel shapes, plates, and steel bars of welded construction. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware, and similar items.

C. Equip units with integrally welded anchors for casting into concrete or building into masonry.

1. Unless otherwise indicated, space anchors 24 inches (600 mm) o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long.

D. Galvanize frames at interior and exterior locations.

2.8 FINISHES

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish gratings, frames, and supports after assembly.

C. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process complying with ASTM A 123.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.2 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing to in-place construction. Include expansion anchors for concrete and masonry, through-bolts, and other connectors as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation. Set accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items to be built into concrete, masonry, or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

E. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.3 INSTALLING METAL BAR GRATINGS

A. General: Install gratings to comply with recommendations of NAAMM grating standard referenced under Part 2 that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.

B. Secure removable units to supporting members with type and size of clips and fasteners indicated, or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.

C. Secure nonremovable units to supporting members by welding where both materials are the same; otherwise, fasten by bolting as indicated above.

3.4 ADJUSTING AND CLEANING

A. For galvanized surfaces, clean welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05530

SECTION 06105 - MISCELLANEOUS CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Rough carpentry work not specified elsewhere and generally intended for support of other work.
2. Sheathing.
3. Miscellaneous blocking, grounds, nailers, and panels.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 6 Section "Interior Architectural Woodwork" for interior casework elements specially fabricated for this Project.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Wood treatment data from chemical treatment manufacturer. Include chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated material.

1. Preservative Treatment: Include certification by treatment plant stating type of solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
2. Waterborne Preservative Treatment: Include certification that moisture content of treated wood was reduced to levels specified prior to shipment to Project site.
3. Fire-Retardant Treatment: Include certification by treating plant that treated wood complies with specified requirements.
4. Warranty: Include warranty of chemical treatment manufacturer for each type of treatment.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack material above ground level on uniformly spaced supports to prevent deformation.

1. For material pressure treated with waterborne chemicals, place spacers between each bundle for air circulation.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

A. Standards: Furnish lumber manufactured to comply with PS 20 "American Softwood Lumber

Standard" and graded in accordance with the Western Lumber Grading Rules (WWPA).

B. Grade Stamps: Furnish lumber with each piece factory-marked with grade stamp of inspection agency that indicates grading agency, grade, species, moisture content at time of surfacing, and mill.

C. Sizes: Provide nominal sizes indicated, complying with PS 20 except where actual sizes are specifically noted as being required.

D. Surfacing: Dressed lumber, S4S, unless otherwise indicated.

E. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.

2.2 DIMENSION LUMBER FOR CONCEALED CONDITIONS

A. Species: Douglas-fir.

B. Moisture Content: S-DRY, KD 19 or MC 19 (19 percent maximum moisture content).

C. Grade: No. 2 or better.

2.3 CONSTRUCTION PANELS

A. Standards: Comply with requirements of PS 1 Voluntary Product Standard "Construction and Industrial Plywood" for veneer plywood and APA PRP-108 "Performance Standards and Policies for Structural-Use Panels" for performance-rated panels.

1. Trademark: Furnish construction panels that are each factory-marked with APA trademark for grade specified.

C. Miscellaneous Exposed Interior Plywood Wall Panels: DOC PS 1, A-D Interior, thickness as indicated.

D. Electrical/Telephone Backing Panels: APA-RATED SHEATHING, Exposure 1, fire-retardant treated, thickness as indicated but not less than 15/32 inch.

2.4 FASTENERS

A. General: Provide fasteners with a hot-dip zinc coating per ASTM A 153 or of AISI Type 304 stainless steel.

B. Nails, Wire, Brads and Staples: FS FF-N-105.

C. Bolts: ASTM A 307, Grade A; with ASTM A 563 hex nuts and flat washers.

2.5 PRESERVATIVE WOOD TREATMENT BY PRESSURE PROCESS

A. General: Obtain preservative-treated lumber complying with AWPA Standard C2. Mark each treated item with AWPB or SPIB Quality Mark Requirements. Coat surfaces cut after treatment to comply with AWPA M4.

B. Above-Ground Wood Treatment: Pressure treat with CCAC preservatives to a minimum retention of 0.25 pcf.

1. Kiln-dry interior dimension lumber after treatment to 19 percent maximum moisture content.
2. Treat wood items indicated and in the following circumstances:
   a. In contact with roofing, flashing, or waterproofing.
   b. In contact with masonry or concrete.
   c. Within 18 inches of grade.

2.6 FIRE RETARDANT TREATMENT BY PRESSURE PROCESS

A. General: Identify treated wood with appropriate classification marking of Underwriters Laboratories Inc. or other testing and inspection agency acceptable to authorities having jurisdiction.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of miscellaneous carpentry and in sizes that would require an excessive number or poor arrangement of joints.

B. Cut and fit miscellaneous carpentry accurately. Install members plumb and true to line and level.

C. Coat cut edges of preservative-treated wood to comply with AWPA M4.

D. Securely fasten miscellaneous carpentry as indicated and according to applicable codes and recognized standards.

E. Use fasteners of appropriate type and length. Pre-drill members when necessary to avoid splitting wood.

3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

A. Install where shown and where required for screeding or attachment of other work. Cut and shape to required size. Coordinate location with other work involved.

B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated.

END OF SECTION 06105

SECTION 06402 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Laminate clad cabinets (plastic-covered casework).
2. Cabinet tops (countertops).

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 6 Section "Miscellaneous Carpentry" for furring, blocking, exposed interior plywood panels, and other carpentry work which may or may not be exposed to view.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

C. Samples for initial selection purposes of the following in form of manufacturer's color charts consisting of actual units or sections of units showing full range of colors, textures, and patterns available for each type of material indicated.

1. Plastic laminate.

D. Samples for verification purposes of the following:

1. Laminate clad panel products, manufacturer standard sample for each type, color, pattern, and surface finish.
2. Corner pieces as follows:

a. Cabinet front frame joints between stiles and rail as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.

3. Exposed cabinet hardware, one unit of each type and finish.

E. Product certificates signed by woodwork manufacturer certifying that products comply with specified requirements.

F. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information specified.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm experienced in successfully producing architectural woodwork similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.

B. Single-Source Manufacturing and Installation Responsibility: Engage a qualified Manufacturer to assume undivided responsibility for woodwork specified in this section, including fabrication, finishing, and installation.

C. Installer Qualifications: Arrange for installation of architectural woodwork by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this project.

D. AWI Quality Standard: Comply with applicable requirements of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI) except as otherwise indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.

B. Do not deliver woodwork until painting, wet work, grinding, and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Obtain and comply with Woodwork Manufacturer's and Installer's coordinated advice for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork is within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.

B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before manufacturing woodwork; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of Work.

1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with manufacture of woodwork without field measurements. Coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.

PART 2 - PRODUCTS

2.1 HIGH PRESSURE DECORATIVE LAMINATE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high pressure decorative laminates which may be incorporated in the work include but are not limited to the following:

1. Formica Corp.
2. Nevamar Corp.
3. Ralph Wilson Plastics Co.

2.2 MATERIALS

A. General: Provide materials that comply with requirements of the AWI woodworking standard for each type of woodwork and quality grade indicated and, where the following products are part of woodwork, with requirements of the referenced product standards, that apply to product characteristics indicated:

1. Hardboard: ANSI/AHA A135.4
2. High Pressure Laminate: NEMA LD 3.
3. Particleboard: ANSI A208.1

2.3 FABRICATION, GENERAL

A. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber in relation to relative humidity conditions existing during time of fabrication and in installation areas.

B. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Edges of solid wood (lumber) members less than 1 inch in nominal thickness: 1/16 inch.
2. Edges of rails and similar members more than 1 inch in nominal thickness: 1/8 inch.

C. Complete fabrication, including assembly, finishing, and hardware application, before shipment to project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

D. Factory-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges of cutouts with a water-resistant coating.

2.4 LAMINATE CLAD CABINETS (PLASTIC-COVERED CASEWORK)

A. Quality Standard: Comply with AWI Section 400 and its Division 400B "Laminate Clad Cabinets."

B. Grade: Custom.

C. AWI Type of Cabinet Construction: Flush overlay.

D. Laminate Cladding: High pressure decorative laminate complying with the following requirements:

1. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

a. Match Architect's sample.

2. Laminate Grade for Exposed Surfaces: Provide laminate cladding complying with the following requirements for type of surface and grade.

a. Horizontal Surfaces Other Than Tops: GP-50 (0.050-inch nominal thickness).
b. Post-formed Surfaces: PF-42 (0.042-inch nominal thickness).
c. Vertical Surfaces: GP-50 (0.050-inch nominal thickness).
d. Edges: GP-50 (0.050-inch nominal thickness).

3. Semi-exposed Surfaces: Provide surface materials indicated below:

a. High pressure laminate, GP-28.

E. Provide dust panels of 1/4-inch plywood or tempered hardboard above compartments and drawers except where located directly under tops.

2.5 CABINET HARDWARE AND ACCESSORY MATERIALS

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Finish Hardware."

B. Cabinet Hardware Schedule: Refer to schedule at end of this section for cabinet hardware required for architectural cabinets.

C. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for BHMA code number indicated.

1. Satin Stainless Steel, Stainless Steel Base: BHMA 630.

D. For concealed hardware provide manufacturer's standard finish that complies with product class requirements of ANSI/BHMA A156.9.

2.6 ARCHITECTURAL CABINET TOPS (COUNTERTOPS)

A. Quality Standard: Comply with AWI Section 400 and its Division 400C.

B. Type of Top: High pressure decorative laminate complying with the following:

1. Grade: Custom.

2. Laminate Cladding for Horizontal Surface: High pressure decorative laminate as follows:

a. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1) Match Architect's sample.

b. Grade: GP-50 (0.050-inch nominal thickness).

3. Edge Treatment: Same as laminate cladding on horizontal surfaces.

2.7 FASTENERS AND ANCHORS

A. Screws: Select material, type, size, and finish required for each use. Comply with FS FF-S-111 for applicable requirements.

1. For metal framing supports, provide screws as recommended by metal framing manufacturer.

B. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

C. Anchors: Select material, type, size, and finish required by each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent woodwork anchorage.

2.8 FACTORY FINISHING OF INTERIOR ARCHITECTURAL WOODWORK

A. Quality Standard: Comply with AWI Section 1500 unless otherwise indicated.

B. General: The entire finish of interior architectural woodwork is specified in this section, regardless of whether factory applied or applied after installation.

1. Factory Finishing: To the greatest extent possible, finish architectural woodwork at factory. Defer only final touch-up, cleaning, and polishing until after installation.

C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces and similar preparations for finishing of architectural woodwork, as applicable to each unit of work.

PART 3 - EXECUTION

3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.

B. Deliver concrete inserts and similar anchoring devices to be built into substrates well in advance of time substrates are to be built.

C. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.2 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for same grade specified in Part 2 of this section for type of woodwork involved.

B. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 8'-0" for plumb and level (including tops) and with no variations in flushness of adjoining surfaces.

C. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fastener heads are required, use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.

E. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated. Maintain veneer sequence matching (if any) of cabinets with transparent finish.

F. Tops: Anchor securely to base units and other support systems as indicated.

1. Solid surfacing tops: Fabricate in largest width possible and install with adhesive as recommended by manufacturer.

G. Complete the finishing work specified in this section to whatever extent not completed at shop or before installation of woodwork.

3.3 ADJUSTMENT AND CLEANING

A. Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensures that woodwork is being without damage or deterioration at time of Substantial Completion.

3.5 HARDWARE SCHEDULE

A. Drawer Slides: Full extension, heavy duty. Accuride, Knape and Vogt, Blum.
B. Shelf Standards: Recessed. Knape and Vogt, Grant Hardware.
C. Hinges: Self-closing concealed hinge. Blum, Mepla, Hafele.
D. Pulls: "D" pull, 4 inch centers, dull chrome finish. Baldwin, Stanley, Quality.

END OF SECTION 06402

SECTION 06651 SOLID SURFACE FABRICATIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following horizontal and trim solid surface product types:

1. Windowsills

B. Related Sections include the following:
1. Division 5 Section “Metal Fabrications” for Blocking.
2. Division 6 Section “Rough Carpentry” for Blocking.

1.3 DEFINITION

A. Solid surface is defined as nonporous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.

1.4 SUBMITTALS

A. Product data:
1. For each type of product indicated.

B. Shop drawings:
1. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
a. Show full-size details, edge details, thermoforming requirements, attachments, etc.
b. Show locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other Sections.

C. Samples:
1. For each type of product indicated.
a. Submit minimum 6-inch by 6-inch sample in specified gloss.
b. Cut sample and seam together for representation of inconspicuous seam.
c. Indicate full range of color and pattern variation.
2. Approved samples will be retained as a standard for work.

D. Product data:
1. Indicate product description, fabrication information and compliance with specified performance requirements.

E. Product certificates:
1. For each type of product, signed by product manufacturer.

F. Manufacturer certificates:
1. Signed by manufacturers certifying that they comply with requirements.

G. Maintenance data:

1. Submit manufacturer's care and maintenance data, including repair and cleaning instructions.
   a. Maintenance kit for finishes shall be submitted.
2. Include in project closeout documents.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Shop that employs skilled workers who custom fabricate products similar to those required for this project and whose products have a record of successful in-service performance.
B. Applicable standards:
   1. Standards of the following, as referenced herein:
      a. American National Standards Institute (ANSI)
      b. American Society for Testing and Materials (ASTM)
      c. National Electrical Manufacturers Association (NEMA)
      d. NSF International
   2. Fire test response characteristics:
      a. Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
         1) Flame Spread Index: 25 or less.
         2) Smoke Developed Index: 450 or less.

1.6 DELIVERY, STORAGE AND HANDLING
A. Deliver no components to project site until areas are ready for installation.
B. Store components indoors prior to installation.
C. Handle materials to prevent damage to finished surfaces.
   1. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.7 WARRANTY
A. Provide manufacturer's warranty against defects in materials.
   1. Warranty shall provide material and labor to repair or replace defective materials.
   2. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.
   3. Warranty shall be transferable to subsequent owner for remainder of warranty period.

B. Manufacturer's warranty period:
   1. Ten years from date of substantial completion.

1.8 MAINTENANCE
A. Provide maintenance requirements as specified by the manufacturer.

PART 2 — PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
   1. Subject to compliance with requirements, provide products by one of the following:
      a. Corian® surfaces from the DuPont company.
      b. Gibraltar from WilsonArt International

c. Avonite surfaces from Aristech Acrylics LLC
d. Others as approved by Architect prior to bidding.

2.2 MATERIALS

A. Solid polymer components
1. Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
2. Superficial damage to a depth of 0.010 inch (.25 mm) shall be repairable by sanding and/or polishing.

B. Thickness:
1. 1/2 inch

C. Edge treatment:
1. As indicated on drawings.

D. Performance characteristics:

Property	**Typical Result**	**Test**
Tensile Strength	6,000 psi	ASTM D 638
Tensile Modulus	1.5×10^{-6} psi	ASTM D 638
Tensile Elongation	0.4% min.	ASTM D 638
Flexural Strength	10,000 psi	ASTM D 790
Flexural Modulus	1.2×10^{-6} psi	ASTM D 790
Hardness	>85	Rockwell "M" Scale ASTM D 785
	56	Barcol Impressor ASTM D 2583
Thermal Expansion	3.02×10^{-5} in./in./°C (1.80×10^{-5} in./in./°F)	ASTM D 696
Gloss (60° Gardner)	5–75 (matte—highly polished)	ANSI Z124
Light Resistance	(Xenon Arc) No effect	NEMA LD 3-2000 Method 3.3
Wear and Cleanability	Passes	ANSI Z124.3 & Z124.6
Stain Resistance: Sheets	Passes	ANSI Z124.3 & Z124.6
Fungus and Bacteria Resistance	Does not support microbial growth	ASTM G21&G22
Boiling Water Resistance	No visible change	NEMA LD 3-2000 Method 3.5
High Temperature Resistance	No change	NEMA LD 3-2000 Method 3.6
Izod Impact (Notched Specimen)	0.28 ft.-lbs./in. of notch	ASTM D 256 (Method A)
Ball Impact Resistance: Sheets	No fracture—1⁄2 lb. ball: 1⁄4" slab—36" drop 1⁄2" slab—144" drop	NEMA LD 3-2000 Method 3.8
Weatherability	ΔE^*_{94}<5 in 1,000 hrs.	ASTM G 155
Specific Gravity †	1.7	
Water Absorption	Long-term 0.4% (3⁄4") 0.6% (1⁄2") 0.8% (1⁄4")	ASTM D 570

Toxicity	99 (solid colors) 66 (patterned colors)	Pittsburgh Protocol Test (“LC50”Test)
Flammability	All colors (Class I and Class A)	ASTM E 84, NFPA 255 & UL 723
Flame Spread Index	<25	
Smoke Developed Index	<25	

† Approximate weight per square foot: 1⁄4" (6 mm) 2.2 lbs., 1⁄2" (12.3 mm) 4.4 lbs.
Shapes meet or exceed the ANSI Z124.3 and ANSI Z124.6 standards for plastic sinks and lavatories.
NEMA results based on the NEMA LD 3-2000

2.3 ACCESSORIES

A. Joint adhesive:
1. Manufacturer’s standard one- or two-part adhesive kit to create inconspicuous, nonporous joints.

B. Sealant:
1. Manufacturer’s standard mildew-resistant, FDA-compliant, NSF 51-compliant (food zone — any type), UL-listed silicone sealant in colors matching components.

2.4 FACTORY FABRICATION

A. Shop assembly
1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer’s printed instructions and technical bulletins.
2. Form joints between components using manufacturer’s standard joint adhesive without conspicuous joints.
   a. Reinforce with strip of solid polymer material, 2" wide.
3. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.
4. Rout and finish component edges with clean, sharp returns.
   a. Rout cutouts, radii and contours to template.
   b. Smooth edges.
   c. Repair or reject defective and inaccurate work.

2.5 FINISHES

A. Select from the manufacturer’s standard color chart.
1. Color:
   a. As selected by Architect from manufacturer’s standard colors.

B. Finish:
1. Provide surfaces with a uniform finish.
   a. Matte; gloss range of 5–20.

PART 3 — EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
   1. Provide product in the largest pieces available.
   2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
      a. Exposed joints/seams shall not be allowed.
   3. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
   4. Cut and finish component edges with clean, sharp returns.
   5. Anchor securely to base cabinets or other supports.
   6. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
   7. Carefully dress joints smooth, remove surface scratches and clean entire and clean entire surface.

3.3 REPAIR

A. Repair or replace damaged work which cannot be repaired to architect's satisfaction.

3.4 CLEANING AND PROTECTION

A. Keep components clean during installation.
B. Remove adhesives, sealants and other stains.

END OF SECTION 06651

SECTION 07412 - METAL WALL SANDWICH PANELS – ADDENDUM #2

PART 1 - GENERAL

1.1 SUMMARY

1. This section specifies an exterior grade insulated metal sandwich panel system that can be used as a contractor's option entirely in lieu of the exterior metal panels and glass-fiber-blanket insulation with vapor retarder facing described in 13125 METAL BUILDING SYSTEMS previously specified. This section includes all steel-faced, factory-assembled panels with insulating foam core and protective inner metal skin surface.

2. This section includes all related metal trim, accessories, fasteners and sealants indicated on the contract drawings as part of this section.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Structural designs shall have been determined from independent tests conducted in accordance with ASTM E72 "Chamber Method."

B. Thermal Performance: Panels shall provide a "U" value of .042 BTU/Hr./Sq. Ft./˚F, corrected to 15 mph wind outside and still air inside, when determined from tests conducted in accordance with ASTM C236 by a recognized testing laboratory.

C. Air Leakage: Panel joints shall be tested for air leakage in accordance with ASTM E283/AAMA 501. The leakage rate for metal wall panels shall not exceed 0.01 CFM/SF at a pressure difference of 40 psf.

D. Water Penetration: Panel joints shall be tested for water penetration in accordance with ASTM E331/AAMA501. There shall be no water penetration for metal wall panels at a pressure difference of 50 psf.

E. Fire Tests: Panels shall be qualified by laboratory scale and/or full scale fire tests for acceptance by building code and insurance authorities. Evidence of fire performance shall include the following:

1. Underwriters Laboratories, Inc. classified and labeled for "Surface Burning Characteristics of Building Materials," UL 723 (ASTM E84).
   a. Core Material (5"): Flame Spread 20, Smoke Developed 400.
   b. Finished Panels 2" to 5" metal wall panels: Flame Spread 15, Smoke Developed 250-450.

2. Factory Mutual Approved and labeled for "Class 1 Insulated Wall & Roof/Ceiling Panels", Factory Mutual Standard 4880 (1994), to 30 ft. (max) high, 5 in. maximum thickness.

3. Factory Mutual listed and labeled for "Surface Burning Characteristics of Building Materials", ASTM E84-95.
   a. Core Material (5"): Flame Spread 25, Smoke Developed 180.

4. Southwest Research Institute listed and labeled for "Surface Burning Characteristics of Building Materials", ASTM E84-95.
   a. Finished Panels 5" metal wall planes: Flame Spread 10, Smoke Developed 130.

1.3 SUBMITTALS

A. Furnish detailed shop drawings, approved by the manufacturer, to the architect (owner) for review. Drawings shall show profile, panel thickness, gauge of interior and exterior sheets, location and type of fasteners, gauges, shape and method of attachment of all trim, location and type of sealants and any other details as may be required for a weathertight installation. Do not proceed with manufacture of materials prior to review of shop drawings and field verification of all dimensions.

B. Furnish manufacturer's data describing the products to be used on the project.

C. Furnish actual samples of prefinished metal for color selection.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. The manufacturer shall have a minimum of ten (10) years experience in the production of factory foamed-in-place metal skinned insulated panels and be able to show experience with projects of similar size and complexity.

2. The manufacturer shall be certified by the American Institute of Steel Construction (AISC) verifying it has sustained audits to confirm it has a continuing quality control program.

B. Installer Qualifications:

1. The installer shall have a minimum of five (5) years experience installing metal skinned insulated panels on projects of similar size and complexity.

1.5 WARRANTY

A. The manufacturer shall warrant for one (1) year from the date of shipment that the product is not defective in workmanship or material.

B. The manufacturer, upon shipment of materials, shall furnish a warranty:

1. Covering paint finish against cracking, chalking, blistering, peeling, flaking and chipping for a period of twenty (20) years.

C. The contractor shall issue a warranty for two (2) years from the date of substantial completion against defects in material installation and workmanship.

PRODUCTS

1.6 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.
   a. IPS Insulated Panel Systems, 13202 Murphy Road, Stafford Texas 77477. Telephone: (281) 499-2605 or (800) 729-9324. Fax: (281) 499-3363. Approved equals will be considered in accordance with provisions set forth in section 1600 of the project specifications.
   b. Centria Architectural Systems, 1005 Beaver Grade Road, Moon Township, PA 15108-2944. Telephone: (412) 299-8000 or (800) 759-7474. Fax: (412) 299-8317. Approved equals will be considered in accordance with provisions set forth in section 1600 of the project specifications.
   c. Approved equals will be considered in accordance with provisions set forth in section 1600 of the project specifications.

1.7 PANEL DESIGN

A. The panels shall be completely prefabricated in the factory using pre-coated, precision roll-formed steel faces chemically bonded to foamed-in-place rigid modified isocyanurate core. A vapor barrier of no more than .02 perm rating shall be provided.

B. Panel units shall be:

1. Metal wall panel – 36" wide, 3" thick or greater as needed to comply with the R-19 insulation requirement. The panel joint shall be a concealed fastener design with an offset shiplap that allows both panel faces to be mechanically attached to supports. The faces shall be stucco embossed and have a mesa pattern or other approved by Architect.

1.8 MATERIALS

A. Exposed face of the panel shall be aluminum zinc alloy coated steel with a minimum AZ50 coating class, conforming to ASTM A792 or steel G90 (min.) coating class, conforming to ASTM A653. Material thickness shall be 24 gauge steel minimum.

A. Interior face shall be 26 gauge steel G60 (min.) coating class, conforming to ASTM A653, or aluminum zinc alloy coated steel AZ 50 (min.) coating class, conforming to ASTM A792.

B. Insulating foam core shall be foamed-in-place rigid modified isocyanurate using an HCFC blowing agent and have the following physical properties:

1. Density: 2.0 pcf (nom.)
2. Compressive strength: 23 psi

3. Tensile strength: 39 psi
4. Shear strength: 26 psi
5. Closed cell: 93%
6. Cold aging: 1% volume decrease after 7 days at -20˚F
7. Heat aging: 3% volume increase after 28 days at 200˚F
8. Humid aging: 4% volume increase after 28 days at 158˚F and 100% RH

C. Trim and flashing shall be formed sheet metal that is equal in thickness and finish to that furnished for the panel faces.

D. All exposed fasteners shall be stainless steel, stainless steel clad, aluminum or cast zinc-aluminum alloy painted to match adjacent colors. All aluminum rivets shall be mill finish and unpainted.

E. Sealants shall be:

1. Field applied vapor barrier sealant in the panel joints shall be a butyl based material that is non-skinning, non-drying, resealable and shall have a service temperature range of –60˚F to 250˚F.
2. Field applied weather sealant shall be a silicone based material with excellent adhesion and cohesion properties and shall have a service temperature range of –60˚F to 400˚F

F. Panel clips shall be heavy gauge galvanized steel and concealed in the panel joint

1.9 FINISHES

A. Exterior face:

1. 24 gauge metal skin minimum with Signature® 300 – Premium 70% resin Kynar 500®/Hylar 5000® paint system, or approved equal utilizing manufacturer's available colors.

B. Interior face:
1. Interior face shall be 26 gauge steel G60 (min.) coating class, conforming to ASTM A653, or aluminum zinc alloy coated steel AZ 50 (min.) coating class, conforming to ASTM A792 with white polyester interior paint finish.

PART 2 - EXECUTION

2.1 INSPECTION

A. Panel Erector shall examine the alignment of the structural steel before installation of the panels. The steel shall be aligned to the tolerances established in the AISC Code of Standard Practice, Section 7, and the supplement modification controlling Section 7.11.3, adjustable items. The maximum deviation of steel alignment should be limited to 3/16" from the control with a 1/8" maximum change in deviation for any member for any 10'–0" run of panel. The erector shall not proceed until defects are corrected by the responsible contractor

B. Inspect all material included in this contract prior to installation. Manufacturer to be notified of any unacceptable material prior to installation, including freight damage

2.2 INSTALLATION

A. Erector shall familiarize himself with all erection instructions and drawings before starting work.

B. Install metal panels, clips, fasteners, trim and related sealants in accordance with approved shop drawings. Panels shall be cut in the field for bevels and openings. Flashing and trim shall be installed and in proper alignment for best appearance. Sealants shall be installed without skips or voids to insure weathertightness and integrity of the vapor barrier system

2.3 DAMAGED MATERIAL

A. Repair or replace all damaged material to the satisfaction of the architect and/or contractor if damage has been caused by the manufacturer or panel erector. The general contractor or builder shall be responsible for the protection of completed or installed areas from damage by other trades. Installed areas or portions of the work shall be inspected by the owner or general contractor and approved immediately following the completion of such areas. Subsequent damage will then be the responsibility of others

B. Remove all debris and metal filings from the panel and trim surfaces at the end of each work period to prevent damage to the panels and possible rust staining

END OF SECTION 07412

SECTION 07901 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes joint sealants for the following locations:

1. Exterior joints in vertical surfaces as indicated below:

a. Control and expansion joints in cast-in-place concrete.

2. Exterior joints in horizontal traffic surfaces as indicated below:

a. Control, expansion, and isolation joints in cast-in-place concrete slabs.
b. Other joints as indicated.

3. Interior joints in vertical surfaces and horizontal nontraffic surfaces as indicated below:

a. Perimeter joints of exterior openings where indicated.
b. Tile control and expansion joints.
c. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
d. Perimeter joints of toilet fixtures.
e. Other joints as indicated.

4. Interior joints in horizontal traffic surfaces as indicated below:

a. Control and expansion joints in cast-in-place concrete slabs.
b. Control and expansion joints in tile flooring.
c. Other joints as indicated.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 8 "Glass and Glazing" for sealants used in glazing.
2. Division 9 Section "Tile" for sealing tile joints.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data from manufacturers for each joint sealant product required.

C. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.

D. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.

E. Qualification data complying with requirements specified in "Quality Assurance" article. Include list of completed projects with project names addresses, names of Architects and Owners, plus other information specified.

F. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.

G. Product test reports for each type of joint sealants indicated, evidencing compliance with requirements specified.

H. Preconstruction field test reports indicating which products and joint preparation methods demonstrate acceptable adhesion to joint substrates.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

B. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.
2. When joint substrates are wet.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until

contaminants capable of interfering with their adhesion are removed from joint substrates.

1.8 SEQUENCING AND SCHEDULING

A. Sequence installation of joint sealants to occur not less than 21 or more than 30 days after completion of waterproofing, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors: Provide color of exposed joint sealants to comply with the following:

1. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

2.2 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing elastomeric sealants that comply with ASTM C 920 and other requirements indicated on each Elastomeric Joint Sealant Data Sheet at end of this Section, including those requirements referencing ASTM C 920 classifications for Type, Grade, Class, and Uses.

1. Additional Movement Capability: Where additional movement capability is specified in Elastomeric Joint Sealant Data Sheet, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for Uses indicated.

B. Available Products: Subject to compliance with requirements, elastomeric sealants that may be incorporated in the Work include, but are not limited to, the products specified in each Elastomeric Sealant Data Sheet.

2.3 LATEX JOINT SEALANTS

A. General: Provide manufacturer's standard one-part, nonsag, mildew-resistant, paintable latex sealant of formulation indicated that is recommended for exposed applications on interior and protected exterior locations and that accommodates indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.

B. Acrylic-Emulsion Sealant: Provide product complying with ASTM C 834 that accommodates joint movement of not more than 5 percent in both extension and compression for a total of 10 percent.

C. Available Products: Subject to compliance with requirements, latex joint sealants that may be incorporated in the Work include, but are not limited to, the following:

1. Acrylic-Emulsion Sealant:

a. "AC-20," Pecora Corp.

b. "Sonolac," Sonneborn Building Products Div., ChemRex, Inc.
c. "Tremco Acrylic Latex 834," Tremco, Inc.

2.4 JOINT SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Open-cell polyurethane foam.

2.5 JOINT FILLERS FOR CONCRETE PAVING

A. General: Provide joint fillers of thickness and widths indicated.

B. Bituminous Fiber Joint Filler: Performed strips of composition below, complying with ASTM D 1751:

1. Asphalt saturated fiberboard.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested

and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form release agents from concrete.
4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   a. Do not leave gaps between ends of joint fillers.
   b. Do not stretch, twist, puncture, or tear joint fillers.
   c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.

D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

E. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

ELASTOMERIC JOINT SEALANT DATA SHEET

Elastomeric Joint Sealant Designation: ES-1

Base Polymer: Urethane.

Type: S (single component).

Grade: P (pourable).

Class: 25.

Use Related to Exposure: T (traffic).

Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated.

Use O Joint Substrates: Galvanized steel, brick, concrete, ceramic tile, and wood.

Available Products: "NR-201 Urexpan," Pecora Corp.; "Vulkem 45," Mameco; "Sonolastic SL 1, " Sonneborn Building Products Division.

ELASTOMERIC JOINT SEALANT DATA SHEET

Elastomeric Joint Sealant Designation: ES-2

Base Polymer: Urethane silicone.

Type: M (multi component).

Grade: NS (nonsag).

Class: 25.

Additional Movement Capability: 50 percent movement in extension and 50 percent in compression for a total of 100 percent movement.

Use Related to Exposure: NT (nontraffic).

Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

Use O Joint Substrates: Coated glass, color anodized aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, ceramic tile, and wood.

Available Products: "Dynatrol II," Pecora Corp.; "Vulkem 922," Mameco; Sonolastic NP2," Sonneborn Building Products Division.

ELASTOMERIC JOINT SEALANT DATA SHEET

Elastomeric Joint Sealant Designation: ES-3

Base Polymer: Acid-curing silicone.

Type: S (single component).

Grade: NS (nonsag).

Class: 25.

Use Related to Exposure: NT (nontraffic).

Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.

Use O Joint Substrates: Coated glass, color anodized aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, and ceramic tile.

Available Products: "786 Mildew Resistant," Dow Corning; "Sanitary 1700," GE Silicones.

JOINT SEALANT SCHEDULE		
SEALANT DESIGNATIONS	JOINT SEALERS	DESCRIPTION OF JOINT CONSTRUCTION AND LOCATION WHERE SEALANT IS TYPICALLY APPLIED*.
ES1	One-Part Pourable Urethane Sealant	Exterior and interior joints in horizontal surfaces of concrete; between metal and concrete, mortar and masonry.
ES2	Multi-Part Nonsag Urethane Sealant	Exterior and interior joints in vertical surfaces of concrete and masonry; between metal and concrete or mortar; interior and exterior perimeter joints of metal frames in exterior walls; exterior overhead joints.
ES3	One-Part Mildew-Resistant Silicone Sealant	Interior joints in vertical surfaces of ceramic tile in toilet rooms, and perimeter of plumbing fixture/ceramic tile joints.
LS	Acrylic-Emulsion Sealant	Interior joints in field-painted vertical and overhead surfaces at perimeter of hollow metal door frames; in gypsum drywall, plaster, concrete, and concrete masonry; and all other interior joints not indicated otherwise.
* Install sealant indicated in joints fitting descriptions listed.		

END OF SECTION 07901

SECTION 08111 - STANDARD STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following products manufactured in accordance with SDI Recommended Standards:

1. Doors: Seamless, hollow or composite construction standard steel doors for interior and exterior locations.
2. Frames: Pressed steel frames for doors, transoms, sidelights, mullions, interior glazed panels, and other interior and exterior openings of following type:

a. Welded unit type.

3. Assemblies: Provide thermal rated (insulated) doors where indicated.

4. Provide factory primed doors and frames to be field painted.

B. Painting primed doors and frames is specified in Division 9 Section "Painting."

C. Door hardware is specified in another Division 8 Section.

D. Glass and Glazing are specified in another Division 8 Section.

E. Division 13 “Metal Building Systems” to coordinate installation.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.

C. Shop drawings showing fabrication and installation of standard steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.

1. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.

2. Indicate coordinate of glazing frames and stops with glass and glazing requirements.

1.4 QUALITY ASSURANCE

A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications

Standard Steel Doors and Frames" ANSI/SDI-100 and as herein specified.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Inspect doors and frames upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4-inches high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4-inches spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering standard steel doors and frames which may be incorporated in the work include; but are not limited to, the following:

1. Standard Steel Doors and Frames:

a. Amweld Building Products, Inc.
b. Ceco Corp.
c. Fenestra Corp.
d. Republic Builders Products.
e. Steelcraft Manufacturing Co.
f. Curries
g. Or, pre-approved equal.

2.2 MATERIALS

A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.

B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM A 568.

C. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 526, or drawing quality, ASTM A 642, hot dipped galvanized in accordance with ASTM A 525, with A60 or G60 coating designation, mill phosphatized.

D. Supports and Anchors: Fabricate of not less than 18-gage sheet steel; galvanized where used with galvanized frames.

E. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize in compliance with ASTM A 153, Class C or D as applicable.

F. Shop Applied Paint: Apply after fabrication.

1. Primer: Rust-inhibitive enamel or paint, either air-drying or baking, suitable as a base for specified finish paints complying with ANSI A224.1, "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames."

2.3 DOORS

A. Provide metal doors of SDI grades and models specified below or as indicated on drawings or schedules:

1. Interior Doors: ANSI/SDI-100, Grade II, heavy-duty, Model 3 or 4, minimum 18-gage cold-rolled sheet steel faces.
2. Exterior Doors: ANSI/SDI-100, Grade III, extra heavy-duty, Model 4, minimum 16-gage galvanized steel faces.

2.4 FRAMES

A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, of types and styles as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate frames of minimum 18-gage cold-rolled steel.

1. Fabricate frames with mitered or coped corners, welded construction for all applications.
2. Form exterior frames from 14-gage galvanized steel.

B. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.

C. Plaster Guards: Provide minimum 26-gage steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

2.5 FABRICATION

A. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory- assembled before shipment, to assure proper assembly at project site. Comply with ANSI/SDI-100 requirements.

1. Internal Construction: Manufacturer's standard honeycomb, polyurethane, polystyrene, unitized steel grid, vertical steel stiffeners, or rigid mineral fiber core with internal sound deadener on inside of face sheets where appropriate in accordance with SDI standards.
2. Clearances: Not more than 1/8 inch at jambs and heads except between non-fire-rated pairs of doors not more than 1/4 inch. Not more than 3/4 inch at bottom.

B. Fabricate exposed faces of doors and panels, including stiles and rails of non-flush units, from only cold-rolled steel.

C. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers and moldings from either cold-rolled or hot-rolled steel.

E. Fabricate exterior doors, panels, and frames from galvanized sheet steel in accordance with

SDI-112. Close top and bottom edges of exterior doors as integral part of door construction or by addition of minimum 16-gage inverted steel channels.

F. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

G. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal insulating door and frame assemblies and tested in accordance with ASTM C 236 or ASTM C 976 on fully operable door assemblies.

1. Unless otherwise indicated, provide thermal-rated assemblies with U factor of 0.41 Btu/(hr x sq ft x deg F.) or better.

H. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware in accordance with final Door Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 Series Specifications for door and frame preparation for hardware.

I. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at project site.

J. Locate hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware on Standard Steel Doors and Frames," published by Door and Hardware Institute.

K. Shop Painting: Clean, treat, and paint exposed surfaces of steel door and frame units, including galvanized surfaces.

1. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint.
2. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.

L. Glazing Stops: Minimum 20 gage steel or .040-inch-thick aluminum.

1. Provide non-removable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
2. Provide screw applied removable glazing beads on inside of glass, louvers, and other panels in doors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install standard steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.

B. Placing Frames: Comply with provisions of SDI-105 "Recommended Erection Instructions For Steel Frames," unless otherwise indicated.

1. Place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.

2. In masonry construction, locate 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry Tee anchors.

C. Door Installation: Fit hollow metal doors accurately in frames, within clearances specified in ANSI/SDI-100.

3.2 ADJUST AND CLEAN

A. Prime Coat Touch-up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

B. Protection Removal: Immediately prior to final inspection, remove protective plastic wrappings from pre-finished doors.

C. Final Adjustments: Check and readjust operating hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF SECTION 08111

SECTION 08360 - SECTIONAL OVERHEAD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes steel frame and steel panel sectional overhead doors, electric motor-operated.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.

B. Product data, roughing-in diagrams, and installation instructions for each type and size of overhead door. Include manufacturer's operating instructions and maintenance data.

C. Shop drawings for special components and installations which are not fully dimensioned or detailed in manufacturer's data.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide each sectional overhead door as a complete unit produced by a single manufacturer, including frames, sections, brackets, guides, tracks, counterbalance mechanisms, hardware, operators, and installation accessories.

B. Inserts and Anchorages: Furnish inserts and anchoring devices that must be set in concrete or built into masonry for unit installation. Provide setting drawings, templates, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.

C. See concrete and masonry Sections for instruction on installing inserts and anchorage devices.

D. Wind Loading: Design and reinforce sectional overhead doors to withstand a 20-psf wind-loading pressure.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Overhead Door Corp.
2. Raynor Garage Door Co.
3. Ceco/Windsor Door.
4. Or, pre-approved equal

2.2 STEEL SECTIONS

A. Construct door sections from galvanized, structural-quality carbon steel sheets complying with ASTM A 446, Grade A, or ASTM A 526, with a minimum yield strength of 33,000 psi, and a minimum G60 zinc coating complying with ASTM A 525.

1. Steel Sheet Thickness: 0.0396 inch (20 gage).
2. Exterior Section Face: Ribbed or fluted.

B. Fabricate sections from a single sheet to provide units not more than 24 inches high, and nominally 1-5/8 inches deep. Roll horizontal meeting edges to a continuous shiplap, rabbeted, or keyed weather seal, with a reinforcing flange return.

C. Enclose open section with 16-gage galvanized steel channel, end stiles welded in place. Provide intermediate stiles, cut to door section profile, spaced at not more than 48 inches o.c. and welded in place.

D. Reinforce bottom section with a continuous channel or angle conforming to bottom section profile.

E. Reinforce sections with continuous horizontal and diagonal reinforcing, as required by door width and design wind loading. Provide galvanized steel bars, struts, trusses or strip steel, formed to depth, and bolted or welded in place.

F. Insulate inner core of steel sections with manufacturer's standard foam type insulation.

1. Enclose insulation with manufacturer's standard steel sheet secured to door panel.
2. U-value: 0.067 BTU. = R-Value 14.92

G. Finish door sections as follows:

1. Apply manufacturer's standard prime coat, applied to both door faces after forming. Finish door with 2 coats baked on finish. See drawings for color selection.

2.3 TRACKS, SUPPORTS, AND ACCESSORIES

A. Tracks: Provide manufacturer's heavy duty, galvanized-steel track system, sized for door size and weight, and designed for clearances shown. Provide complete track assembly including brackets, bracing and reinforcing for rigid support of ball-bearing roller guides for required door type and size. Slot vertical sections of track at 2 inches o.c. for door-drop safety device. Slope tracks at proper angle from vertical, or otherwise design to ensure tight closure at jambs when door unit is closed. Weld or bolt to track supports.

B. Track Reinforcement and Supports: Provide galvanized-steel track reinforcement and support members. Secure, reinforce and support tracks as required for size and weight of door to provide strength and rigidity without sag, sway, and vibration during opening and closing of doors.

C. Support and attach tracks to opening jambs with continuous angle welded to tracks and attached to wall. Support horizontal (ceiling tracks) with continuous angle welded to track and supported by laterally braced attachments to overhead structural members at curve and end of tracks.

D. Weather Seals: Provide continuous rubber, neoprene, or flexible vinyl adjustable weatherstrip gasket at tops and compressible astragal on bottoms of each overhead door.

Provide continuous flexible seals at door jamb edges for a fully weathertight installation

E. Insulated Vision Panels: Provide pre-assembled clear float-glass or plastic vision panels in arrangement shown. Set glass in rubber or neoprene channel glazing strips. Provide removable stops of same material at door section frames.

1. Vision Panel Thickness: 5/8 inches.

2.4 HARDWARE

A. General: Provide heavy-duty, rust-resistant hardware, with galvanized or cadmium-plated or stainless steel fasteners, to suit type of door.

B. Hinges: Provide heavy steel hinges at each end stile and at each intermediate stile, per manufacturer's recommendations for size of door. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is not possible. Provide double-end hinges, where required, for doors exceeding 16 feet in width, unless otherwise recommended by door manufacturer.

C. Rollers: Provide heavy-duty rollers, with steel ball bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide roller tires to suit size of track 3-inch diameter for 3-inch track; and as follows:

1. Case-hardened steel tires for normal installations.

2.5 COUNTERBALANCING MECHANISM

A. Torsion Spring: Operation by torsion-spring counterbalance mechanism, consisting of adjustable-tension, tempered-steel torsion springs mounted on a case hardened steel shaft. Connect to door with galvanized aircraft-type lift cables. Provide springs calibrated for 10,000 cycles minimum.

B. Provide cast-aluminum or grey-iron casting cable drums, grooved to receive cable. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of shaft. Provide one additional midpoint bracket for shafts up to 16 feet long and two additional brackets at one-third points to support shafts over 16 feet long, unless closer spacing recommended by door manufacturer.

C. Include a spring-loaded, steel or bronze cam mounted to bottom door roller assembly on each side, designed to automatically stop door if either cable breaks.

D. Provide a spring bumper at each horizontal track to cushion door at end of opening operation.

2.6 ELECTRIC DOOR OPERATORS

A. General: Furnish electric door-operator assembly of size and capacity recommended and provided by door manufacturer; complete with electric motor and factory-prewired motor controls, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations and control devices.

B. Provide hand-operated disconnect or mechanism for automatically engaging sprocket-chain operator and releasing brake for emergency manual operation. Include interlock device to automatically prevent motor from operating when emergency sprocket is engaged.

C. Design operator so that motor may be removed without disturbing limit-switch adjustment and

without affecting emergency auxiliary operator.

D. Door Operator Type: Provide the following:

1. Jack Shaft Operator with solenoid activated primary drive and chain and sprocket secondary drive.

E. Electric Motors: Provide high-starting torque, reversible, constant-duty, Class A-insulated electric motors with overload protection, sized to move door in either direction, from any position, at not less than 2/3 foot or more than 1 foot per second.

1. Coordinate wiring requirements and current characteristics of motors with building electrical system.
2. Provide totally enclosed, non-ventilated-type motors, fitted with plugged drain, and controller with NEMA Type 4 enclosure where required.

F. Remote Control Station: Provide momentary-contact, three-button control station with push button controls labeled "Open," "Close," and "Stop."

1. Provide interior units, full-geared, surface-mounted, heavy-duty, with general purpose NEMA Type 1 enclosure.
2. Provide remote control transmitters.
   a. Quantity: 1 per door.

H. Obstruction Detection Device: Provide each motorized door with indicated external automatic safety sensors able to protect full width of door opening. Activation of sensor immediately stops and reverses downward door travel.

1. Photoelectric Sensor: Manufacturer’s standard system designed to detect an obstruction in door opening without contact between door and obstruction.

   a. Self-Monitoring Type: Provide self-monitoring sensor designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door operates to close only with constant pressure on close button.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install door, track, and operating equipment complete with necessary hardware, jamb and head mold stops, anchors, inserts, hangers, and equipment supports according to shop drawings, manufacturer's instructions, and as specified.

B. Fasten vertical track assembly to framing at not less than 24 inches o.c. Hang horizontal track from structural overhead framing with angle or channel hangers, welded and bolt-fastened in place. Provide sway bracing, diagonal bracing, and reinforcing as required for rigid installation of track and door-operating equipment.

C. After completing installation, including work by other trades, lubricate, test, and adjust doors to operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.

END OF SECTION 08360

SECTION 08520 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes heavy commercial-grade aluminum window units of the performance class indicated. Window types required include:

1. Horizontal Sliding Windows.
2. Fixed windows and frames.
3. Flashing and break metal to match frames.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 7 Section "Joint Sealants" for sealants between frame and wall.
2. Division 8 Section "Glazing" for glass systems and components.
3. Division 13 Section “Metal Building Systems to coordinate installation.

1.3 DEFINITIONS

A. Performance class number included as part of the window designation system is the actual design pressure in pounds per sq. ft. used to determine the structural test pressure and water test pressure.

1. Structural test pressure, windload test, is equivalent to 150 percent of the design pressure.
2. Water leakage resistance test pressure is equivalent to 15 percent of the design pressure with 2.86 psf as a minimum.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide aluminum window units that comply with performance requirements specified, as demonstrated by testing manufacturer's corresponding stock systems according to test methods indicated.

B. Design Requirements: Comply with structural performance, air infiltration, and water penetration requirements indicated in AAMA 101 for type, grade, and performance class of window units required.

1. Design wind velocity at the project site is 90 mph, Expos. “C”, importance factor 1.0

C. Testing: Test each type and size of required window unit through a recognized independent testing laboratory or agency, in accordance with ASTM E 330 for structural performance, with ASTM E 283 for air infiltration, and with both ASTM E 331 and ASTM E 547 for water penetration. Provide certified test results.

1. Structural Performance: Provide window units with no failure or permanent deflection in excess of 0.4 percent of any member's span after removal of the imposed load, for a positive (inward) and negative (outward) test pressure of 30

lbf/sq. ft.

2. Air Infiltration: Provide units with air infiltration rate of not more than 0.37 cfm/ft. of operable sash joint for an inward test pressure of 1.57 lbf/sq. ft.
3. Water Penetration: Provide units with no water penetration as defined in the test method at an inward test pressure of 15 percent of the design pressure.
4. Condensation Resistance: Where window units are indicated to be of "thermal-break construction," provide units that have been tested for thermal performance in accordance with AAMA 1503.1 showing a condensation resistance factor (CRF) of 45.
5. Forced-Entry Resistance: Provide window units that comply with requirements for Performance Level 10 when tested in accordance with ASTM F 588.
6. Horizontal-Sliding Windows: Comply with AAMA/NWWDA 101/I.S.2 for the following tests:
   a. Operating Force.
   b. Deglazing: When tested according to ASTM E 987.

1.5 SUBMITTALS

A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.

1. Product data for each type of window required, including:

   a. Construction details and fabrication methods.
   b. Profiles and dimensions of individual components.
   c. Data on hardware, accessories, and finishes.
   d. Recommendations for maintenance and cleaning of exterior surfaces.

2. Shop drawings for each type of window required. Include information not fully detailed in manufacturer's standard product data and the following:

   a. Layout and installation details, including anchors.
   b. Elevations of continuous work at 1/4-inch scale and typical window unit elevations at 3/4-inch scale.
   c. Full-size section details of typical composite members, including reinforcement.
   d. Glazing details.
   e. Accessories.

3. Samples for Initial Color Selection: Submit samples of each specified finish on 12-inch-long sections of window members. Where finishes involve normal color variations, include sample sets showing the full range of variations expected.
4. Samples for Verification Purposes: The Architect reserves the right to require additional samples, that show fabrication techniques and workmanship, and design of hardware and accessories.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed installation of aluminum windows similar in design and extent to those required for the project and whose work has resulted in construction with a record of successful in-service performance.

B. Standards: Requirements for aluminum windows, terminology and standards of performance, and fabrication workmanship are those specified and recommended in AAMA 101 and applicable general recommendations published by AAMA.

C. Single-Source Responsibility: Provide aluminum window units from one source and produced by a single manufacturer.

D. Design Concept: The drawings indicate the size, profiles, and dimensional requirements of the aluminum window types required and are based on the specific type and model indicated. Aluminum windows by other manufacturers may be considered provided deviations in dimensions and profiles are minor and do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

1.7 PROJECT CONDITIONS

A. Field Measurements: Check actual window openings by accurate field measurement before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

1. Where necessary, proceed with fabrication without field measurements, and coordinate fabrication tolerances to ensure proper fit of window units.

1.8 WARRANTY

A. Aluminum Window Warranty: Submit a written warranty, executed by the window manufacturer, agreeing to repair or replace window units that fail in materials or workmanship within the specified warranty period. Failures include but are not necessarily limited to:

1. Structural failures including excessive deflection, excessive leakage, or air infiltration.
2. Faulty operation of sash and hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

B. Warranty Period: 3 years after the date of Substantial Completion.

C. The warranty shall not deprive the Owner of other rights or remedies that the Owner may have under other provisions of the Contract Documents and is in addition to and runs concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Horizontal Sliding Windows:
   a. Arcadia
   b. Capital Products Corporation
   c. EFCO Corporation
   d. Kawneer Company, Inc.
   e. Peerless Products, Inc.
   f. Or, pre-approved equal.

2. Fixed Windows:
   a. Arcadia

b. Capital Products Corporation
c. EFCO Corporation
d. Kawneer Company, Inc.
e. Peerless Products, Inc.
f. Or, pre-approved equal.

2.2 MATERIALS

A. Aluminum Extrusions: Provide alloy and temper recommended by the window manufacturer for the strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength and not less than 0.062 inch thick at any location for main frame and sash members.

1. Provide flashing and break metal as indicated on the drawings, metal and finish to match frames.

B. Fasteners: Provide aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by the manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components of window units.

1. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125 inch thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads or provide standard noncorrosive pressed-in splined grommet nuts.
2. Exposed Fasteners: Do not use exposed fasteners.

C. Anchors, Clips, and Window Accessories: Fabricate anchors, clips, and window accessories of aluminum, nonmagnetic stainless steel, or hot-dip zinc-coated steel or iron complying with the requirements of ASTM B 633; provide sufficient strength to withstand design pressure indicated.

D. Compression-Type Glazing Strips and Weatherstripping: Unless otherwise indicated, and at the manufacturer's option, provide compressible stripping for glazing and weatherstripping such as molded EPDM or neoprene gaskets complying with AAMA SG-1 or with ASTM D 2000 Designation 2BC415 to 3BC620, or molded PVC gaskets complying with ASTM D 2287, or molded expanded EPDM or neoprene gaskets complying with ASTM C 509, Grade 4.

E. Wire Fabric Insect Screen: Provide 18 by 18, 18 by 16, or 18 by 14 mesh of 0.013-inch diameter coated aluminum wire, complying with FS RR-W-365, Type VII.

2.3 HARDWARE

A. General: Provide the manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum and of sufficient strength to perform the function for which it is intended.
B. Four-Bar Friction Hinges: Comply with AAMA 904.1

1. Friction Shoes: Provide friction shoes of nylon or other nonabrasive, nonstaining, noncorrosive, durable material.

2.4 ACCESSORIES

A. General: Provide the manufacturer's standard accessories that comply with indicated standards.

B. Insect Screens: Provide insect screens for each operable exterior sash or ventilator. Locate

screens on the inside or outside of the window sash, depending upon window type. Design windows and hardware to accommodate screens in a tight-fitting removable arrangement, with a minimum of exposed fasteners and latches.

C. Screen Frames: Fabricate frames of tubular-shaped extruded or formed aluminum members of 0.040-inch minimum wall thickness, with mitered or coped joints and concealed mechanical fasteners. Finish frames to match window units.

1. Provide removable PVC spline-anchor concealing the edge of the screen frame.

2.5 Horizontal-Sliding Windows

A. Provide the following operating hardware:

1. Sash Rollers: Stainless-steel, lubricated ball-bearing rollers with nylon tires.
2. Sash Lock: Cam-action sweep sash lock and keeper at meeting rails.
3. Sash Lock: Spring-loaded, snap-type lock at jambs; two per sash.
4. Sash Lock: Spring-loaded plunger lock with keeper on meeting rail; two per sash.
5. Sash Lock: Cam action sweep lock handle.
6. Limit Device: Sash stop limit device; mounted in bottom of pull stile.
7. Removable Lift-Out Sash: Design windows and provide with tamperproof hardware to permit removal of sash from inside for cleaning.

2.6 FIXED WINDOWS

A. Window Grade and Class: Comply with requirements of AAMA Grade and Performance Class HC40.

2.7 FABRICATION

A. General: Fabricate aluminum window units to comply with indicated standards. Include a complete system for assembly of components and anchorage of window units.

1. Provide units that are reglazable without dismantling sash or ventilator framing.
2. Prepare window sash for glazing.

B. Thermal-Break Construction: Fabricate window units with an integral concealed low-conductance thermal barrier, located between exterior materials and window members exposed on the interior, in a manner that eliminates direct metal-to-metal contact.

1. Provide thermal-break construction that has been in use for not less than 3 years, has been tested to demonstrate resistance to thermal conductance and condensation, and has been tested to show adequate strength and security of glass retention.
2. Weepholes: Provide weepholes and internal passages to conduct infiltrating water to the exterior.
3. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, in the manner indicated.
4. Glazing Stops: Provide screw-applied or snap-on glazing stops, coordinated with glass selection and glazing system indicated. Finish glazing stops to match window units.

C. Preglazed Fabrication: Preglaze window units at the factory where possible and practical for

applications indicated. Comply with glass and glazing requirements of the "Glass and Glazing" sections of these specifications and AAMA 101.

2.8 FINISHES

A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

C. Organic:
1. Finish all exposed areas of aluminum windows and components with paint. Color shall be white.

AA Description	Description	AAMA Guide Spec.
AA-M12-C42-R1X	Kynar 500®/Hylar 5000® Fluropon®,	2605-98
AA-M12-C42-R1X	Kynar®/Hylar® Acroflur™	2604-98

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances; rough opening dimensions; levelness of sill plate; coordination with wall flashings, vapor retarders, and other built-in components; operational clearances; and other conditions affecting performance of work.

1. Metal surfaces shall be dry; clean; free of grease, oil, dirt, rust and corrosion, and welding slag; without sharp edges or offsets at joints.

3.2 INSTALLATION

A. Comply with manufacturer's specifications and recommendations for installation of window units, hardware, operators, and other components of the work.

B. Set window units plumb, level, and true to line, without warp or rack of frames or sash. Provide proper support and anchor securely in place.

1. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with the requirements specified under paragraph "Dissimilar Materials" in the Appendix to AAMA 101.

C. Set sill members and other members in a bed of compound or with joint fillers or gaskets, as shown, to provide weathertight construction. Refer to the "Joint Sealer" sections of Division 7 for compounds, fillers, and gaskets to be installed concurrently with window units. Coordinate installation with wall flashings and other components of the work.

3.3 ADJUSTING

A. Adjust operating sash and hardware to provide a tight fit at contact points and at

weatherstripping for smooth operation and a weathertight closure.

3.4 CLEANING

A. Clean aluminum surfaces promptly after installation of windows. Exercise care to avoid damage to protective coatings and finishes. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and other moving parts.

3.5 PROTECTION

A. Initiate and maintain protection and other precautions required through the remainder of the construction period, to ensure that, except for normal weathering, window units will be free of damage or deterioration at the time of Substantial Completion.

END OF SECTION 08520

SECTION 08521 - HORIZONTAL SLIDING VINYL (PVC) WINDOWS

PART 1 GENERAL

1.1 SCOPE OF WORK:

Scope of work shall include but not be limited to the following.

1. Furnish and install new windows.
2. All other work, materials and labor required for a complete installation.

1.2 SECTION INCLUDES

A. Horizontal Sliding Window Units.

1.3 RELATED WORK

A. Joint Sealers.

1. Sealant around windows shall be class 25, nonsag, multi component urethane silicone with 50 percent movement in extension and compression. Available products are Dynatrol II, Vulkem 922 and Sonolastic NP2.

1.4 REFERENCES

A. AAMA/NWWDA 101/I.S. 2-97 - Voluntary Standard for Aluminum and Poly (Vinyl Chloride) (PVC) Prime Windows and Glass Doors.

B. NFRC 100 - Thermal Properties; National Fenestration Rating Council.

C. NFRC 200 - Solar Heat Gain; National Fenestration Rating Council.

D. ASTM D 3656 - Standard Specification for Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Fiber Yarn.

E. ASTM D 3678 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Interior Profile Extrusions.

F. ASTMD 4726-02 Standard Specification for Rigid Poly (Vinyl Chloride((PVC) Exterior Profiel Extrusions.

G. ASTM D 4028 - Standard Specification for Solar Screening Woven from Vinyl-Coated Fiber Glass Yarn.

H. ASTM E 774 - Standard Specification for Sealed Insulating Glass.

I. IGCC - Classification of Insulating Glass Units; Insulated Glass Certification Council.

J. U.S. Department of Energy - Energy Star(R) Windows Program.

1.5 SUBMITTALS

A. Submit product data.

B. Product Data: Manufacturer's standard details and catalog data demonstrating compliance with referenced standards; include manufacturer's standard installation instructions.

C. Drawings: Manufacturer's product drawings showing details of fabrication, hardware, weatherstripping, fasteners, screens, glazing, accessories, and related items.

D. Test Reports: For each window type specified, furnish test reports from accredited independent testing laboratory certifying that identical or larger window units meet requirements specified for air infiltration, water penetration and structural performance by AAMA/NWWDA 101/I.S. 2-97, for thermal performance by NFRC-97, and for seal integrity of insulating glass units by IGCC.
1. Test reports to test standards other than those listed will not be accepted.

E. Closeout Submittals: Warranty documents, properly executed.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum ten (10) years experience producing vinyl (PVC) windows.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver windows to project site in undamaged condition; handle windows to prevent damage to components and to finishes.

B. Store windows out of contact with ground; protect windows from weather and construction traffic in well-ventilated area.

1.8 WARRANTY

A. Warranty Period: 3 years after the date of Substantial Completion.

B. The warranty shall not deprive the Owner of other rights or remedies that the Owner may have under other provisions of the Contract Document and is in addition to and runs concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers
1. Alside Window Systems
2. CertainTeed Corp.
3. Kolbe & Kolbe
4. Marvin
5. Milgard Windows
6. Viking
7. Weather Shield
8. Or, pre-approved equal.

2.2 HORIZONTAL SLIDING WINDOW UNITS

A. Product Requirements

1. Grade: AAMA/NWWDA 101/I.S. 2-97, HS-C30, for 71-inch wide by 59-inch high window unit; exceeding grade requirements as follows:
   a. Water test pressure: 6.75 pounds per square foot.
   b. Air infiltration: 0.10 cubic feet per minute per linear foot at 25 miles per hour.
   c. Structural test pressure: 60 pounds per square foot.

2. Thermal performance, in accordance with NFRC 100-97, for 72-inch wide by 48-inch high window unit: U-Value 0.32.
3. Solar Heat Gain Coefficient, in accordance with NFRC 200-97, for 60-inch wide by 36-inch high window unit shall not exceed 0.32.
4. Glazing: Low-e sealed insulating glass unit, 13/16 inch unit thickness, with DSB glass and argon gas fill; U.S. Department of Energy Energy Star(R) conformance labeled.
5. Sealed Insulating Glass Units: Conform to ASTM E 774, Level CBA.
6. Frame: PVC extrusions, butt-joint construction at corners, joined with screws into integral screw ports; multi-chambered weep system with wind-blocking covers.
7. Sash: PVC extrusions, aluminum-reinforced vertical members for window units over 29-1/2 inches high, lift-out operation of both operable sash units, with nylon-encased metal dual-roller system, full-interlocking meeting rails, full sash capture at jamb, sash vent lock, theft-deterrent blocks, and cam-type sweep locks and keepers.
8. Insect screening: Roll-formed or extruded aluminum channel frames, with 18 by 16 fiberglass mesh secured with continuous vinyl gasket, removable for screen replacement.

2.3 FABRICATION

A. Window Units: Assemble units completely in factory, including operating hardware and glazing. Comply with glass and glazing requirements of the “Glass and Glazing” section of these specifications and AAMA 101.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Openings are in correct location, and of correct size, in accordance with approved shop drawings and manufacturer's installation instructions.

B. Installer's Examination:
   1. Have installer of this section examine conditions under which construction activities of this section are to be performed, then submit written notification if such conditions are unacceptable.
   2. Transmit two copies of installer's report to Owner within 24 hours of receipt.
   3. Beginning construction activities of this section before unacceptable conditions have been corrected is prohibited.
   4. Beginning construction activities of this section indicates installer's acceptance of conditions.

3.2 INSTALLATION

A. Install products specified in this section square, plumb and level, in accordance with approved shop drawings and manufacturer's installation instructions.

B. Install joint sealers as specified.

3.3 ADJUSTING

A. Adjust operating hardware for correct operation in accordance with manufacturer's installation instructions.

3.4 CLEANING

A. Clean interior and exterior surfaces free of labels, mortar, plaster, paint, joint sealers, and other foreign matter to prevent damage to weatherstrip, and to prevent interference with operation of hardware.

3.5 PROTECTION

A. Protect ventilators and operating parts from dirt and damage caused by subsequent construction activities.

B. Replace units damaged by subsequent construction activities.

END OF SECTION 08521

SECTION 08710 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes items known commercially as finish or door hardware that are required for swing doors, except special types of unique hardware specified in the same sections as the door frames on which they are installed.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 6 Section "Interior Architectural Woodwork" for cabinet hardware.
2. Division 8 Section "Standard Steel Doors and Frames" for silencers integral with hollow metal frames.

C. Products furnished but not installed under this Section include:

1. Cylinders for locks on entrance doors.
2. Final replacement cores and keys to be installed by End User.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification sections.

B. Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

C. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:

a. Type, style, function, size, and finish of each hardware item.
b. Name and manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of each hardware set cross referenced to indications on Drawings both on floor plans and in door and frame schedule.
e. Explanation of all abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for hardware.
g. Door and frame sizes and materials.
h. Keying information.

2. Submittal Sequence: Submit final schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work that is critical in the Project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of schedule.

3. Keying Schedule: Submit separate detailed schedule indicating clearly how the End User's final instructions on keying of locks has been fulfilled.

D. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.4 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.

1.5 PRODUCT HANDLING

A. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

B. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).

1.6 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for End User’s continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Butts and Hinges:

a. Hager Hinge Co.
b. H. Soss & Company.
c. Stanley Hardware, Div. Stanley Works.
d. Mckinney
e. Or, pre-approved equal.

2. Cylinders and Locks:

a. Best Lock Corp.
b. Corbin & Russwin Architectural Hardware, Div. Black & Decker Corp.
c. Falcon Lock Co.
d. Sargent Manufacturing Company.
e. Schlage Lock, Div. Ingersoll-Rand Door Hardware Group.

f. Yale Security Inc.
g. Hagar
h. Hadrian Metal Lockers
i. Or, pre-approved equal.

3. Overhead Closers:

a. Dorma Door Controls International.
b. LCN, Div. Ingersoll-Rand Door Hardware Group.
c. Monarch Hardware & Mfg. Co., Div Newman Tonks, Inc.
d. Rixson-Firemark, Div. Yale Security Inc.
e. Sargent Manufacturing Company.
f. Russwin
g. Hagar
h. Or, pre-approved equal.

4. Door Trim Units (Kickplates):

a. Baldwin Hardware Corp.
b. Builders Brass Works Corp.
c. Hager Hinge Co.
d. H. B. Ives, A Harrow Company.
e. Triangle Brass Manufacturing Company (Trimco).
f. Quality
g. Or, pre-approved equal.

5. Door Stripping and Seals:

a. Hager Hinge Co.
b. National Guard Products, Inc.
c. Pemko Manufacturing Co., Inc.
d. Reese Enterprises, Inc.
e. Zero International, Inc.
f. Ultra
g. Or, pre-approved equal.

6. Thresholds:

a. Hager Hinge Co.
b. National Guard Products, Inc.
c. Pemko Manufacturing Co., Inc.
d. Reese Enterprises, Inc.
e. Zero International, Inc.
f. Ultra
g. Or, pre-approved equal.

2.2 SCHEDULED HARDWARE

A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in the "Hardware Schedule" at the end of this Section. Products are identified by using hardware designation numbers of the following:

1. Manufacturer's Product Designations: The product designation and name of one manufacturer are listed for each hardware type required for the purpose of establishing minimum requirements. Provide either the product designated or, where

more than one manufacturer is specified under the Article "Manufacturers" in Part 2 for each hardware type, the comparable product of one of the other manufacturers that complies with requirements.

2.3 MATERIALS AND FABRICATION

A. Manufacturer's Name Plate: Do not use manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise acceptable to Architect.

1. Manufacturer's identification will be permitted on rim of lock cylinders only.

B. Base Metals: Produce hardware units of basic metal and forming method indicated using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units for finish designations indicated.

C. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.

D. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.

E. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

2.4 HINGES, BUTTS, AND PIVOTS

A. Templates: Provide only template-produced units.

B. Screws: Provide Phillips flat-head screws complying with the following requirements:

1. For metal doors and frames install machine screws into drilled and tapped holes.
2. Finish screw heads to match surface of hinges or pivots.

C. Hinge Pins: Non-removable pins.

1. Tips: Flat button and matching plug, finished to match leaves, except where hospital tip (HT) indicated.

D. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges per door leaf for doors 90 inches or less in height and one additional hinge for each 30 inches of additional height.

2.5 LOCK CYLINDERS AND KEYING

A. Review the keying system with the Owner and provide the type required (master,

grandmaster or great-grandmaster), either new or integrated with Owner's existing system.

B. Equip locks with cylinders for interchangeable-core pin tumbler inserts. Furnish only temporary inserts for the construction period, and remove these when directed. Final replacement cores and keys to be installed by End User.

C. Metals: Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.

D. Comply with End User’s instructions for masterkeying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.

1. Permanently inscribe each key with number of lock that identifies cylinder manufacturer's key symbol, and notation, "DO NOT DUPLICATE."

E. Key Material: Provide keys of nickel silver only.

F. Key Quantity: Furnish 3 change keys for each lock, 5 master keys for each master system, and 5 grandmaster keys for each grandmaster system.

1. Furnish one extra blank for each lock.
2. Deliver keys to Owner.

2.6 KEY CONTROL SYSTEM

A. Provide a key control system including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150 percent of the number of locks required for the Project.

1. Provide complete cross index system set up by key control manufacturer, and place keys on markers and hooks in the cabinet as determined by the final key schedule.
2. Provide hinged-panel type cabinet for wall mounting.

2.7 LOCKS, LATCHES, AND BOLTS

A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set, unless otherwise indicated.

1. Provide flat lip strikes for locks with 3-piece, antifriction latchbolts as recommended by manufacturer.
2. Provide recess type top strikes for bolts locking into head frames, unless otherwise indicated.
3. Provide dust-proof strikes for foot bolts, except where special threshold construction provides nonrecessed strike for bolt.
4. Provide roller type strikes where recommended by manufacturer of the latch and lock units.

B. Lock Throw: Provide 5/8-inch minimum throw of latch on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.

1. Provide 1/2-inch minimum throw of latch for other bored and preassembled types of locks and 3/4-inch minimum throw of latch for mortise locks. Provide 1-inch minimum throw for all dead bolts.

C. Exit Device Dogging: Equip the units with keyed dogging device to keep the latch bolt retracted, when engaged.

D. Rabbeted Doors: Where rabbeted door stiles are indicated, provide special rabbeted front on lock and latch units and bolts.

2.8 CLOSERS AND DOOR CONTROL DEVICES

A. Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit depending on size of door, exposure to weather, and anticipated frequency of use.

1. Provide parallel arms for all overhead closers, except as otherwise indicated.
2. Provide metal enclosure plate.
3. Color & finish of all exposed surfaces to match and to be selected by Architect from manufacturers standard colors.

B. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A117.1 provisions for door opening force and delayed action closing.

C. Provide grey resilient parts for exposed bumpers.

2.9 DOOR TRIM UNITS

A. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units consisting of either machine screws or self-tapping screws.

B. Fabricate protection plates not more than 1-1/2 inches less than door width on hinge side and not more than 1/2 inch less than door width on pull side by height indicated.

1. Metal Plates: Stainless steel, 0.050 inch (U.S. 18 gage).

2.10 WEATHERSTRIPPING AND SEALS

A. General: Provide continuous weatherstripping on exterior doors. Provide noncorrosive fasteners.

B. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer.

C. Weatherstripping at Jambs and Heads: Provide bumper-type resilient insert and metal retainer strips, surface applied unless shown as mortised or semimortised, and of following metal, finish, and resilient bumper material:

1. Extruded aluminum with clear anodized finish as selected from manufacturer's standard color range, 0.062-inch minimum thickness of main walls and flanges.
2. Sponge neoprene conforming to MIL R 6130, Class II (Closed Cell).

a. Grade C (67 deg F to 170 deg F, low temperature).

D. Weatherstripping at Door Bottoms: Provide threshold consisting of contact-type resilient insert and metal housing of design and size shown and of following metal, finish, and resilient seal strip:

1. Extruded aluminum with clear anodized finish as selected from manufacturer's standard color range, 0.062-inch minimum thickness of main walls and flanges.
2. Solid neoprene wiper or sweep seal complying with MIL R 6855, Class II, Grade 40.

2.11 THRESHOLDS

A. General: Except as otherwise indicated, provide standard metal threshold unit of type and profile as shown or scheduled. Width of threshold shall match width of door frame.

B. Exterior Hinged or Pivoted Doors: Provide units not less than 3 inches wide, formed to accommodate change in floor elevation where indicated, fabricated to accommodate door hardware and to fit door frames, and as follows:

1. For out-swinging doors provide thermal barrier saddle type with black rigid vinyl between extrusions.

2.12 HARDWARE FINISHES

A. Match items to the manufacturer's standard color and texture finish for the latch and lock sets (or push-pull units if no latch or lock sets).

B. Provide finishes that match those established by BHMA or, if none established, match the Architect's sample.

C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

D. Provide protective lacquer coating on all exposed hardware finishes of brass, bronze, and aluminum, except as otherwise indicated. The suffix "-NL" is used with standard finish designations to indicate "no lacquer."

E. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18, "Materials and Finishes," including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect.

1. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 Section "Joint Sealers."

F. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.2 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.

1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

B. Clean adjacent surfaces soiled by hardware installation.

C. Instruct End User's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.

D. Six-Month Adjustment: Approximately six months after the date of Substantial Completion, the Installer, accompanied by representatives of the manufacturers of latchsets and locksets and of door control devices, and of other major hardware suppliers, shall return to the Project to perform the following work:

1. Examine and re-adjust each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.

2. Consult with and instruct End User's personnel in recommended additions to the maintenance procedures.

3. Replace hardware items that have deteriorated or failed due to faulty design, materials, or installation of hardware units.

4. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.3 HARDWARE SCHEDULE

A. General: Provide hardware for each door to comply with requirements of Section "Door Hardware," hardware set numbers indicated in door schedule, and in the following schedule of hardware sets.

1. Hardware sets indicate quantity, item, manufacturer and product designation, size and finish or color, as applicable.

2. Provide hardware with US26D finish, unless indicated otherwise.

3. Lockset Designs: Provide the lockset designs designated in the Hardware Schedule or, if by another manufacturer, one that matches those designated:

4. Provide locks with interchangeable cores per requirements of this section.

B. Hardware Set No. 1: Door D101A, D102A & D102G.

1.5 pr.	Hinges	Stanley	FBB199 4.5 x 4.5 NRP	US32D
1	Lock	Yale	AU 5407L	US26D
1	Closer	LCN	4041	ALUM
1	Kickplate	Quality	8 x 1.5 LDW	US32D
1	Stop	Quality	119ES	US26D
1	Threshold	Pemko	169A	ALUM
1	Door Sweep	Pemko	315CN	ALUM
1 Set	Weatherstrip	Pemko	303AV	ALUM

C. Hardware Set No. 2: Door D105A & D106A.

1.5 pr.	Hinges	Stanley	FBB179 4.5 x 4.5	US26D
1	Lock	Yale	AU5407L	US26D
1	Stop	Quality	307	US26D
3	Silencers			
1	Kickplate	Quality	8 x 1.5 LDW	US32D

D. Hardware Set No. 3: Door D104A.

1.5 pr.	Hinges	Stanley	FBB179 4.5 x 4.5	US26D
1	Privacy	Yale	AU5404L	US26D
1	Closer	LCN	4041	ALUM
1	Kickplate	Quality	8 x 1.5 LDW	US32D
1	Stop	Quality	307	US26D
3	Silencers			

E. Hardware Set No. 4: Door D103A.

1.5 pr.	Hinges	Stanley	FBB179 4.5 x 4.5	US26D
1	Lock	Yale	AU5407L	US26D
1	Closer	LCN	4041	ALUM
1	Kickplate	Quality	8 x 1.5 LDW	US32D
1	Stop	Quality	302	US26D
1	Silencers			

F. Hardware Set No. 5: Door D101B, D102B, D102C, D102D, D102E, D102F, D102H, D102J, D102K, D102L & D102M.
All hardware by door supplier.

END OF SECTION 08710

SECTION 08800 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes glazing for the following products, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Division 8 Sections “Aluminum Windows” and Horizontal Sliding Vinyl (PVC) Windows” for pre-manufactured window units.
2. Door vision lites.

1.3 DEFINITIONS

A. Manufacturer is used in this Section to refer to a firm that produces primary glass or fabricated glass as defined in the referenced glazing standard.

B. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use due to causes other than glass breakage and improper practices for maintaining, and cleaning insulating glass. Evidence of failure is the obstruction of vision by dust, moisture, or film on the interior surfaces of glass. Improper practices for maintaining and cleaning glass do not comply with the manufacturer's directions.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading (where applicable), without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; and other defects in construction.

B. Glass Design: Glass thicknesses indicated on Drawings are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for the various size openings in the thicknesses and strengths (annealed or heat-treated) to meet or exceed the following criteria:

1. Wind pressure of 20-psf.
2. Minimum glass thickness, nominally, of lites in exterior walls is 6.0 mm (0.23 inch).
3. Tinted glass thicknesses for each tint indicated are the same throughout Project.
4. Minimum glass thicknesses of lites, whether composed of annealed or heat-treated glass, are selected so the worst-case probability of failure does not exceed the following:

a. 8 lites per 1000 for lites set vertically or not over 15 degrees off vertical and under wind action. Determine minimum thickness of monolithic annealed glass according to ASTM E 1300. For other than monolithic annealed glass, determine thickness per glass manufacturer's standard method of analysis including applying adjustment factors to ASTM E 1300 based on type of glass.

C. Normal thermal movement results from the following maximum change (range) in ambient and surface temperatures acting on glass-framing members and glazing components. Base engineering calculation on materials' actual surface temperatures due to both solar heat gain and nighttime sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.5 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data for each glass product and glazing material indicated.

C. Samples for verification purposes of 12-inch-square samples of each type of glass indicated except for clear monolithic glass products, and 12-inch-long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative in color of the adjoining framing system.

D. Product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements.

1. Separate certifications are not required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program of a recognized certification agency or independent testing agency acceptable to authorities having jurisdiction.

E. Compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed for adhesion.

F. Compatibility test report from manufacturer of insulating glass edge sealant indicating that glass edge sealants were tested for compatibility with other glazing materials including sealants, glazing tape, gaskets, setting blocks, and edge blocks.

G. Product test reports for each type of glazing sealant and gasket indicated, evidencing compliance with requirements specified.

H. Maintenance data for glass and other glazing materials to include in Operating and Maintenance Manual specified in Division 1.

1.6 QUALITY ASSURANCE

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. FGMA Publications: "FGMA Glazing Manual."
2. SIGMA Publications: TM-3000 "Vertical Glazing Guidelines."

B. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR

Part 1201 for Category II materials.

1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

C. Glazier Qualifications: Engage an experienced glazier who has completed glazing similar in material, design, and extent to that indicated for Project with a record of successful in-service performance.

D. Single-Source Responsibility for Glass: Obtain glass from one source for each product indicated below:

1. Primary glass of each (ASTM C 1036) type and class indicated.
2. Heat-treated glass of each (ASTM C 1048) condition indicated.
3. Insulating glass of each construction indicated.

E. Single-Source Responsibility for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

F. Preconstruction Compatibility and Adhesion Testing: Submit to sealant manufacturers, samples of each glass, gasket, glazing accessory, and glass-framing member that will contact or affect glazing sealants for compatibility and adhesion testing as indicated below:

1. Use test methods standard with sealant manufacturer to determine if priming and other specific preparation techniques are required for rapid, optimum glazing sealants adhesion to glass and glazing channel substrates.

a. Perform tests under normal environmental conditions during installation.

2. Submit not less than nine pieces of each type and finish of glass-framing members and each type, class, kind, condition, and form of glass (monolithic, laminated, insulating units) for adhesion testing, as well as one sample of each glazing accessory (gaskets, setting blocks and spacers) for compatibility testing.
3. Schedule sufficient time to test and analyze results to prevent delay in the Work.
4. Investigate materials failing compatibility or adhesion tests and get sealant manufacturer's written recommendations for corrective measures, including using special primers.

5. Testing is not required when glazing sealant manufacturer can submit required preparation data that is acceptable to Architect and is based on previous testing of current sealant products for adhesion to and compatibility with submitted glazing materials.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1. Where insulating glass units will be exposed to substantial altitude changes, comply with insulating glass fabricator's recommendations for venting and sealing to avoid hermetic seal ruptures.

1.8 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing materials manufacturer or when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Install liquid sealants at ambient and substrate temperatures above 40 deg F (4.4 deg C).

1.9 WARRANTY

A. General: Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

B. Manufacturer's Warranty on Insulating Glass: Submit written warranty signed by manufacturer of insulating glass agreeing to furnish replacements for insulating glass units that deteriorate as defined in "Definitions" article, f.o.b. point of manufacture, freight allowed Project site, within specified warranty period indicated below. Warranty covers only deterioration due to normal conditions of use and not to handling, installing, protecting, and maintaining practices contrary to glass manufacturer's published instructions.

1. Warranty Period: Manufacturer's standard but not less than 10 years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following companies:
1. AFG Industries
2. Guardian Industries
3. PPG Industries
4. Or, pre-approved equal.

2.2 PRIMARY FLOAT GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Class as indicated below, and Quality q3 (glazing select).
1. Class as indicated in each Product Data Sheet at end of this Section.

B. Refer to requirements for sealed insulating glass units for performance characteristics of assembled units composed of tinted glass, coated or uncoated, relative to visible light transmittance, U-values, shading coefficient, and visible reflectance.

2.3 HEAT-TREATED FLOAT GLASS PRODUCTS, GENERAL

A. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.

2.4 HEAT-TREATED FLOAT GLASS

A. Uncoated, Clear, Heat-Treated Float Glass: ASTM C 1048, Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), kind as indicated below.

1. Kind FT (fully tempered) where indicated.

B. Uncoated, Tinted, Heat-Treated Float Glass: ASTM C 1048, Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 2 (tinted heat-absorbing and light-reducing), Quality q3 (glazing select), with tint color and performance characteristics for 6.0-mm-thick (0.23-inch-thick) glass matching those indicated for annealed primary tinted float glass; kind as indicated below:

1. Kind FT (fully tempered) where indicated.

2.5 INSULATING GLASS PRODUCTS

A. Sealed Insulating Glass Units: Preassembled units consisting of organically sealed lites of glass separated by dehydrated air spaces complying with ASTM E 774 and with other requirements indicated, including those in Insulating Glass Product Data Sheet at the end of this Section.
1. For properties of individual glass lites making up units, refer to requirements specified elsewhere in this Section applicable to types, classes, kinds, and conditions of glass products comprising lites of insulating glass units.
2. Provide heat-treated, coated float glass of kind indicated or, if not otherwise indicated, Kind HS (heat strengthened) where recommended by manufacturer to comply with system performance requirements specified and Kind FT (fully tempered) where safety glass is designated or required.
3. U-values are expressed as Btu/hour x sq. ft. x deg F.

2.6 ELASTOMERIC GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:
1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
2. Suitability: Comply with sealant and glass manufacturer's recommendations for selecting glazing sealants and tapes that are suitable for applications indicated and conditions existing at time of installation.
3. Colors: Provide color of exposed joint sealants to comply with the following:

a. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

B. Elastomeric Glazing Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with ASTM C 920 requirements indicated on each Elastomeric Glazing Sealant Product Data Sheet at the end of this Section, including those referencing ASTM classifications for Type, Grade, Class and Uses.

1. Additional Movement Capability: Where additional movement capability is specified in Elastomeric Glazing Sealant Product Data Sheet, provide products, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, with the capability to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.

2.7 GLAZING GASKETS

A. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames

with molded corner units and zipper lock strips, complying with ASTM C 542, black.

B. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:

1. EPDM, ASTM C 864.
2. Silicone, ASTM C 1115.
3. Any material indicated above.

C. Soft Compression Gaskets: Extruded or molded closed-cell, integral-skinned gaskets of material indicated below, complying with ASTM C 509, Type II, black, and of profile and hardness required to maintain watertight seal:
1. EPDM.
2. Silicone.
3. Any material indicated above.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85 plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side-walking).

2.9 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

B. Clean cut or flat grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine glass framing, with glazier present, for compliance with the following:
1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass from edge damage during handling and installation as follows:

1. Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturer's label.
2. Remove damaged glass from Project site and legally dispose of off site. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.

C. Install elastomeric setting blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

D. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

E. Provide edge blocking to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.

F. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

G. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

H. Square cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.

B. Secure compression gaskets in place with joints located at corners to compress gaskets producing a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

C. Install gaskets so they protrude past face of glazing stops.

3.5 LOCK-STRIP GASKET GLAZING

A. Comply with ASTM C 716 and gasket manufacturer's printed recommendations. Provide

supplementary wet seal and weep system unless otherwise indicated.

3.6 PROTECTION AND CLEANING

A. Protect exterior glass from breakage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkali deposits, or stains, and remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.

E. Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

3.7 GLAZING SCHEDULE

A. Refer to Product Data Sheets which follow schedule for requirements.

Glass Designation	Nominal Thickness	Description
IG-1	1"	Insulating glass consisting of clear, float glass indoor lite and tinted, float glass outdoor lite, with 1/2" air space at all exterior framed windows.
IG-2		NOT USED
IG-3	1"	Insulating glass consisting of clear, tempered, float glass indoor lite and clear, tempered outdoor lite, with 1/2" air space at all exterior man doors.

INSULATING GLASS PRODUCT DATA SHEET

Insulating Glass Unit Designation: IG-1

Classification of Units: Class CBA per ASTM E 774.

Air Space Width: Nominal 1/2 inch measured perpendicularly from surfaces of glass lites at unit's edge.

Gas Filling: Fill air space with argon.

Sealing System: Dual seal, primary and secondary sealants: manufacturer's standard sealants.

Spacer Specifications: Manufacturer's standard metal.

Dessicant: Either molecular sieve or silica gel or blend of both.

Corner Construction: Manufacturer's standard corner construction.

Color of Spacer: Color as selected by Architect from manufacturer's standard colors.

Glass Specifications: Comply with the following requirements:

Thickness of Each Lite: 6.0 mm (0.23 inch).

Uncoated Indoor Lite: Class 1 (clear) float glass.

Uncoated Tinted Outdoor Lite: Class 2 (tinted, heat-absorbing and light-reducing) float glass, Kind HS (heat strengthened), with a tint color of green, bronze or gray as selected by Architect.

Nominal Performance Characteristics are as indicated below:

Summer Daytime U-Value:	0.57
Winter Nighttime U-Value:	0.49
Shading Coefficient:	0.58

INSULATING GLASS PRODUCT DATA SHEET

Insulating Glass Unit Designation: IG-2

NOT USED

INSULATING GLASS PRODUCT DATA SHEET

Insulating Glass Unit Designation: IG-3

Classification of Units: Class CBA per ASTM E 774.

Air Space Width: Nominal 1/2 inch measured perpendicularly from surfaces of glass lites at unit's edge.

Gas Filling: Fill air space with argon.

Sealing System: Dual seal, primary and secondary sealants: manufacturer's standard sealants.

Spacer Specifications: Manufacturer's standard metal.

Dessicant: Either molecular sieve or silica gel or blend of both.

Corner Construction: Manufacturer's standard corner construction.

Color of Spacer: Color as selected by Architect from manufacturer's standard colors.

Glass Specifications: Comply with the following requirements:

Thickness of Each Lite: 6.0 mm (0.23 inch).

Uncoated Indoor Lite: Kind FT (fully tempered), Condition A (uncoated) Class 1 (clear) float glass.

Uncoated Tinted Outdoor Lite: Kind FT (fully tempered), Condition A (uncoated), Class (clear)

ELASTOMERIC GLAZING SEALANT PRODUCT DATA SHEET

Base Polymer: Neutral-curing silicone.

Type: S (single component).

Grade: NS (nonsag).

Class: 25.

Additional Movement Capability: 50 percent movement in extension and 50 percent in compression for a total of 100 percent movement.

Use[s] Related to Exposure: NT (nontraffic).

Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
Use O Glazing Substrates: Coated glass, color anodized aluminum, aluminum coated with a high-performance coating, galvanized steel, wood, elastomeric glazing gaskets and glazing accessories.

Available Products: "795", Dow Corning; "Silglaze II 2800," GE silicones.

END OF SECTION 08800

SECTION 09255 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Non-load-bearing steel framing members for gypsum board assemblies.
2. Gypsum board assemblies attached to steel framing.
3. Cementitious Backer Units

1.3 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms related to gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of product specified.

C. Product certificates signed by manufacturers of gypsum board assembly components certifying that their products comply with specified requirements.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer.

B. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.

C. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

C. Handle gypsum board to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.7 PROJECT CONDITIONS

A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 and with gypsum board manufacturer's recommendations.

B. Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 deg F (4 deg C). For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F (10 deg C) for 48 hours prior to application and continuously after until dry. Do not exceed 95 deg F (35 deg C) when using temporary heat sources.

C. Ventilation: Ventilate building spaces, as required, for drying joint treatment materials. Avoid drafts during hot dry weather to prevent finishing materials from drying too rapidly.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Steel Framing and Furring:

a. Dale Industries, Inc.
b. Dietrich Industries, Inc.
c. Gold Bond Building Products Div., National Gypsum Co.
d. Or, pre-approved equal.

2. Gypsum Board:

a. Domtar Gypsum.
b. Georgia-Pacific Corp.
c. Gold Bond Building Products Div., National Gypsum Co.
d. United States Gypsum Co.
e. Or, pre-approved equal.

3. Cementitious Backer Units:

a. United States Gypsum Co.
b. Or, pre-approved equal.

2.2 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS

A. General: Provide components of sizes indicated but not less than that required to comply with ASTM C 754 for conditions indicated.

B. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper.

C. Channels: Cold-rolled steel, 0.05980-inch-minimum thickness of base (uncoated) metal and 7/16-inch-wide flanges, and as follows:

1. Carrying Channels: 1-1/2 inch deep, 475 lb per 1000 feet, unless otherwise indicated.
2. Finish: Rust-inhibitive paint, unless otherwise indicated.

D. Steel Rigid Furring Channels: ASTM C 645, hat-shaped, depth of 7/8 inch, and minimum thickness of base (uncoated) metal as follows:

1. Thickness: 0.0179 inch, unless otherwise indicated.

2.3 STEEL FRAMING FOR WALLS AND PARTITIONS

A. General: Provide steel framing members complying with the following requirements:

1. Component Sizes and Spacings: As indicated but not less than that required to comply with ASTM C 754 under the following maximum deflection and lateral loading conditions:
   a. Maximum Deflection: L/240 at 5 lbf per sq. ft.

2. Protective Coating: G40 hot-dip galvanized coating per ASTM A 525.

B. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 deg and doubled over to form 3/16-inch-wide minimum lip (return) and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:

1. Thickness: 0.0179 inch, unless otherwise indicated.
2. Depth: 6 inches, unless otherwise indicated.
3. Spacing: 24 inches on center, unless otherwise indicated.

C. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

2.4 GYPSUM BOARD PRODUCTS

A. General: Provide gypsum board of types indicated in maximum lengths available to minimize end-to-end butt joints.

B. Gypsum Wallboard: ASTM C 36 and as follows:

1. Type: Regular for vertical surfaces, unless otherwise indicated.
2. Edges: Tapered.
3. Thickness: 5/8 inch unless otherwise noted

2.5 CEMENTITIOUS BACKER UNITS

A. Cementitious Backer Units: ANSI A118.9 and as follows:

1. Thickness: ½ inch

2.5 TRIM ACCESSORIES

A. Accessories for Interior Installation: Corner beads, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:

1. Material: Formed metal, plastic, or metal combined with paper, with metal complying with the following requirement:
   a. Sheet steel coated with zinc by hot-dip or electrolytic processes, or with aluminum or rolled zinc.

2. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:
   a. Cornerbead on outside corners, unless otherwise indicated.
   b. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim unless otherwise indicated.
   c. One-piece control joint formed with V-shaped slot, with removable strip covering slot opening.

2.6 JOINT TREATMENT MATERIALS

A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.

B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.

C. Setting-Type Joint Compounds for Gypsum Board: Factory-packaged, job-mixed, chemical-hardening powder products formulated for uses indicated.

1. Where setting-type joint compounds are indicated as a taping compound only or for taping and filling only, use formulation that is compatible with other joint compounds applied over it.

D. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.

1. Ready-Mixed Formulation: Factory-mixed product.
2. Taping compound formulated for embedding tape and for first coat over fasteners and face flanges of trim accessories.
3. Topping compound formulated for fill (second) and finish (third) coats.

E. Joint Tape and Joint Compound for Cement Board: Material recommended by cement board unit manufacturer

2.7 MISCELLANEOUS MATERIALS

A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.

B. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot grouting hollow metal door frames.

C. Steel drill screws complying with ASTM C 1002 for the following applications:

1. Fastening gypsum board to steel members less than 0.03 inch thick.
2. Fastening gypsum board to wood members.

D. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch thick.

E. Polyethylene Vapor Retarder: ASTM D 4397, thickness and maximum permeance rating as follows:

1. 6.0 mils, 0.13 perms.

F. Vapor Retarder Tape: Pressure-sensitive tape of type recommended by vapor retarder

manufacturer for sealing joints and penetrations in vapor retarder.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing with Installer present for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLING STEEL FRAMING, GENERAL

A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with "Gypsum Construction Handbook" published by United States Gypsum Co.

C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement. Comply with details shown on Drawings.

1. Where building structure abuts ceiling perimeter or penetrates ceiling.
2. Where partition framing and wall furring abut structure except at floor.
   a. Provide slip- or cushioned-type joints as detailed to attain lateral support and avoid axial loading.

D. Do not bridge building expansion and control joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.

3.3 INSTALLING STEEL FRAMING FOR SUSPENDED CEILINGS

A. Suspend ceiling hangers from building structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
4. Do not attach hangers to steel deck or deck tabs. Attach hangers to structural members.
5. Do not connect or suspend steel framing from ducts, pipes or conduit.

B. Install suspended steel framing components in sizes and at spacings indicated but not less than that required by the referenced steel framing installation standard.

1. Carrying Channels (Main Runners): 1-1/2 inch, 4 feet o.c.
2. Rigid Furring Channels (Furring Members): 16 inches o.c.

C. Installation Tolerances: Install steel framing components for suspended ceilings so that cross-furring members or grid suspension members are level to within 1/8 inch in 12 feet as measured both lengthwise on each member and transversely between parallel members.

3.4 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.

1. Where studs are installed directly against exterior walls, install asphalt felt strips between studs and wall.

B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch from the plane formed by the faces of adjacent framing.

C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Cut studs 1/2 inch short of full height. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

D. Terminate partition framing at suspended ceilings where indicated.

E. Install steel studs and furring in sizes and at spacings indicated but not less than that required by the referenced steel framing installation standard to comply with maximum deflection and minimum loading requirements specified:

1. Single-Layer Construction: Space studs at 24 inches o.c.

F. Install steel studs so that flanges point in the same direction and so that leading edges or ends of each gypsum board can be attached to open (unsupported) edges of stud flanges first.

G. Frame door openings to comply with details indicated, with GA-219, and with applicable published recommendations of gypsum board manufacturer. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

H. Frame openings other than door openings to comply with details indicated or, if none indicated, in same manner as required for door openings. Install framing below sills of openings to match framing required above door heads.

I. Install thermal insulation as follows:

1. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw attach short flange of furring channel to web of attached channel. Start from this furring channel with standard width insulation panel and continue in regular manner. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

2. Until gypsum board is installed, hold insulation in place with 10-inch staples fabricated from 0.0625-inch (16-gage)-diameter tie wire and inserted through slot in web of member.

J. Install polyethylene vapor retarder where indicated to comply with the following requirements:

1. Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with mechanical fasteners or adhesives. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose mineral-fiber insulation.
2. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs. Fasten vapor retarders to framing at top, end, and bottom edges, at perimeter of wall openings, and at lap joints; space fasteners 16 inches o.c.
3. Seal joints in vapor retarders caused by pipes, conduits, electrical boxes and similar items penetrating vapor retarders with vapor retarder tape.
4. Repair any tears or punctures in vapor retarder immediately before concealing it with the installation of gypsum board or other construction.

3.5 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.

B. Install ceiling board panels across framing to minimize the number of abutting end joints and avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install wall/partition board panels to minimize the number of abutting end joints or avoid them entirely. Stagger abutting end joints not less than one framing member in alternate courses of board. At stairwells and other high walls, install panels horizontally with end abutting joints over studs and staggered.

D. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

E. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Position adjoining panels so that tapered edges abut tapered edges, and field-cut edges abut field-cut edges and ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions. Avoid joints at corners of framed openings where possible.

F. Attach gypsum panels to steel studs so that the leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

G. Attach gypsum panels to framing provided at openings and cutouts.

H. Spot grout hollow metal door frames. Apply spot grout at each jamb anchor clip and immediately insert gypsum panels into frames.

I. Form control joints and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.

J. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.).
1. Except where concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft.

in area.

2. Fit gypsum panels around ducts, pipes, and conduits.

K. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide 1/4-inch-to-1/2-inch-wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

L. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.

3.6 GYPSUM BOARD APPLICATION METHODS

A. Single-Layer Application: Install gypsum wallboard panels as follows:

1. On ceilings, apply gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated, and provide panel lengths that will minimize end joints.

B. Single-Layer Fastening Methods: Apply gypsum panels to supports as follows:

1. Fasten with screws.

3.7 CEMENT BOARD APPLICATION METHODS

A. Install cement board to comply with ANSI A108.11 at shower

3.8 INSTALLING TRIM ACCESSORIES

A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.

B. Install corner beads at external corners.

C. Install edge trim where edge of gypsum panels would otherwise be exposed or semiexposed. Provide edge trim type with face flange formed to receive joint compound except where other types are indicated.

1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
2. Install other accessories where indicated.

D. Install control joints at locations indicated, and where not indicated according to ASTM C 840, and in locations approved by Architect for visual effect.

3.9 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Apply joint treatment at gypsum board joints (both directions); flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration and levels of gypsum board finish indicated.

B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.

C. Apply joint tape over gypsum board joints except those with trim accessories having concealed face flanges not requiring taping to prevent cracks from developing in joint treatment at flange edges.

D. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.

1. Level 4 for gypsum board surfaces unless otherwise indicated.

E. For level 4 gypsum board finish, embed tape in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration. Use following joint compound combination:

1. Embedding and First Coat: Setting-type joint compound or ready-mixed, drying-type, topping compound.
2. Fill (Second) Coat: Setting-type joint compound or ready-mixed, drying-type, topping compound.
3. Finish (Third) Coat: Ready-mixed, drying-type, topping compound.

3.10 CLEANING AND PROTECTION

A Promptly remove any residual joint compound from adjacent surfaces.

B. Provide final protection and maintain conditions, in a manner suitable to Installer, that ensures gypsum board assemblies remain without damage or deterioration at time of Substantial Completion.

END OF SECTION 09255

SECTION 09300 - TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Unglazed ceramic mosaic tile.
2. Glazed wall tile.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 3 Section "Concrete Work" for monolithic slab finishes specified for tile substrates.
2. Division 7 Section "Joint Sealants" for tile control and expansion joints.
3. Division 9 Section “Gypsum Board Assemblies” for cement boards tile backer.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified.

C. Shop drawings indicating tile patterns and locations and widths of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

1. Locate precisely each joint and crack in tile substrates by measuring, record measurements on shop drawings, and coordinate them with tile joint locations, in consultation with Architect.

D. Samples for initial selection purposes in form of manufacturer's color charts consisting of actual tiles or sections of tile showing full range of colors, textures, and patterns available for each type and composition of tile indicated. Include samples of grout and accessories involving color selection.

E. Samples for verification purposes of each item listed below, prepared on samples of size and construction indicated, products involve color and texture variations, in sets showing full range of variations expected.

1. Each type and composition of tile and for each color and texture required, at least 12 inches square, mounted on plywood or hardboard backing and grouted.
2. Full-size units of each type of trim and accessory for each color required.
3. Stone thresholds in 6-inch lengths.

F. Master grade certificates for each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

G. Material test reports from qualified independent testing laboratory indicating and interpreting

test results relative to compliance of tile and tile setting and grouting products with requirements indicated.

H. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, plus other information specified.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

B. Single-Source Responsibility for Setting and Grouting Materials: Obtain ingredients of a uniform quality from one manufacturer for each cementitious and admixture component and from one source or producer for each aggregate.

C. Installer Qualifications: Engage an experienced Installer who has successfully completed tile installations similar in material, design, and extent to that indicated for Project.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.

B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

1.6 PROJECT CONDITIONS

A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.

C. Maintain temperatures at 50 deg F (10 deg C) or more in tiled areas during installation and for 7 days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

1.7 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials that match products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering

products that may be incorporated in the Work, include, but are not limited to, the following:

1. Unglazed Ceramic Mosaic Tile:
   a. American Olean Tile Co., Inc.
   b. Dal-Tile Corp.
   c. Or, pre-approved equal.

2. Glazed Wall Tile:
   a. American Olean Tile Co., Inc.
   b. Dal-Tile Corp.
   c. Or, pre-approved equal.

3. Latex-Emulsion-Based Latex-Portland Cement Mortars:

   a. Bostik Construction Products Div.
   b. Custom Building Products
   c. Laticrete International Inc.
   d. Mapei Corp.
   Or, pre-approved equal.

2.2 PRODUCTS, GENERAL

A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types, compositions, and grades of tile indicated.

1. Furnish tile complying with "Standard Grade" requirements unless otherwise indicated.

B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.

C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials compling with the following requirements:

1. Provide selections made by Architect from manufacturer's full range of standard colors, textures, and patterns for products of type indicated.
2. Provide tile trim and accessories that match color and finish of adjoining flat tile.

D. Factory Blending: For tile exhibiting color variations within the ranges selected during sample submittals, blend tile in factory and package accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.

2.3 TILE PRODUCTS

A. Unglazed Ceramic Mosaic Tile: Provide factory-mounted flat tile complying with the following requirements:

1. Composition: Porcelain with abrasive admixture.
2. Nominal Facial Dimensions: 2 inches by 2 inches.
3. Nominal Thickness: 1/4 inch.
4. Face: Plain with cushion edges.
5. Aesthetic Effect: Provide tile from Dal-Tile price groups as follows, or comparable price group from other manufacturers:

a. Price Group 1: 100 percent for field tile.

B. Glazed Wall Tile: Provide flat tile complying with the following requirements:

1. Nominal Facial Dimensions: 4-1/4 inches by 4-1/4 inches.
2. Nominal Thickness: 5/16 inch.
3. Face: Plain with cushion edge, unless pattern indicated.
4. Aesthetic Effect: Provide tile from Dal-Tile price groups as follows, or comparable price group from other manufacturers:
   a. Price Group 1: 100% for field tile.

C. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with following requirements:

1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.
2. Shapes: As follows, selected from manufacturer's standard shapes:

   a. Base for Portland Cement Mortar Installations: 4” Coved base of the same material as the unglazed floor tile.
   b. Wainscot Cap for Thinset Mortar Installations: Surface bullnose.
   c. External corners for Portland Cement Mortar Installations: Bullnose shape with a radius of at least 3/4 inch unless otherwise indicated.
   d. External Corners for Thinset Installations: Surface bullnose.
   e. Internal Corners: Field-butted square corners, except use coved base and cap angle pieces designed to member with stretcher shapes.

2.4 SETTING MATERIALS

A. Portland Cement Mortar Installation Materials: Provide materials complying with ANSI A108.1 and as specified below.

1. Latex additive (water emulsion) described below, serving as replacement for part or all of gauging water, of type specifically recommended by latex additive manufacturer for use with job-mixed portland cement and aggregate mortar bed.

   a. Latex Additive: Manufacturer's standard.

B. Latex-Portland Cement Mortar: ANSI A118.4, composition as follows:
1. Prepackaged dry mortar mix composed of portland cement, graded aggregate, and the following dry polymer additive in the form of a reemulsifiable powder to which only water is added at job site.
   a. Dry Polymer Additive: Polyvinyl acetate or ethylene vinyl acetate.

2. Latex additive (water emulsion) of type described below, serving as replacement for part or all of gauging water, combined at job site with prepackaged dry mortar mix supplied or specified by latex additive manufacturer.
   a. Latex Type: Styrene butadiene rubber.

2.5 GROUTING MATERIALS

A. Latex-Portland Cement Grout: ANSI A118.6, color as indicated, composition as follows:

1. Prepackaged dry grout mix composed of portland cement, graded aggregate, and the following dry polymer additive in the form of a reemulsifiable powder to which

only water is added at job site.

a. Dry Polymer Additive: Polyvinyl acetate or ethylene vinyl acetate.

2. Latex additive (water emulsion) serving as replacement for part or all of gauging water, added at job site with dry grout mixture, with type of latex and dry grout mix as follows:

a. Latex Type: Manufacturer's standard.
b. Dry Grout Mixture: Commercial portland cement specified or supplied by latex additive manufacturer.

1) Application: Use commercial portland cement grout combined with latex additive for grouting joints in floor tile unless otherwise indicated.

2.6 MISCELLANEOUS MATERIALS

A. Floor Sealer: Penetrating silicone sealer, compatible with tile and grout.

2.7 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with requirements of referenced standards and manufacturers including those for accurate proportioning of materials, water, or additive content; type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.

2.8 MISCELLANEOUS MATERIALS

A. Metal Edge Strips: Zinc alloy or stainless steel terrazzo strips, 1/8-inch wide at top edge with integral provision for anchorage to mortar bed or substrate unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and areas where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, and free from oil or waxy films and curing compounds.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Blending: For tile exhibiting color variations within the ranges selected during sample submittals, verify that tile has been blended in factory and packaged accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION, GENERAL

A. ANSI Tile Installation Standard: Comply with parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile" that apply to type of setting and grouting materials and methods indicated.

B. TCA Installation Guidelines: TCA "Handbook for Ceramic Tile Installation"; comply with TCA installation methods indicated.

C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions except as otherwise shown. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so that plates, collars, or covers overlap tile.

E. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths unless otherwise shown.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work.

F. Lay out tile wainscots to next full tile beyond dimensions indicated.

G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw cut joints after installation of tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.

H. Grout tile to comply with the requirements of the following installation standards:

1. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts), comply with ANSI A108.10.

3.4 FLOOR INSTALLATION METHODS

A. Ceramic Mosaic Tile: Install tile to comply with requirements indicated below for setting bed methods, TCA installation methods related to types of subfloor construction, and grout types:

1. Portland Cement Mortar: ANSI A108.1

a. Bond Coat: Portland cement paste or dust coat on plastic bed or the following thin-set mortar on cured bed, ANSI A108.5, at Contractor's option:

1) Latex-portland cement mortar.

b. Concrete Subfloors, Interior: TCA F112 (bonded).
c. Grout: Latex-portland cement.
d. Waterproof membrane: Provide waterproof membrane at shower as recommended by tile manufacturer for tile application indicated.

B. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets other flooring.

3.5 WALL TILE INSTALLATION METHODS

A. Install types of tile designated for wall application to comply with requirements indicated below for setting-bed methods, TCA installation methods related to subsurface wall conditions, and grout types:

1. Latex-Portland Cement Mortar: ANSI A108.5.

a. Masonry, Interior: TCA W202.
b. Grout: Latex-portland cement.

3.6 CLEANING AND PROTECTION

A. Cleaning: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove latex-portland cement grout residue from tile as soon as possible.
2. Apply sealer in accordance with manufacturer's recommenations. Allow grout to cure the minimum number of days recommended by the sealer manufacturer.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

C. Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer that ensures that tile is without damage or deterioration at time of Substantial Completion.

1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 09300

SECTION 09660 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Vinyl composition floor tile.

B. Resilient wall base, reducer strips, and other accessories installed with resilient floor tiles are specified in Division 9 Section "Resilient Wall Base and Accessories."

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified.

C. Samples for initial selection purposes in form of manufacturer's color charts consisting of actual tiles or sections of tiles showing full range of colors and patterns available for each type of resilient floor tile indicated.

D. Samples for verification purposes in full-size tiles of each different color and pattern of resilient floor tile specified, showing full range of variations expected in these characteristics.

E. Maintenance data for resilient floor tile, to include in Operating and Maintenance Manual specified in Division 1.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility for Floor Tile: Obtain each type, color, and pattern of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver tiles and installation accessories to Project site in original manufacturer's unopened cartons and containers each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.

B. Store flooring materials in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F (10 deg C) and 90 deg F (32 deg C).

C. Store tiles on flat surfaces. Move tiles and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

1.6 PROJECT CONDITIONS

A. Maintain a minimum temperature of 70 deg F (21 deg C) in spaces to receive tiles for at least 48 hours prior to installation, during installation, and for not less than 48 hours after

installation. After this period, maintain a temperature of not less than 55 deg F (13 deg C).

B. Do not install tiles until they are at the same temperature as the space where they are to be installed.

C. Close spaces to traffic during tile installation.

1.7 SEQUENCING AND SCHEDULING

A. Install tiles and accessories after other finishing operations, including painting, have been completed.

B. Do not install tiles over concrete slabs until the slabs have cured and are sufficiently dry to bond with adhesive as determined by tile manufacturer's recommended bond and moisture test.

1.8 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.

1. Furnish not less than one box for each 50 boxes or fraction thereof, of each class, wearing surface, color, pattern and size of resilient floor tile installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, resilient floor tiles that may be incorporated in the Work include, but are not limited to, the products specified in each Product Data Sheet at end of this Section.

B. Vinyl Composition Floor Tile: Products complying with ASTM F 1066, Composition 1 (nonasbestos formulated), and with requirements specified in Vinyl Composition Floor Tile Product Data Sheet at end of this Section.

2.2 INSTALLATION ACCESSORIES

A. Concrete Slab Primer: Nonstaining type as recommended by flooring manufacturer.

B. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by tile manufacturer for applications indicated.

C. Adhesives (Cements): Water-resistant type recommended by tile manufacturer to suit resilient floor tile products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General: Examine areas where installation of tiles will occur, with Installer present, to verify that substrates and conditions are satisfactory for tile installation and comply with tile

manufacturer's requirements and those specified in this Section.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by tile manufacturer.
2. Finishes of subfloors comply with tolerances and other requirements specified in Division 3 Section "Cast-In-Place Concrete" for slabs receiving resilient flooring.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.

C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with manufacturer's installation specifications to prepare substrates indicated to receive tile.

B. Use trowelable leveling and patching compounds per tile manufacturer's directions to fill cracks, holes, and depressions in substrates.

C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.

D. Broom or vacuum clean substrates to be covered by tiles immediately before tile installation. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

E. Apply concrete slab primer, if recommended by flooring manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.

3.3 INSTALLATION

A. General: Comply with tile manufacturer's installation directions and other requirements indicated that are applicable to each type of tile installation included in Project.

B. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths at perimeter that equal less than one-half of a tile. Install tiles square with room axis, unless otherwise indicated.

C. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain running in one direction.

D. Where items are indicated for installing on top of finished tile floor, install tile before these items are installed.

E. Scribe, cut, and fit tiles to butt tightly to vertical surfaces, permanent fixtures, built-in furniture

including cabinets, pipes, outlets, edgings, thresholds, and nosings.

F. Extend tiles into toe spaces, door reveals, closets, and similar openings.

G. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent marking device.

H. Adhere tiles to flooring substrates without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed tile installation.

I. Use full spread of adhesive applied to substrate in compliance with tile manufacturer's directions including those for trowel notching, adhesive mixing, and adhesive open and working times.

J. Hand roll tiles where required by tile manufacturer.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing tile installation:

1. Remove visible adhesive and other surface blemishes using cleaner recommended by tile manufacturers.
2. Sweep or vacuum floor thoroughly.
3. Do not wash floor until after time period recommended by resilient floor tile manufacturer.
4. Damp-mop tile to remove black marks and soil.

B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by tile manufacturer.

1. Apply protective floor polish to tile surfaces that are free from soil, visible adhesive, and surface blemishes.

a. Use commercially available, metal, cross-linked acrylic product acceptable to tile manufacturer.
b. Coordinate selection of floor polish with Owner's maintenance service.

2. Cover tiles with undyed, untreated building paper until inspection for Substantial Completion.

3. Do not move heavy and sharp objects directly over tiles. Place plywood or hardboard panels over tiles and under objects while they are being moved. Slide or roll objects over panels without moving panels.

VINYL COMPOSITION FLOOR TILE PRODUCT DATA SHEET

Vinyl Composition Floor Tile Designation: VCT Type 1.

Class:	Class 2 (through pattern tile).
Wearing Surface:	Smooth.
Thickness:	1/8 inch.
Size:	12-by-12 inches.
Color and Pattern:	As selected by product designation below.
Available Products:	"Premium Excelon - Companion Square," Armstrong World Industries, Inc.; "Collage," Tarkett Inc., Mannington VCT, or pre-approved equal.

END OF SECTION 09660

SECTION 09678 - RESILIENT WALL BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Resilient wall base.
2. Vinyl accessories.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 9 Section "Resilient Tile Flooring."

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified.

C. Samples for initial selection purposes of manufacturer's standard sample sets in form of pieces cut from each type of product specified showing full range of colors and patterns available.

D. Samples for verification purposes in manufacturer's standard sizes, but not less than 12 inches long, of each different color and pattern of product specified.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility for Products: Obtain each type and color of product specified from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in original manufacturer's unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.

B. Store products in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F (10 deg C) and 90 deg F (32 deg C).

C. Move products into spaces where they will be installed at least 48 hours in advance of installation.

1.6 PROJECT CONDITIONS

A. Maintain a minimum temperature of 70 deg F (21 deg C) in spaces to receive products

specified in this Section for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 deg F (13 deg C).

B. Do not install products until they are at the same temperature as that of the space where they are to be installed.

C. Close spaces to traffic during installation of products specified in this Section.

1.7 SEQUENCING AND SCHEDULING

A. Sequence installing products specified in this Section with other construction to minimize possibility of damage and soiling during remainder of construction period.

1.8 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below, packaged with protective covering for storage, and identified with labels clearly describing contents.

1. Furnish not less than 10 linear feet for each 500 linear feet or fraction thereof of each different type and color of resilient wall base installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, those specified in each Product Data Sheet at end of this Section.

2.2 RESILIENT WALL BASE

A. Rubber Wall Base: Products complying with FS SS-W-40, Type I, and requirements specified in the Rubber Wall Base Product Data Sheet at end of this Section.

2.3 RESILIENT ACCESSORIES

A. Vinyl Accessories: Products complying with requirements specified in Vinyl Accessory Product Data Sheet at end of this Section.

2.4 INSTALLATION ACCESSORIES

A. Concrete Slab Primer: Nonstaining type as recommended by flooring manufacturer.

B. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by flooring manufacturer for applications indicated.

C. Adhesives: Water-resistant type recommended by manufacturer to suit resilient flooring product and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where installation of products specified in this Section will occur, with Installer present, to verify that substrates and conditions are satisfactory for installation and comply with manufacturer's requirements and those specified in this Section.

3.2 PREPARATION

A. General: Comply with manufacturer's installation specifications for preparing substrates indicated to receive products indicated.

B. Use trowelable leveling and patching compounds per manufacturers directions to fill cracks, holes, and depressions in substrates.

C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.

D. Broom or vacuum clean substrates to be covered immediately before installing products specified in this Section. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

E. Apply concrete slab primer, if recommended by flooring manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.

3.3 INSTALLATION

A. General: Install products specified in this Section using methods indicated according to manufacturer's installation directions.

B. Apply resilient wall base to walls, columns, pilasters, casework, and other permanent fixtures in rooms and areas where base is required. Install wall base in lengths as long as practicable. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

1. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
2. Install inside and exterior corners before installing straight pieces.

C. Place resilient accessories so they are butted to adjacent materials of type indicated and bond to substrates with adhesive. Install reducer strips at edges of flooring that otherwise would be exposed.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing installation:

1. Remove visible adhesive and other surface blemishes using cleaner recommended by manufacturers of resilient product involved.
2. Sweep or vacuum floor thoroughly.
3. Do not wash floor until after time period recommended by manufacturer.
4. Damp-mop resilient accessories to remove black marks and soil.

B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by manufacturer of resilient product

involved.

1. Apply protective floor polish to resilient accessories that are free from soil, visible adhesive, and surface blemishes.

    a. Use commercially available metal, cross-linked, acrylic product acceptable to resilient accessory manufacturer.
    b. Coordinate selection of floor polish with Owner's maintenance service.

RUBBER WALL BASE PRODUCT DATA SHEET

Style: Cove with top-set toe.

Minimum Nominal Thickness: 1/8 inch.

Height: 4 inches.

Lengths: Coils in lengths standard with manufacturer but not less than 100 feet.

Exterior Corners: Premolded.

Interior Corners: Premolded or formed on job.

Ends: Premolded.

Color and Pattern: As selected by Architect from manufacturer's full range of colors and patterns produced for rubber wall base complying with requirements indicated.

Available Products: Burke; Flexco Co.; Roppe Corp.; or pre-approved equal.

VINYL ACCESSORY PRODUCT DATA SHEET

Product Description:	Binder bar edging reducer.
Profile and Dimensions:	As indicated.
Color:	As selected by Architect from manufacturer's full range of colors produced for vinyl accessories complying with requirements indicated.
Available Products:	"Vinyl Underslung Reducer," #168, Roppe Corp., or pre-approved equal.

END OF SECTION 09678

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation, painting, and finishing of exposed interior and exterior items and surfaces.

1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop-priming and surface treatment specified under other Sections.

B. Paint exposed surfaces whether or not colors are designated in schedules, except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, provide custom color as selected by the Architect.

1. Painting includes field-painting exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
2. Painting includes touch-up of factory primed surfaces prior to application of finish coats.

C. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts, and labels.

1. Prefinished items not to be painted include the following factory-finished components:
   a. Architectural woodwork and casework unless otherwise noted.
   b. Finished mechanical and electrical equipment.
   c. Light fixtures.
   d. Switchgear.
   e. Distribution cabinets.
   f. Concrete slab or stem walls.

2. Concealed surfaces not to be painted include wall or ceiling surfaces in the following generally inaccessible areas:
   a. Foundation spaces.
   b. Furred areas.
   c. Pipe spaces.
   d. Duct shafts.
   e. Concrete stemwalls.

3. Finished metal surfaces not to be painted include:
   a. Anodized aluminum.
   b. Stainless steel.

4. Operating parts not to be painted include moving parts of operating equipment, such as the following:

a. Valve and damper operators.
b. Linkages.
c. Sensing devices.
d. Motor and fan shafts.

5. Labels: Do not paint over Underwriters Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 5 Section "Metal Fabrications" for shop-priming ferrous metal.
2. Division 5 Section "Metal Stairs" for shop priming ferrous metal.
3. Division 5 Section "Pipe and Tube Railings" for shop priming.
4. Division 6 Section "Interior Architectural Woodwork" for shop-priming interior architectural woodwork.
5. Division 6 Section “Miscellaneous Carpentry” for painting exposed lumber and plywood panels.
6. Division 7 Section 07180 Water Repellants.
7. Division 8 Section "Standard Steel Doors and Frames" for shop-priming steel doors and frames.
8. Division 13 Section “Metal Building Systems” for shop priming metal.
9. Divisions 15 and 16: Painting mechanical and electrical work is specified in Divisions 15 and 16, respectively.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each paint system specified, including block fillers and primers.

1. Provide the manufacturer's technical information including label analysis and instructions for handling, storage, and application of each material proposed for use.
2. List each material and cross-reference the specific coating, finish system, and application. Identify each material by the manufacturer's catalog number and general classification.

C. Samples for initial color selection in the form of manufacturer's color charts.

1. After color selection, the Architect will furnish color chips for surfaces to be coated.

D. Samples for Verification Purposes: Provide samples of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate.

1. Provide stepped samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.
2. Provide a list of material and application for each coat of each sample. Label each sample as to location and application.
3. Submit samples on the following substrates for the Architect's review of color and texture only:

a. Ferrous Metal: Provide two 4-inch-square samples of flat metal and two 8-inch-long samples of solid metal for each color and finish.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to those indicated for the Project that have resulted in a construction record of successful in-service performance.

B. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.6 JOB CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F (10 deg C) and 90 deg F (32 deg C).

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg F (7 deg C) and 95 deg F (35 deg C).

C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. ICI Dulux Paints (ICI).
2. PPG Industries, Pittsburgh Paints (PPG).

3. Pratt and Lambert (P & L).
4. The Sherwin-Williams Company (S-W).
5. KWAL Howells.

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.

B. Material Quality: Provide the manufacturer's best-quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish the manufacturer's material data and certificates of performance for proposed substitutions.

C. Colors: Provide custom color selections made by the Architect.

2.3 PRIMERS

A. Primers: Provide the manufacturer's recommended factory-formulated primers that are compatible with the substrate and finish coats indicated.

B. Available Products: Subject to compliance with requirements, prime coat materials that may be incorporated in the Work include, but are not limited to, the following:

1. Gypsum Drywall / Interior Plywood Primer: White, interior, latex-based primer.
   a. ICI: 1030-Ultra Hide PVA Primer Sealer.
   b. PPG: 6-2 Quick-Dry Latex Primer Sealer.
   c. P & L: Latex Wall Primer Z30001.
   d. S-W: Pro-Mar 200 Latex Wall Primer B28W200.

2. Ferrous Metal Primers: Synthetic, quick-drying, rust-inhibiting primers.
   a. ICI: 4160 Devguard Tank & Structural Metal Primer.
   b. PPG: 6-208 Red Inhibitive Metal Primer.
   c. P & L: Effecto Rust-Inhibiting Primer.
   d. S-W: Kem Kromik Metal Primer B50N2/B50W1.

3. Ferrous Metal Primers: Alkyd-type primers.
   a. ICI: 4160 Devguard Tank & Structural Metal Primer..
   b. PPG: 6-612 Speedhide Inhibitive White Primer.
   c. P & L: Effecto Primer Red or White.
   d. S-W: Kem Kromik Metal Primer B50N2/B50W1.

4. Galvanized Metal Primers:
   a. ICI: 4120 All purpose Metal & Galvanized Primer.
   b. PPG: 6-215/216 Speedhide Galvanized Steel Primer.
   c. P & L: P & L Interior Trim Primer.
   d. S-W: Galvite B50W3.

2.4 UNDERCOAT MATERIALS

A. Undercoat Materials: Provide the manufacturer's recommended factory formulated undercoat materials as required in lieu of one of two finish coats that are compatible with the substrate and finish coats indicated.

B. Available Products: Subject to compliance with requirements, undercoat materials that may be incorporated in the Work include, but are not limited to, the following:

1. Interior & Exterior Enamel Undercoat: Ready-mixed enamel.
   a. ICI: 1120 Ultra Hide Alkyd Int. undercoater.
   b. PPG: 6-6 Speedhide Quick-Dry Enamel Undercoater.
   c. P & L: Interior Trim Primer.
   d. S-W: Pro-Mar 200 Alkyd Semi-Gloss Enamel B34W200.

2.5 EXTERIOR FINISH PAINT MATERIAL

A. Finish Paint: Provide the manufacturer's recommended factory-formulated finish-coat materials that are compatible with the substrate and undercoats indicated.

B. Available Products: Subject to compliance with requirements, finish coat materials that may be incorporated in the Work include, but are not limited to, the following:

1. Alkyd Gloss Enamel: Weather-resistant, air-drying, high-gloss enamel.
   a. ICI: 4308 Devguard Alkyd Industrial gloss Enamel.
   b. PPG: 54 Line Quick-Dry Enamel.
   c. P & L: Effecto Enamel.
   d. S-W: Industrial Enamel B-54 Series.

2.6 INTERIOR FINISH PAINT MATERIAL

A. Finish Paint: Provide the manufacturer's recommended factory-formulated finish-coat materials that are compatible with the substrate and undercoats indicated.

B. Available Products: Subject to compliance with requirements, finish coat materials that may be incorporated in the Work include, but are not limited to, the following:

1. Interior, Semigloss, Alkyd Enamel: Semigloss, low-odor, alkyd enamel.
   a. ICI: 1516 Ultra Hide Alkyd Semigloss Enamel.
   b. PPG: 27 Line Wallhide Semigloss Enamel.
   c. P & L: Cellu-Tone Alkyd Satin Enamel.
   d. S-W: ProMar 200 Alkyd Semigloss Enamel B34 Series.

2. Interior, Flat, Latex-Based Paint: Ready-mixed, latex-based paint.
   a. ICI: 1210 Ultra Hide Latex flat.
   b. PPG: 50-35 Latex Ceiling Paint.
   c. P & L: Vapex Latex Flat Wall Finish.
   d. S-W: ProMar 200 Laytex Flat Wall Paint B30 Series

3. Exterior, Gloss, Alkyd Enamel:
   a. ICI: 4380 Devguard Alkyd Industrial Gloss Enamel.
   b. PPG: 54 Line Quick-Dry Enamel.
   c. P & L: Effecto Enamel.
   d. S-W: Industrial Enamel B-54 Series.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which painting will be performed for compliance with paint application requirements. Surfaces receiving paint must be thoroughly dry before paint is applied.

1. Do not begin to apply paint until unsatisfactory conditions have been corrected.
2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items, if necessary, to completely paint the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease prior to cleaning. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to the manufacturer's instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and re-prime. Notify Architect in writing about anticipated problems using the specified finish-coat material with substrates primed by others.
2. Ferrous Metals: Clean ungalvanized ferrous metal surfaces that have not been shop-coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council (SSPC).

   a. Blast steel surfaces clean as recommended by the paint system manufacturer and according to requirements of SSPC specification SSPC-SP 6.
   b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
   c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.

3. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment

from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Materials Preparation: Carefully mix and prepare paint materials according to manufacturer's directions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
3. Use only thinners approved by the paint manufacturer and only within recommended limits.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

1. Paint colors, surface treatments, and finishes are indicated in the schedules.
2. Provide finish coats that are compatible with primers used.
3. The number of coats and the film thickness required are the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce a smooth even surface according to the manufacturer's directions.
4. Apply additional coats if undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
5. The term exposed surfaces includes areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
6. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
7. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, nonspecular black paint.
8. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
9. Finish exterior doors on tops, bottoms, and side edges same as exterior faces.
10. Sand lightly between each succeeding enamel or varnish coat.
11. Omit primer on metal surfaces that have been shop-primed and touch-up painted.

C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

D. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to the manufacturer's directions.

1. Brushes: Use brushes best suited for the material applied.
2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

E. Minimum Coating Thickness: Apply materials no thinner than the manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

F. Block Fillers: Apply block fillers to concrete at a rate to ensure complete coverage with pores filled.

G. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime-coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

H. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with specified requirements.

3.4 CLEANING

A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.5 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINT SCHEDULE

A. General: Provide the following paint systems for the various substrates indicated excluding of pre-finished metal building components. Sherwin-Williams products are listed below to indicate paint system types, but are not intended to limit the choice of manufacturers.

B. Ferrous Metal: Primer is not required on shop-primed items.

1. Full-Gloss Alkyd Enamel: Two finish coats over primer.

a. Primer: Synthetic rust-inhibiting primer.
1) Kem Kromik Metal Primer B50N2/B50W1.
2) ICI: 4160 Devguard Tank & Structural Metal Primer.

b. First and Second Coats: Gloss alkyd enamel.
1) Industrial Enamel B-54 Series.
2) ICI: 4308 Devguard Alkyd Industrial gloss Enamel.

C. Zinc-Coated Metal:

1. High-Gloss Alkyd Enamel: Two finish coats over primer.

a. Primer: Galvanized metal primer.
1) Galvite B50W3.
2) ICI: 4120 All purpose Metal & Galvanized Primer.

b. First and Second Coats: Gloss alkyd enamel.
1) Industrial Enamel B-54 Series.
2) ICI: 4308 Devguard Alkyd Industrial gloss Enamel.

3.7 INTERIOR PAINT SCHEDULE

A. General: Provide the following paint systems for the various substrates, as indicated. Sherwin-Williams products are listed below to indicate paint system types, but are not intended to limit the choice of manufacturers.

B. Gypsum Drywall Systems / Painted Plywood Panels:

1. Semigloss Alkyd Enamel Finish: Three coats with total dry film thickness not less than 2.5 mils.

a. Primer: White, interior, latex-based primer.
1) Pro-Mar 200 Latex Wall Primer B28W200.
2) ICI: 1030-Ultra Hide PVA Primer Sealer.

b. First and Second Coats: Interior, semigloss, odorless, alkyd enamel.
1) Pro-Mar 200 Alkyd Semi-Gloss Enamel B34 W200.
2) ICI: 1516 Ultra Hide Alkyd Semigloss Enamel.

C. Ferrous Metal:

1. Full-Gloss Enamel Finish: Two coats over primer with total dry film thickness not less than 2.5 mils.

a. Primer: Synthetic, quick-drying, rust-inhibiting primer.
1) Kem Kromik Metal Primer B50N2/B50W1.
2) ICI: 4160 Devguard Tank & Structural Metal Primer.

b. First and Second Coats: Exterior, gloss, alkyd enamel.
1) Industrial Enamel B-54 Series.
2) ICI: 4308 Devguard Alkyd Industrial gloss Enamel.

D. Zinc-Coated Metal:

1. Full-Gloss Enamel Finish: Two coats over primer with total dry film thickness not less than 2.5 mils.

   a. Primer: Galvanized metal primer.
      2) Galvite B50W3.
      2) ICI: 4120 All purpose Metal & Galvanized Primer.

   b. First and Second Coats: Exterior, gloss, alkyd enamel.
      3) Industrial Enamel B-54 Series.
      2) ICI: 4308 Devguard Alkyd Industrial gloss Enamel.

END OF SECTION 09900

SECTION 10100 - VISUAL DISPLAY BOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following types of visual display boards:

1. Porcelain enamel markerboards (for liquid chalk).
2. Vinyl-fabric-faced cork tackboards.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 6 Section "Miscellaneous Carpentry" for wood blocking and grounds.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.

B. Product Data: Include motor capacities, and individual panel weights for sliding chalkboard or markerboard units. Include manufacturer's data substantiating that tackboard materials comply with requirements indicated.

C. Shop Drawings: Provide shop drawings for each type of chalkboard, markerboard, and tackboard required. Include sections of typical trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, layout, and installation details.

D. Samples: Provide the following samples of each product for initial selection of colors, patterns, and textures, as required, and for verification of compliance with requirements indicated.

1. Samples for initial selection of color, pattern, and texture:

a. Porcelain Enamel Chalkboard and Markerboard: Manufacturer's color charts consisting of actual sections of porcelain enamel finish showing the full range of colors available for each type of chalkboard and markerboard required.
b. Vinyl-fabric-faced Cork Tackboards: Manufacturer's color charts consisting of actual sections of vinyl fabric, showing the full range of colors, textures, and patterns available for each type of vinyl-fabric-faced cork tackboard indicated.

2. Samples for verification of color, pattern, and texture selected, and compliance with requirements indicated.

a. Chalkboards, Markerboards, and Tackboards: Sample panels not less than 8-1/2 inches by 11 inches for each type of chalkboard, markerboard, and tackboard indicated. Include a sample panel for each color, texture, and pattern required.

E. Certificates: In lieu of laboratory test reports, when permitted by the Architect, submit the manufacturer's certification that vinyl-fabric-faced cork tackboard materials furnished comply with requirements specified for flame spread ratings.

1.4 QUALITY ASSURANCE

A. Fire Performance Characteristics: Provide vinyl-fabric-faced tackboards with surface burning characteristics indicated below, as determined by testing assembled materials composed of facings and backings identical to those required in this section, in accordance with ASTM E 84, by a testing organization acceptable to authorities having jurisdiction.

1. Flame Spread: 25 or less.
2. Smoke Developed: 10 or less.

B. Design Criteria: The drawings indicate size, profiles, and dimensional requirements of visual display boards and are based on the specific type and model indicated. Other visual display boards having equal performance characteristics by other manufacturers may be considered provided that deviations in dimensions and profiles are minor and do not change the design concept or intended performance as judged by the Architect. The burden of proof of equality is on the proposer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. Porcelain Enamel Marker Boards:
   a. Claridge Products and Equipment, Inc.
   b. Greensteel, Inc.
   c. ADP Lemco
   d. Or, pre-approved equal.

2. Tackboards:
   a. Claridge Products and Equipment, Inc.
   b. Greensteel, Inc.
   c. ADP Lemco
   d. Or, pre-approved equal.

2.2 MATERIALS

A. Porcelain Enamel Marker Boards: Provide balanced, high-pressure-laminated porcelain enamel marker boards of 3-ply construction consisting of face sheet, core material, and backing.

1. Face Sheet: Provide face sheet of 24-gage enameling grade steel especially processed for temperatures used in coating porcelain on steel. Coat the exposed face and exposed edges with a 3-coat process consisting of primer, ground coat, and color cover coat, and the concealed face with a 2-coat process consisting of primer

and ground coat. Fuse cover and ground coats to steel at the manufacturer's standard firing temperatures, but not less than 1200 deg F (649 deg C).

a. Cover Coat: Provide the manufacturer's standard light-colored special writing surface with gloss finish intended for use with liquid felt-tipped markers.

2. Core: Provide the manufacturer's standard 3/8-inch-thick particleboard core material complying with the requirements of ANSI A208.1, Grade 1-M-1.
3. Backing Sheet: Provide the manufacturer's standard 0.015-inch-thick aluminum sheet backing.
4. Laminating Adhesive: Provide the manufacturer's standard moisture-resistant thermoplastic-type adhesive.

B. Vinyl-Fabric-Faced Tackboards: Provide mildew-resistant, washable, vinyl fabric complying with FS CCC-W-408, Type II, weighing not less than 13 ounces per square yard, laminated to 1/4-inch-thick cork sheet. Provide fabric that has a flame spread rating of 25 or less when tested in accordance with ASTM E 84. Provide color and texture as scheduled or as selected from the manufacturer's standards.

1. Backing: Make panels rigid by factory laminating cork face sheet under pressure to 1/4-inch-thick hardboard backing.

2.3 ACCESSORIES

A. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062-inch-thick aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units wherever possible; keep joints to a minimum. Miter corners to a neat, hairline closure.

1. Where the size of boards or other conditions exist that require support in addition to the normal trim, provide structural supports or modify the trim as indicated or as selected by the Architect from the manufacturer's standard structural support accessories to suit the condition indicated.
2. Field-Applied Trim: Provide the manufacturer's standard snap-on trim, with no visible screws or exposed joints.
3. Field-Applied Trim: Provide the manufacturer's standard screw-on trim with Phillips flat-head screws.
4. Chalktray: Furnish the manufacturer's standard continuous, solid extrusion-type aluminum chalktray with ribbed section and smoothly curved exposed ends, for each chalkboard.

2.4 FABRICATION

A. Porcelain Enamel Marker Boards: Laminate facing sheet and backing sheet to core material under pressure with manufacturer's recommended flexible, waterproof adhesive.

B. Assembly: Provide factory-assembled marker board and tackboard units, except where field-assembled units are required.

1. Make joints only where total length exceeds maximum manufactured length. Fabricate with the minimum number of joints, balanced around the center of the board, as acceptable to the Architect.
2. Provide the manufacturer's standard vertical joint system between abutting sections of marker board.
3. Provide manufacturer's standard mullion trim at joints between marker board and tackboard.

2.5 FINISHES

A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

C. Class II Clear Anodized Finish: AA-M12C22A31 (Mechanical Finish: as fabricated, nonspecular; Chemical Finish: etched, medium matte; Anodic Coating: Class II Architectural, clear film thicker than 0.4 mil).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Deliver factory-built marker board and tackboard units completely assembled in one piece without joints, wherever possible. Where dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to the Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.

B. Install units in locations and at mounting heights indicated and in accordance with the manufacturer's instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for a complete installation.

C. Coordinate job-site assembled units with grounds, trim, and accessories. Join parts with a neat, precision fit.

3.2 ADJUST AND CLEAN

A. Verify that accessories required for each unit have been properly installed and that operating units function properly.

B. Clean units in accordance with the manufacturer's instructions. Break in marker boards only as recommended by the manufacturer.

END OF SECTION 10100

SECTION 10425 - SIGNS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following types of signs:

1. Panel signs, Dimensional letters and numbers.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.

C. Shop drawings showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.

1. Provide message list for each sign required, including large-scale details of wording and lettering layout.
2. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.

D. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.

1. Samples for initial selection of color, pattern, and texture:

a. Cast Acrylic Sheet and Plastic Laminate: Manufacturer's color charts consisting of actual sections of material including the full range of colors available for each material required.

2. Samples for verification of color, pattern, and texture selected and compliance with requirements indicated:

a. Cast Acrylic Sheet and Plastic Laminate: Provide a sample panel not less than 8 inches by 8 inches for each material, color, texture, and pattern required. On each panel include a representative sample of the graphic image process required, showing graphic style, and colors and finishes of letters, numbers, and other graphic devices.

1.4 QUALITY ASSURANCE

A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.

B. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.

C. Design Concept: The Drawings indicate sizes, profiles, and dimensional requirements of signs and are based on the specific types and models indicated. Sign units by other manufacturers may be considered provided deviations in dimensions and profiles do not change the design concept as judged by the Architect. The burden of proof of equality is on the Proposer.

1.5 PROJECT CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Coordinate fabrication schedule with construction progress to avoid delay.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Manufacturers of Panel Signs:
   a) Utah Correctional Industries
   b) Allenite Signs; Allen Marking Products, Inc.
   c) American Graphics Inc.
   d) Andco Industries Corp.
   e) APCO Graphics, Inc.
   f) ASI Sign Systems, Inc.
   g) Best Manufacturing Co.
   h) Grimco, Inc.
   i) Innerface Sign Systems, Inc.
   j) Kaltech Industries Group, Inc.
   k) Mills Manufacturing, Inc.
   l) Mohawk Sign Systems.
   m) Seton Identification Products.
   n) Signature Signs, Inc.
   o) Supersine Company (The).
   p) Or, pre-approved equal.

2.2 MATERIALS

A. Cast Acrylic Sheet: Provide cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet, in sizes and thicknesses indicated, with a minimum flexural strength of 16,000 psi when tested according to ASTM D 790, with a minimum allowable continuous service temperature of 176 deg F (80 deg C), and of the following general types:

1. Transparent Sheet: Where sheet material is indicated as "clear," provide colorless sheet in matte finish, with light transmittance of 92 percent, when tested according to the requirements of ASTM D 1003.
2. White Translucent Sheet: Where sheet material is indicated as "white," provide white translucent sheet of density required to produce uniform brightness and minimum halation effects.
3. Opaque Sheet: Where sheet material is indicated as "opaque," provide colored opaque acrylic sheet in colors and finishes as selected from the manufacturer's standards.

B. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.

C. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance.

D. Colored Coatings for Acrylic Plastic Sheet: Use colored coatings, including inks and paints for copy and background colors that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are non-fading for the application intended.

2.3 PANEL SIGNS

A. Panel Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.

B. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to conform with the following requirements:

1. Edge Condition: Square cut.
2. Corner Condition: Corners rounded to 3/4-inch radius unless indicated otherwise.

C. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices.

D. Raised Copy: Machine-cut copy characters from matte-finished opaque acrylic sheet and chemically weld onto the acrylic sheet forming sign panel face. Produce precisely formed characters with square cut edges free from burrs and cut marks.

1. Panel Material: Matte-finished opaque acrylic sheet.
2. Raised Copy Thickness: Not less than 1/32 inch.

2.4 INFORMATION FOR SIGNS AS FOLLOWS:

A. 1. Message: "STORAGE ROOM" – On two lines
2. Letter Height: 1 1/4 inches.
3. Letter Style: Helvetica.

B. 1. Message: "TRAINING ROOM" – On two lines
2. Letter Height: 1 1/4 inches.
3. Letter Style: Helvetica.

C. 1. Message: "OFFICE"
2. Letter Height: 1 1/4 inches.
3. Letter Style: Helvetica.

D. 1. Message: "GREASE"
2. Letter Height: 1 1/4 inches.
3. Letter Style: Helvetica.

E. 1. Message: "ATF"
2. Letter Height: 1 1/4 inches.
3. Letter Style: Helvetica.

F. 1. Message: "ENGINE OIL"
2. Letter Height: 1 1/4 inches.
3. Letter Style: Helvetica.

G. 1. Message: "HYDRAULIC FLUID"
2. Letter Height: 1 1/4 inches.
3. Letter Style: Helvetica.

H. 1. Message: "DURING THE USE OF A TORCH OR WELDING DEVICE A FIRE EXTINGUISHER SHALL BE LOCATED NEAR THE WELDING / CUTTING OPERATION AND A "*FIRE WATCH*" PERSON SHALL OVERSEE OPERATION"
2. Letter Height: 1 1/4 inches.
3. Letter Style: Helvetica.

I. 1. Message: "RESTROOM"
2. Letter Height: 3/4 inches.
3. Letter Style: Helvetica.
4. Provide all ADA Compliant graphics & Braille Text

J. 1. Message: "ENTRANCE"
2. Letter Height: 3/4 inches.
3. Letter Style: Helvetica.
4. Provide all ADA Compliant graphics & Braille Text

2.5 FINISHES

A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the Architect from the manufacturer's standards.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.

3. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.

B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:

3. Vinyl-Tape Mounting: Use double-sided foam tape to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
4. Silicone-Adhesive Mounting: Use liquid silicone adhesive recommended by the sign manufacturer to attach sign units to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended by the sign manufacturer to hold the sign in place until the adhesive has fully cured.

3.2 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

END OF SECTION 10425

SECTION 10500 - METAL LOCKERS AND STORAGE CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Wardrobe lockers, including the following:

a. Single-tier.

2. Metal storage cabinets

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 3 Section "Cast-in-Place Concrete" for concrete base.
2. Division 6 Section "Miscellaneous Carpentry" for wood furring and grounds.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data: Manufacturer's printed data including materials, accessories, construction, finishes, assembly, and installation instructions for lockers and cabinets.

C. Shop Drawings: Layout and dimensions of metal lockers and cabinets. Indicate relationship to adjoining surfaces. Show locker and cabinet elevations and details, fillers, trim, base, sloping tops, and accessories. Include locker and cabinet numbering sequence. Indicate installation and anchorage requirements.

D. Samples for Initial Color Selection: Manufacturer's color charts showing a full range of available colors.

E. Samples for Color Verification: Samples showing actual colors prepared on same material to be used for the Work.

F. Maintenance Instructions: Instructions for cleaning lockers and cabinets and for adjusting, repairing, and replacing locker and cabinet doors and latching mechanisms.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain locker and cabinet units and accessories from one manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver lockers and cabinets until spaces to receive them are clean, dry, and ready for locker and cabinet installation.

B. Protect lockers and cabinets from damage during delivery, handling, storage, and installation.

C. Deliver master keys, control keys, and combination control charts to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:

1. The Interior Steel Equipment Co.
2. List Industries Inc.
3. Lyon Metal Products Inc.
4. Medart, Inc.
5. Penco Products.
6. Republic Storage Systems Co., Inc.
7. Hadrian Metal Lockers

2.2 MATERIALS

A. Steel Sheet: ASTM A 366 (A 366M), commercial-quality, stretcher-leveled, cold-rolled carbon steel sheet, stretcher leveled, free of buckling, scale, and surface imperfections.

B. Hot-Dip Zinc-Coated Steel Sheet: ASTM A 526/A 526M, commercial-quality, zinc-coated, carbon-steel sheet, hot-dip galvanized according to ASTM A 525 (A 525M) with A 60 (ZF 180) or G 60 (Z 180) coating designation.

C. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, with Class C zinc coating, mill phosphatized.

D. Fasteners: Zinc- or nickel-plated steel; slotless-type exposed bolt heads; self-locking nuts or lock washers for nuts on moving parts.

E. Equipment: Manufacturer's standard plated steel hooks or coat rods.

2.3 WARDROBE LOCKERS

A. Arrangement: Single-tier.

B. Size: 72 inches high by 15 inches wide by 18 inches deep.

C. Body: Form backs, tops, bottoms, sides, and intermediate partitions of flanged 0.0239-inch (24 ga) (0.61-mm) minimum steel sheet.

1. Form exposed ends of non recessed lockers of 0.0598-inch (16 ga) (1.5-mm) minimum steel sheet.

D. Frames: Form channel frames of 0.0598-inch (16 ga) (1.5-mm) minimum steel sheet. Form continuous integral strike on vertical frame members or weld 0.0897-inch (13 ga) (2.3-mm) minimum latch hooks to latch strike frame.

1. Cross Frames: Form intermediate channel cross frames to double- or triple-tier lockers of 0.0598-inch (16 ga) (1.5-mm) minimum steel sheet.

E. Shelf: Form 0.0239-inch (24 ga) (0.61-mm) minimum steel sheet hat shelf in single-tier units.

F. Door: One-piece steel sheet, flanged at all edges, constructed to prevent springing when opening or closing. Fabricate to swing 180 degrees.

1. Thickness: 0.0598 inch (16 ga) (1.5 mm) minimum.
2. Style: Louvered vents.

G. Reinforcing and Sound-Dampening Panels: Brace or reinforce inner face of doors with manufacturer's standard reinforcing angles, channels, or stiffener panels.

H. Acoustical Treatment: Fabricate lockers for quiet operation with manufacturer's standard rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact.

I. Louvered Vents: Stamped, louvered vents in door face, as follows:

1. Single-Tier Lockers: No fewer than 6 louver openings top and bottom.

J. Security Vents: Manufacturer's standard arrangement of stamped horizontal or vertical security vents on door face.

K. Hinges: Steel, full-loop, 5- or 7-knuckle tight pin, 2 inches (51 mm) high minimum. Weld to inside of frame and secure to door with not fewer than 2 factory-installed fasteners that are completely concealed and tamperproof when door is closed.

1. Provide at least 3 hinges for each door over 42 inches (1067 mm) high; at least 2 hinges for each door 42 inches (1067 mm) high or less.

L. Recessed Handle and Latch: Manufacturers' standard housing to form recess for latch lifter and locking devices; nonprotruding latch lifter containing strike and eye for padlock; and automatic, prelocking, pry-resistant latch mechanism with latching action as follows:

1. Single-Tier Lockers: Not less than 3-point latching.

2.4 METAL STORAGE CABINETS

A. Size: 78 inches high by 36 inches wide by 18 inches deep.

B. Shelving: 4 shelves adjustable every 2 inches

C. Storage: Minimum 180 lbs. per shelf storage requirement

D. Finish: All surfaces to receive manufacturer’s stock finish

2.4 LOCKS

A. Fabricate lockers to receive the following locking devices:
1. Combination padlock.

B. Fabricate cabinets to receive the following locking devices:
1. Built-in key lock

2.5 LOCKER ACCESSORIES

A. Equipment: Furnish each locker with:

1. 2 single-prong wall hooks.
2. Coat Rod.

B. Number Plates: Manufacturer's standard etched, embossed, or stamped, nonferrous-metal number plates with numerals not less than 3/8 inch (9 mm) high. Number lockers in sequence indicated. Attach plates to each locker door, near top, centered, with at least 2 fasteners of same finish as number plate.

C. Recess Trim: Manufacturer's standard 0.0478-inch (18 ga) (1.2-mm) minimum steel sheet trim with concealed fastening clips.

D. Filler Panels: 0.0478-inch (18 ga) (1.2-mm) minimum steel sheet, factory fabricated.

2.6 FABRICATION

A. Fabricate lockers and cabinets square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make exposed metal edges free of sharp edges and burrs, and safe to touch. Weld frame members together to form a rigid, 1-piece structure.

1. Form locker and cabinet body panels, doors, shelves and accessories from 1-piece steel sheet unless otherwise indicated.
2. Preassemble lockers and cabinets by welding all joints, seams, and connections. Grind exposed welds flush.

2.7 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

B. Finish all steel surfaces and accessories, except prefinished stainless-steel and chrome-plated surfaces.

C. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering prior to shipment.

D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within 1/2 of the range of approved samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved samples and they are assembled or installed to minimize contrast.

2.8 GALVANIZED-STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces of dirt, grease, and other contaminants followed by a conversion coating of type suited to organic coating applied over it. Clean welds, mechanical connections, and abraded areas and follow with an application of the galvanizing repair paint, specified below, to comply with ASTM A 780.

1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

B. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard baked-enamel finish consisting of a thermosetting topcoat. Comply with paint manufacturer's instructions for application and baking to achieve a minimum dry film thickness of 1.1 mils (0.028 mm) on doors, frames, and legs, and 0.7 mil (0.018 mm) elsewhere.

1. Color and Gloss: As selected by Architect from manufacturer's standard choices for color and gloss.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install metal lockers and cabinets complete with accessories according to manufacturer's recommendations. Install plumb, level, rigid, and flush.

B. Connect together welded locker and cabinet groups with standard fasteners according to manufacturer's recommendations, with no exposed fasteners on face frames.

C. Anchor lockers and cabinets to floors and walls at intervals recommended by manufacturer but no greater than 36 inches (910 mm). Install anchors through back-up reinforcing plates where necessary to avoid metal distortion, using concealed fasteners.

D. Install recess trim to recessed lockers using concealed fasteners. Provide hairline joints and concealed splice plates.

3.2 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices are operating properly.

B. Clean interior and exposed exterior surfaces and polish stainless-steel and nonferrous metal surfaces.

C. Protect lockers and cabinets from damage, abuse, dust, dirt, stain, or paint. Do not permit locker use during construction.

D. Touch up marred finishes, or replace locker and cabinet units that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker and cabinet manufacturer.

END OF SECTION 10500

SECTION 10522 - FIRE EXTINGUISHERS AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Fire extinguishers.
2. Fire extinguisher mounting brackets.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain extinguishers and cabinets from one source from a single manufacturer.

B. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. J.L. Industries.
2. Larsen's Manufacturing Co.
3. Potter-Roemer, Inc.
4. Or, pre-approved equal.

2.2 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers for each location indicated, in colors and finishes selected by Architect from manufacturer's standard, that comply with authorities having jurisdiction.

B. Multipurpose Dry Chemical Type: UL-rated 4-A:80-B:C, 10-lb nominal capacity, in enameled steel container.

2.3 MOUNTING BRACKETS

A. Brackets: Designed to prevent accidentally dislodging extinguisher, of sizes required for type and capacity of extinguisher indicated, with red enamel finish.

1. Provide brackets for extinguishers not located in cabinets.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Follow manufacturer's printed instructions for installation.

B. Install in locations and at mounting heights indicated or, if not indicated, at heights to comply with applicable regulations of governing authorities.

END OF SECTION 10522

SECTION 10800 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes toilet and bath accessory items as indicated on drawings.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specifications Sections.

B. Product data for each toilet accessory item specified, including construction details relative to materials, dimensions, gages, profiles, mounting method, specified options, and finishes.

C. Setting drawings where cutouts are required in other work, including templates, substrate preparation instructions, and directions for preparing cutouts and installing anchorage devices.

D. Maintenance instructions including replaceable parts and service recommendations.

1.4 QUALITY ASSURANCE

A. Inserts and Anchorages: Furnish accessory manufacturers' standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.

B. Single-Source Responsibility: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise acceptable to Architect.

1.5 PROJECT CONDITIONS

A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

1.6 WARRANTY

A. Warranty: Submit a written warranty executed by mirror manufacturer, agreeing to replace any mirrors that develop visible silver spoilage defects within warranty period.

B. Warranty Period: 15 years from date of Substantial Completion.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering toilet accessories that may be incorporated in the Work include, but are not limited to, the following:

1. Bobrick Washroom Equipment, Inc.
2. Bradley Corporation.
3. American Specialties Inc.
4. Gamcc

2.2 MATERIALS, GENERAL

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 0.034-inch (22-gage) minimum thickness.

B. Mirror Glass: Nominal 6.0-mm (0.23-inch) thick, conforming to ASTM C 1036, Type I, Class 1, Quality q2, and with silvering, electro-plated copper coating, and protective organic coating.

C. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

D. Fasteners: Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

2.3 COMBINATION TOWEL DISPENSER/WASTE RECEPTACLE UNITS

A. Recessed Unit: Stainless steel combination unit fabricated for nominal 4-inch wall depth with continuous, seamless wall flange. Towel compartment in upper portion of unit designed to dispense not less than 400 C-fold or 700 multifold paper towels. Waste receptacle in lower portion of unit provided with reusable, heavy-duty vinyl liner, minimum 4-gallon capacity. Provide flush doors with piano hinges and tumbler locks on upper and lower compartments.

2.4 PAPER TOWEL DISPENSER

A. Surface Mounted: Stainless Steel unit to dispense not less 400 C-fold or 525 multifold towels without adjustment or adapters. Door with tumbler lock and piano-hinge.

2.5 COMBINATION TOILET TISSUE DISPENSER/SANITARY NAPKIN DISPOSAL UNITS

A. Recessed Unit: Fabricate of stainless steel with satin finish for recessed mounting in nominal 4-inch wall depth. Provide complete with drywall mounting clamp. Clearance between grab bar and unit required.

1. Size: Unit to accommodate two separate core-type tissue rolls up to 5 inches in diameter.

2.6 GRAB BARS

A. Stainless Steel Type: Provide grab bars with wall thickness not less than 0.05 inch (18 gage) and as follows:

1. Mounting: Concealed, manufacturer's standard flanges and anchorages.
2. Clearance: 1-1/2-inch clearance between wall surface and inside face of bar.

3. Gripping Surfaces: Manufacturer's standard nonslip texture.
4. Heavy-Duty Size: Outside diameter of 1-1/2 inches.

2.7 SOAP DISPENSERS

A. Liquid Soap Dispenser, Horizontal-Tank Type: Fabricate for surface mounting, sized for 40-fluid-ounce minimum capacity. Provide stainless steel piston, springs, and internal parts designed to dispense soap in measured quantity by pump action. Provide cover of type 304 stainless steel in No. 4 finish, with unbreakable window-type refill indicator.

1. Equip unit with push-type valve for dispensing soap in liquid form.

2.8 MISCELLANEOUS ACCESSORIES

A. Mop and Broom Holder: 0.05-inch (18-gage), Type 304, stainless steel hat channel with spring-loaded, rubber, cam-type mop/broom holders. Provide unit 24 inches long and complete with three holders.

B. Double-Prong Robe Hook: Heavy-duty satin finished stainless steel double-prong robe hook; rectangular wall bracket with backplate for concealed mounting.

2.9 MIRROR UNITS

A. Standard Stainless Steel Framed Mirror Units: Fabricate frame with channel shapes not less than 0.04 inch (20 gage), with square corners carefully mitered to hairline joints and mechanically interlocked. Provide in Type 430 bright polished finish.

2.10 FABRICATION

A. General: Only a maximum 1-1/2-inch-diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

C. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors or access panels with full-length, stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.

D. Framed Mirror Units, General: Fabricate frames for glass mirror units to accommodate wood, felt, plastic, or other glass edge protection material. Provide mirror backing and support system that will permit rigid, tamperproof glass installation and prevent moisture accumulation, as follows:

1. Provide galvanized-steel backing sheet, not less than 0.034 inch (22 gage) and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.

E. Mirror Unit Hangers: Provide system for mounting mirror units that will permit rigid, tamperproof, and theftproof installation, as follows:

1. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.

F. Keys: Provide universal keys for access to toilet accessory units requiring internal access for servicing, re-supply, etc. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install toilet accessory units according to manufacturers' instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to manufacturer's instructions for type of substrate involved.

C. Install grab bars to withstand a downward load of at least 250 lbf, complying with ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
B. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

3.3 SCHEDULE OF ACCESSORIES

A. Manufacturer: The following catalog numbers refer to products of Bobrick Washroom Equipment, Inc. and these scheduled products serve as the standard of quality required for the project. Provide these or comparable products from specified manufacturers if they meet or exceed this standard of quality.

1. Semi-Recessed Paper Towel Dispenser and Waste Receptacle: #B-3944.
2. Paper Towel Dispenser: #B-262.
3. Toilet Tissue Dispenser and Sanitary Napkin Disposal: #B-35704.
4. Grab Bars: #B-6206.99, #B-62616
5. Soap Dispenser: #B-2112.
6. Mop & Broom Holder: #B-223 x 24".
7. Robe Hook: #B-682.
8. Mirror: #B 166-2436

END OF SECTION 10800

SECTION 12511 - HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes horizontal louver blinds.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of horizontal louver blind specified. Include printed data on physical characteristics.

C. Samples for initial selection purposes in manufacturer's standard sizes showing full range of colors available for each type of blind indicated.

D. Maintenance data to include in Operating and Maintenance Manual specified in Division 1.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has specialized in installing horizontal louver blinds similar to those required for this Project.

B. Surface Burning Characteristics: Provide blinds identical to those tested for the following fire performance characteristics as determined by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Test Method: NFPA 701, Small Scale Vertical Burn Test.

C. Single-Source Responsibility: Obtain horizontal louver blinds from one source of a single manufacturer.

1.5 PROJECT CONDITIONS

A. Field Measurements: Check openings by field measurements before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay in the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, horizontal louver blinds that may be incorporated in the Work include, but are not limited to, the products specified in each Horizontal Louver Blind Product Data Sheet at the end of this Section.

2.2 MATERIALS AND FABRICATION

A. Product Standard and Description: American Window Covering Manufacturers Association (AWCMA) Document 1029. Each horizontal louver blind unit consists of slats, rails, cord lock, tilting mechanism, tapes, and installation hardware complying with referenced product standard and requirements indicated on each Horizontal Louver Blind Product Data Sheet at the end of this Section.

B. Lifting and Tilting Mechanisms: Noncorrosive, self-lubricating materials.

C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):

1. Blind Units Installed Between (Inside) Jambs: Width and length equal to 1/2 inch less than opening dimensions formed by jamb, head, and sill members of opening in which each blind is installed.

D. Installation Fasteners: Not less than two fasteners per bracket, fabricated from metal noncorrosive to blind hardware and adjoining construction and to support blind units under conditions of normal use.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings where horizontal louver blinds will be installed prior to beginning installation. Verify that critical dimensions are correct and surface conditions acceptable.

1. Complete all finishing operations, including painting, before beginning installation.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install blinds level, plumb, and located so exterior slat edges in any position are not closer than 1 inch to interior face of glass lites, gaps between slat ends and jambs do not exceed 1/4 inch plus or minus 1/8 inch, and bottom rail in fully lowered position is within 1/2 inch of bottom of window or other opening.

3.3 CLEANING

A. After completing the installation, clean blind surfaces according to the manufacturer's instructions.

B. Remove surplus materials, packaging, rubbish and debris resulting from the installation. Leave areas where installation occurred neat, clean, and ready for use.

HORIZONTAL LOUVER BLIND PRODUCT DATA SHEET

Slat Description: Perforated slats complying with the following requirements:

Openness Factor: 180 degrees

Nominal Slat Width: 1 inch (mini blinds.)

Tilt Operation: Manual with wand.

Position of Tilter Control: Left side unless otherwise indicated.

Tilt: Full.

Cord Lock Operation: Cord lock, locks pull cord to stop blind at any position in ascending or descending travel.

Position: Right unless otherwise indicated.

Cord Equalizers: Self-aligning to maintain horizontal blind position.

Valance: Match color of slats.

Mounting: Wall.

Color: As selected by Architect from manufacturer's full range of colors produced for horizontal blinds specified.

Product(s): As follows:

"Bali Classic Mini" - Carey-McFall

"Riveria" – Levolor

Or pre-approved equal.

END OF SECTION 12511

SECTION 13125 - METAL BUILDING SYSTEMS

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
1. Structural framing.
2. Roof panels.
3. Wall panels.
4. Fascia and Soffit panels.
5. Insulation and vapor barrier.
6. Building components, as follows: provide and install misc. framing for mechanical units and grills, framing for lighting support, overhead door frames, doors, windows, equipment and other items not listed which will rely on the building for support.
7. Accessories and trim.

B. Related Sections include the following: List below only products, construction, and equipment that the reader might expect to find in this Section but are specified elsewhere.

1. Division 3 Section "Cast-in-Place Concrete" for concrete foundations and anchor-bolt installation including concrete waterproofing systems.

2. Division 8 Section "Sectional Overhead Doors." for requirements of support for overhead door.

3. Division 8 Section "Door Hardware" for finish door hardware and keying to be used with metal building system.

4. Division 8 Section "Glazing" for glass and glazing to be used with metal building system.

5. Division 9 Section "Painting" for shop-applied finishes not standard with metal building system manufacturer.

6. Division 9 Section "Gypsum board Assemblies" for application of fire rated assemblies to metal building systems.

7. Division 15 Section “Mechanical” for required coordination of equipment with wall, soffit and roof.

8. Division 16 Section “Interior Exterior Building Lighting” for required coordination of equipment with wall, and soffit.

1.3 DEFINITIONS

A. Bay Spacing: Dimension between main frames measured normal to frame (at centerline of frame) for interior bays, and dimension from centerline of first interior main frame measured perpendicular to end wall (outside face of end-wall girt).

B. Building Length: Dimension of the building measured perpendicular to main framing from end

wall to end wall (outside face of girt to outside face of girt).

C. Building Width: Dimension of the building measured parallel to main framing from sidewall to sidewall (outside face of girt to outside face of girt).

D. Clear Span: Distance between supports of beams, girders, or trusses (measured from lowest level of connecting area of a column and a rafter frame, or knee).

E. Eave Height: Vertical dimension from finished floor to eave (the line along the sidewall formed by intersection of the planes of the roof and wall).

F. Clear Height under Structure: Vertical dimension from finished floor to lowest point of any part of primary or secondary structure, not including crane supports, located within clear span.

G. Terminology Standard: Refer to MBMA's "Low Rise Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in referenced standards.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide a complete, integrated set of metal building system manufacturer's standard mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior. Include primary and secondary framing, roof and wall panels, and accessories complying with requirements indicated, including those in this Article.

B. Metal Building System Design: Of size, spacing, slope, and spans indicated, and as follows:

1. Primary Frame Type: Provide the following: a. Rigid Clear Span: Solid-member structural-framing system without interior columns as indicated.

2. End-Wall Framing: Manufacturer's standard, for buildings required to be expandable to the east, as follows:

a. Provide primary frame, capable of supporting one-half of a bay design load, and end-wall columns.

b. Flush-framed girts.

3. Eave Height: Manufacturer's standard height, as indicated by nominal height on Drawings.

4. Bay Spacing: See plans.

5. Roof Slope: 1 inch per 12 inches (See plans).

6. Roof System: Manufacturer's standard standing-seam roof panels with high clip, vapor barrier, thermal block, and insulation.

7. Exterior Wall System: Manufacturer's standard field-assembled wall panels with vapor barrier and insulation.

C. Structural Performance: Provide metal building systems capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Engineer metal building systems according to procedures in MBMA's "Low Rise Building Systems Manual."

2. Design Loads: As indicated.

3. Live Loads: Include vertical loads induced by the building occupancy indicated on Drawings. Include loads induced by maintenance workers, materials, and equipment for roof live loads. a. Building Occupancy: (20psf minimum).

4. Roof Snow Loads: Include vertical loads induced by the weight of snow (43 psf.-Ground; 30 psf Roof). Allow for unbalanced and drift loads.

5. Wind Loads: Include horizontal loads induced by a basic wind speed corresponding IBC 90 mph 3 second gust, Exposure C, Wind Importance Factor 1.0.

6. Collateral Loads: Include additional dead loads other than the weight of metal building system for permanent items such as sprinklers, mechanical systems, electrical systems, and ceilings. (5 psf minimum). Excluding Salt Storage Building.

7. Load Combinations: Design metal building systems to withstand the most critical effects of load factors and load combinations.

8. Deflection Limits: Engineer assemblies to withstand design loads with deflections no greater than the following:

   a. Purlins and Rafters: Vertical deflection of 1/240 of the span.
   b. Girts: Horizontal deflection of 1/180 of the span.
   c. Roof Panels: Vertical deflection of 1/180 of the span.
   d. Wall Panels: Horizontal deflection of 1/180 of the span.

9. Design secondary framing system to accommodate deflection of primary building structure and construction tolerances, and to maintain clearances at openings.

D. Seismic Performance: Design and engineer metal building systems capable of withstanding the effects of earthquake motions determined according to the International Building Code, Soil Profile D.

E. Thermal Movements: Provide metal building roof and wall panel systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

F. Thermal Performance: Provide metal building roof and wall assemblies with the following thermal-resistance values (R-value):

1. Roof Assemblies: R19.
2. Wall Assemblies: R19.

G. Air Infiltration for Roof Panels: Provide roof panel assemblies with permanent resistance to air leakage through assembly of not more than 0.09 cfm/sq. ft. of fixed roof area when tested according to ASTM E 1680 at a static-air-pressure difference of 4 lbf/sq. ft.

H. Air Infiltration for Wall and Soffit Panels: Provide wall panel assemblies with permanent resistance to air leakage through assembly of not more than 0.09 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a static-air-pressure difference of 4 lbf/sq. ft.

I. Water Penetration for Roof Panels: Provide roof panel assemblies with no water penetration as defined in the test method when tested according to ASTM E 1646 at a minimum differential pressure of 20 percent of inward-acting, wind-load design pressure of not less than 6.24 lbf/sq. ft. and not more than 24 lbf/sq. ft.

J. Water Penetration for Wall and Soffit Panels: Provide wall panel assemblies with no water penetration as defined in the test method when tested according to ASTM E 331 at a minimum differential pressure of 20 percent of inward-acting, wind-load design pressure of not less than 6.24 lbf/sq. ft. and not more than 12 lbf/sq. ft.

K. Wind-Uplift Resistance: Provide roof panel assemblies that meet requirements of UL 580 for the following wind-uplift resistance:

1. Class 90. With additional requirements for resistance to 95 mph winds.

1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, finishes and available colors as indicated on the drawings for each type of the following metal building system components:

1. Structural-framing system.
2. Roof panels.
3. Wall panels.
4. Insulation.
5. Vapor retarders.
6. Trim and closures.
7. Accessories.
8. Overhead door mounting details.
9. Mechanical louvers and fan mounting details.
10. Recessed soffit lighting.
11. Mechanical roof penetrations.
12. Doors and windows.

B. Shop Drawings: For the following metal building system components. Include plans, elevations, sections, details, and attachments to other Work.

1. For installed components indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

2. Anchor-Bolt Plans: Include location, diameter, and projection of anchor bolts required to attach metal building to foundation. Indicate column reactions at each location.

3. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing. Indicate welds and bolted connections, distinguishing between shop and

field applications. Include transverse cross-sections.

4. Roof and Wall Panel Layout Drawings: Show layouts of panels on support framing, details of edge conditions, joints, panel profiles, corners, custom profiles, supports, anchorages, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work.

5. Accessory Drawings: Include details of the following items, at a scale of not less than 2 inches per 12 inches: Include details of reinforcement and installation requirements for all accessories specified in other sections.

    a. Ventilators. Coordinate with mechanical.
    b. Louvers. Coordinate with mechanical.
    c. Gutters.
    d. Downspouts.
    e. Lighting.

C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of the following products with factory-applied color finishes as required to match the selected colors: Design intent is to match the colors of the existing open storage building on-site; roof, walls and trim & closure colors as used on existing building.

1. Roof panels.
2. Wall panels.
3. Soffit panels.
4. Trim, gutter and closures.
5. Accessories.

D. Samples for Verification: For the following products, in manufacturer's standard sizes, showing the full range of color, texture, and pattern variations expected, in the profile and style indicated. Prepare Samples from the same material to be used for the Work.

1. Roof Panels: 12-inches long by actual panel width (24"). Include clips, caps, battens, fasteners, closures, and other exposed panel accessories.

2. Architectural Wall Panels: 12-inches long by actual panel width (12"). Include clips, caps, battens, fasteners, closures, and other exposed panel accessories.

3. Soffit Panels: 12-inches long by actual panel width (12"). Include clips, caps, battens, fasteners, closures, and other exposed panel accessories.

4. Trim and Closures: 12-inches long. Include fasteners and other exposed accessories.

5. Vapor Retarders: 6-inch square samples.

6. Accessories: 12-inch long samples for each type of accessory.

E. Product Certificates: Signed by manufacturers of metal building systems certifying that products furnished comply with requirements.

1. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:

    a. Name and location of Project.
    b. Order number.

c. Name of manufacturer.
d. Name of Contractor.
e. Building dimensions, including width, length, height, and roof slope.
f. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
g. Governing building code and year of edition.
h. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic zone or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
i. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
j. Building-Use Category: Indicate category of building use and its effect on load importance factors.
k. AISC Certification for Category MB: Include statement that metal building system and components were designed and produced in an AISC-Certified Facility by an AISC-Certified Manufacturer.

F. Welding Certificates: Copies of certificates for welding procedures and personnel.

G. Erector Certificates: Signed by manufacturer certifying that erectors comply with requirements.

H. Manufacturer Certificates: Signed by manufacturers certifying that they comply with requirements. Include evidence of manufacturing experience.

I. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

J. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:

1. Thermal insulation.
2. Vapor retarders.

K. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, indicating the following current products comply with requirements:

1. Insulation and Vapor Retarders: Include reports for thermal resistance, fire-test-response characteristics, water-vapor transmission, and water absorption.

L. Surveys: Show final elevations and locations of major members. Engage a qualified engineer or land surveyor to perform surveys and certify their accuracy. Indicate discrepancies between actual installation and the Contract Documents.

M. Warranties: Special warranties specified in the provisions of the contract documents.

1.6 QUALITY ASSURANCE

A. Erector Qualifications: An experienced erector who has specialized in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal building systems that are similar to those indicated for this Project in material, design, and extent.

C. Manufacturer Qualifications: A firm experienced in manufacturing metal building systems similar to those indicated for this Project and with a record of successful in-service performance.

1. AISC Certification for Category MB: An AISC-Certified Manufacturer that designs and produces metal building systems and components, AISC-Certified Facility, Category I. For non pre-approved Manufacturer's copies of current AISC certificate must be submitted to the Architect prior to the issuance of the final addendum or the final response to bidder's questions, whichever is sooner.

2. Engineering Responsibility: Preparation of Shop Drawings, testing program development, test result interpretation, and comprehensive engineering analysis by a qualified professional engineer.

D. Surveyor Qualifications: A land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing surveying services of the kind indicated.

E. Source Limitations: Obtain each type of metal building system component through one source from a single manufacturer.

F. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sight lines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, or in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

G. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.3, "Structural Welding Code--Sheet Steel." All welding shall be done by certified welders per AWS in the last 12 months.

H. Regulatory Requirements: Fabricate and label structural framing to comply with special inspection requirements at point of fabrication for welding and other connections required by authorities having jurisdiction.

I. Structural Steel: Comply with AISC S335, "Specification for Structural Steel Buildings--Allowable Stress Design, Plastic Design"; or AISC S342, "Load and Resistance Factor Design Specification for Structural Steel Buildings," for design requirements and allowable stresses.

J. Cold-Formed Steel: Comply with AISI SG-671, "Specification for the Design of Cold-Formed Steel Structural Members," and AISI SG-911, "Load and Resistance Facet Design Specification for Steel Structural Members," for design requirements and allowable stresses.

K. Preinstallation Conference: Conduct conference at Project site to comply with requirements

in Division 1 Section "Project Meetings." Review methods and procedures related to metal building systems including, but not limited to, the following:

1. Inspect and discuss condition of foundations and other preparatory work performed by other trades.

2. Review structural load limitations.

3. Review and finalize construction schedule and verify availability of materials, Erector's personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review required testing, inspecting, and certifying procedures.

5. Review weather and forecasted weather conditions and procedures for unfavorable conditions.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package roof and wall panels for protection during transportation and handling.

B. Handling: Unload, store, and erect roof and wall panels to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store roof and wall panels to ensure dryness. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when weather conditions permit roof and wall panel installation to be performed according to manufacturer's written instructions and warranty requirements.

B. Field Measurements: Verify metal building system foundations by field measurements before metal building fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions for Foundations: Where field measurements cannot be made without delaying the Work, establish foundation dimensions and proceed with fabricating structural framing without field measurements. Coordinate anchor-bolt installation to ensure that actual anchorage dimensions correspond to established dimensions.

2. Established Dimensions for Panels: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating roof and wall panels without field measurements, or allow for field-trimming panels. Coordinate roof and wall construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.9 COORDINATION

A. Coordinate size and location of concrete foundations and casting of anchor-bolt inserts into

foundation walls and footings. Concrete, reinforcement, and form work requirements are specified in Division 3 Section "Cast-in-Place Concrete."

B. Coordinate installation of roof curbs, equipment supports, roof, wall and soffit penetrations.

1.10 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty on Panels: Written warranty, executed by manufacturer agreeing to repair or replace roof and wall panels that fail in materials or workmanship within specified warranty period.

1. Warranty Period: five years from date of Substantial Completion.

C. Special Warranty on Panel Finishes: Written warranty, signed by manufacturer agreeing to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period. Deterioration of finish includes, but is not limited to, color fade, chalking, cracking, peeling, and loss of film integrity.

1. Warranty Period for Roof Panels: 20 years from date of Substantial Completion.

2. Warranty Period for Wall Panels: 20 years from date of Substantial Completion.

D. Special Warranty on Standing-Seam Roof Panel Weather tightness: Written warranty, signed by manufacturer agreeing to repair or replace standing-seam roof panel assemblies that fail to remain weather tight within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART II – 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. American Building Systems.

2. American Iron and Steel Corporation.

3. Butler Manufacturing Company.

4. Metallic Building Co.

5. Golden Empire Manufacturing Inc. (GEM)

6. Varco-Pruden Buildings; a United Dominion Company.

7. Braemar Building Systems.

8. United Structures of America, Inc.

9. Nucor Building Systems

10. Chief Industries

11. HCI Steel Building Systems, Inc.

12. Behlen Manufacturing Company

13. Other manufactures meeting the requirements may be accepted. Prior approval from the Architect required. See section 01631 for substitution requirements and Section 13125, 1.6, C.1.

2.2 STRUCTURAL-FRAMING MATERIALS

A. Structural-Steel Shapes: ASTM A 36/A 36M or ASTM A 529/A 529M.

B. Steel Plate, Bar, or Strip: ASTM A 529/A 529M, ASTM A 570/A 570M, or ASTM A 572/A 572M; 50,000-psi minimum yield strength.

C. Steel Tubing or Pipe: ASTM A 500, Grade B or ASTM A 53, Grade B.

D. Structural-Steel Sheet: Hot-rolled, ASTM A 570/A 570M, Grade 50 or Grade 55; hot-rolled, ASTM 568/A 568M; or cold-rolled, ASTM A 611, structural-quality, matte (dull) finish.

E. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, structural quality, Grade 50, with G60 (Z180) coating designation; mill phosphatized.

F. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M and the following requirements:

1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality. Galvalume accepted.

G. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers. Size bolts for primary systems shall be 5/8" diameter.

1. Finish: Hot-dip zinc coating, ASTM A 153, Class C.

H. Anchor Rods, Bolts, Nuts, and Washers: As follows:

1. Unheaded Rods: ASTM A 572/A 572M, Grade 50 (Grade 345).

2. Headed Bolts: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts.

3. Washers: ASTM A 36/A 36M.

I. Primers: As selected by manufacturer for resistance to normal atmospheric corrosion, compatibility with finish paint systems, capability to provide a sound foundation for field-applied topcoats despite prolonged exposure, and as follows:

1. Primer: Manufacturer's standard, lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

2.3 PANEL MATERIALS

A. Metallic-Coated Steel Sheet Pre-painted with Coil Coating: Steel sheet metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A 755/A 755M and the following requirements:

1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality. Aluminum-zinc alloy-coated steel accepted.

2. Surface: Smooth, flat, mill finish.

3. Trapezoidal Structural Standing Seam Roof System, field seamed system 3" High. Roof panels begin and end with a 3" high seam, and concealed fasteners as manufactured by MBCI, Model Double-Lok or prior approved equal.

4. Architectural wall panel, 36" wide, 24 gauge minimum, or thicker as necessary for structural loading requirements, with ribs at 12” o.c. with exposed Fasteners at 12” o.c. horizontal or less as necessary for structural loadings. Metallic Building Company “PBR” wall panel or approved equal.

5. Architectural Soffit panel, 24 gauge minimum, smooth with beads at 4" on center. Concealed fastener system. MBCI, Artisan series L12 with beads or prior approved equal.

B. Panel Sealants: Provide the following:

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

2. Joint Sealant: ASTM C 920; one-part elastomeric polyurethane, polysulfide, or silicone-rubber sealant; of type, grade, class, and use classifications required to seal joints in panels and remain weathertight; and as recommended by metal building system manufacturer. Non hardening.

2.4 INSULATION MATERIALS

A. Fire-Test-Response Characteristics for Insulation: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.

2. Combustion Characteristics: ASTM E 136.

B. Glass-Fiber-Blanket Insulation: Thermal insulation, complying with ASTM C 991, Type II, of 0.5-lb/cu. ft. density, thickness as indicated, with a flame-spread rating of 25 or less, and 2-inch wide, continuous, vapor-tight edge tabs.

1. Type II: Faced one side with nonreflective vapor-retarder membrane.
Class A: Membrane-faced surface with a flame-spread rating of 25 or less.

2. Type II: 1.35-lb/cu. ft. minimum density.

3. Type II: Applied with dry adhesive activated by water during installation.

C. Vapor-Retarder Facing: Complying with ASTM C 1136, with permeance not greater than the following when tested according to ASTM E 96, Desiccant Method:

1. Composition: Semi-gloss White Polypropylene-faced, scrim-reinforced foil, with permeance not greater than 0.02 perm.

2. 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:

a. CGI Silvercote, Inc.
b. Lamtec Corporation.
c. Owens-Corning Fiberglas Corporation.
d. Simple Saver System as designed by Thermal design, Inc. (800-255-0776).

D. Retainer Strips: 0.019-inch thick, formed, galvanized steel or PVC retainer clips colored to match insulation facing (White).

2.5 MISCELLANEOUS MATERIALS

A. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

B. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application, and with a 30-minute working time.

C. Shop Primer for Galvanized Metal Surfaces: Zinc dust, zinc-oxide primer selected by manufacturer for compatibility with substrate. Comply with FS TT-P-641.

D. Finish Painting: Refer to Division 9 Section "Painting." Coordinate primer that is required and compatible with the finish coat system.

E. Flexible weather resistant EPDM pipe flashing. Isolates piping from building movement. Acceptable product, Dektite as manufactured by ITW Buildex (708-595-3500) or prior approved equal.

F. Gypsum Board: Type X, of thicknesses indicated, complying with ASTM C 442 or ASTM C 36.

2.6 FABRICATION, GENERAL

A. General: Design components and field connections required for erection to permit easy assembly and disassembly.

1. Fabricate components in a manner that once assembled in the shop, they may be disassembled, repackaged, and reassembled in the field.

2. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.

3. Fabricate framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Cold-formed members shall be free of cracks, tears, and ruptures.

B. Primary Framing: Shop-fabricate framing components to indicated size and section with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.

1. Make shop connections by welding continuous or by using high-strength bolts.

2. Join flanges to webs of continuous built-up members by a continuous submerged arc-welding process.

3. Brace compression flange of primary framing by angles connected between frame web and purlin or girt web, so flange compressive strength is within allowable limits for any combination of loadings.

4. Weld clips to frames for attaching secondary framing members.

5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary structural members with specified primer after fabrication.

C. Secondary Framing: Shop-fabricate framing components to indicated size and section by roll-forming or break-forming, with base plates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.

1. Make shop connections by welding or by using high-strength bolts.

2. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime secondary structural members with specified primer after fabrication.

D. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply the specified air-dried primer immediately after cleaning and pretreating.

1. Prime primary, secondary, and end-wall steel framing members with specified primer to a minimum dry film thickness of 1 mil.

2. Prime secondary steel framing formed from metallic-coated steel sheet with red-oxide polyester paint, with a minimum dry film thickness of 0.5 mil on each side.

3. Prime galvanized members, after phosphoric acid pretreatment, with manufacturer's standard zinc dust, zinc-oxide primer.

E. Tolerances: Comply with MBMA's "Low Rise Building Systems Manual": Chapter IV, Section 9, "Fabrication and Erection Tolerances."

2.7 STRUCTURAL FRAMING

A. Primary Framing: Manufacturer's standard structural primary framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafter, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing. If build-up sections are used out of plate, continuous welding shall be employed on at least one side and intermittent welds on the opposite side to suite design requirements.

1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.

2. Rigid Frames: I-shaped frame sections fabricated from continuous shop-welded, built-up steel plates Minimum plate thickness of 1/4" or structural-steel shapes.

3. Frame Configuration: Two-directional sloped.

4. Exterior Column Type: Straight.

5. Rafter Type: Tapered.

B. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:

1. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural-steel sheet; with minimum thickness of 0.125 inch.

2. End-Wall Rafters: C-shaped, cold-formed, structural-steel sheet; with minimum thickness of 0.0598 inch.

C. Secondary Framing: Manufacturer's standard secondary framing members, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Fabricate framing from cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet prepainted with coil coating, unless otherwise indicated, to comply with the following:

1. Purlins: C- or Z-shaped sections; fabricated from minimum 0.0598-inch thick steel sheet, built-up steel plates, or structural-steel shapes; minimum 2-1/2-inch wide flanges.

2. Girts: C- or Z-shaped sections; fabricated from minimum 0.0598-inch thick steel sheet, built-up steel plates, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 45 to 50 degrees to flange and with minimum 2-1/2-inch wide flanges.

3. Eave Struts: Unequal-flange, C-shaped sections; fabricated from 0.0598-inch thick steel sheet, built-up steel plates, or structural-steel shapes; to provide adequate backup for both roof and wall panels.

4. Flange and Sag Bracing: Minimum 1-5/8-by-1-5/8-inch structural-steel angles, with a minimum thickness of 0.0598 inch, to stiffen primary frame flanges.

5. Base or Sill Angles: Minimum 3-by-2-by-0.0747-inch zinc-coated (galvanized) steel sheet.

6. Purlin and Girt Clips: Minimum 0.0747-inch thick, zinc-coated (galvanized) steel sheet.

7. Secondary End-Wall Framing: Manufacturer's standard sections fabricated from minimum 0.0747-inch thick, zinc-coated (galvanized) steel sheet.

8. Framing for Openings: Channel shapes; fabricated from minimum 0.0598-inch thick,

cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings, and head, jamb, and sill of other openings.

9. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.

D. Canopy Framing: Provide canopy framing as indicated on architectural drawings.

1. Type: Construct using standard secondary framing members indicated above.

E. Bracing: Provide adjustable wind bracing as follows:

1. Rods: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade D; or ASTM A 529/A 529M, Grade 50; 1/2-inch diameter steel; threaded full length or threaded a minimum of 12 inches at each end.

2. Cable: Cable bracing is not allowed.

3. Angles: Fabricated from structural-steel shapes to match primary framing, of size required to withstand design loads.

4. Rigid Portal Frames: Fabricate from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.

5. Fixed-Base Columns: Fabricate from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.

6. Diaphragm Action of Panels: Design metal building to resist wind forces through diaphragm action of roof, wall panels and rod bracing.

7. Bracing: Provide wind bracing using any method specified above, at manufacturer's option.

F. Bolts: Provide shop-painted bolts unless structural-framing components are in direct contact with roof and wall panels. Provide zinc-plated bolts when structural-framing components are in direct contact with roof and wall panels. The primary frame shall use a minimum bolt size of 5/8" diameter A325 or higher strength.

2.8 ROOF PANELS

A. Structural Standing-Seam Roof Panels: Manufacturer's standard panels complying with the following:

1. Ribbed Roof Panels: Fabricate from metallic-coated steel sheets prepainted with coil coating, factory formed to provide 24-inch coverage; with 3-inch high (including seam), raised trapezoidal major ribs at panel edges, and intermediate stiffening ribs symmetrically spaced between major ribs for full length of panel. Field seamed. Comply with the following:
   a. Material: Zinc-coated (galvanized) steel.
   b. Yield Strength: 50 ksi.
   c. Metal Thickness: 0.0239 inch minimum.

d. Joint Type: Folded, mechanically seamed type.
e. Clip System: Floating to accommodate thermal movement (high clip system).

B. Roof Panel Accessories: Provide components required for a complete roof panel assembly including trim, copings, fasciae, mullions, sills, corner units, ridge closures, clips, seam covers, battens, flashings, gutters, sealants, gaskets, fillers, closure strips, and similar items. Match materials and finishes of roof panels, unless otherwise indicated.

1. Closures: Provide closures at eave and ridge, fabricated of same metal as roof panels.

2. Clips: Minimum 0.0625-inch thick, stainless-steel panel clips designed to withstand negative-load requirements.

3. Cleats: Mechanically seamed cleats formed from minimum 0.0250-inch thick, stainless-steel or nylon-coated aluminum sheet.

4. Thermal Spacer Blocks: Where panels attach directly to purlins, provide 1-inch thick, thermal spacer blocks; fabricated from extruded polystyrene.

5. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

C. Exterior Finish: Apply the following coil coating to roof panels and accessories:

1. Galvalume Plus: clear acrylic coating applied to Galvalume sheet. Galvalume sheet: aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M.

2. Colors, Textures, and Glosses: As selected by Architect from manufacturer's full range for these characteristics.

D. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored backer finish, consisting of prime coat and wash coat with a total minimum dry film thickness of 0.5 mil.

2.9 WALL PANELS

A. Uninsulated Wall Panels: Provide manufacturer's standard Architectural panels complying with the following:

1. Beaded Panels: Fabricate from metallic-coated steel sheets prepainted with coil coating, factory formed to provide 12-inch coverage, beads at 4-inches o.c. Design panels for mechanical attachment to structure using concealed fasteners, lapping major ribs at panel edges. Comply with the following:
a. Material: Zinc-coated (galvanized) steel. Or Aluminum-zinc alloy-coated steel
b. Yield Strength: 50 ksi.
c. Metal Thickness: 22 gauge minimum or as required for wind exposure.
d. Panel Thickness: 1.5 inches.

B. Wall Panel Accessories: Provide components required for a complete wall panel assembly, including trim, copings, mullions, sills, corner units, clips, seam covers, battens, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match materials and finishes of panels.

1. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

C. Exposed Finish for Exterior Panels: Apply the following coil coating:

1. Siliconized-Polyester Coating. Provide epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 1.0 mil including primer.

2. Colors, Textures, and Glosses: As selected by Architect from manufacturer's full range for these characteristics.

D. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored backer finish, consisting of prime coat and wash coat with a total minimum dry film thickness of 0.5 mil.

2.10 FASCIA AND SOFFIT PANELS

A. Fascia Panels: Manufacturer's standard panels complying with the following:

1. Match roof panel profile and material.

2. Flat-Pan Panels: Fabricate from metallic-coated steel sheets prepainted with coil coating, factory formed to provide 12-inch coverage; with 1-inch high, inverted-L, standing-seam, vertical ribs at panel edges. Design panels for mechanical attachment to fascia supports using concealed clips in side laps. Factory applied sealant at each interlocking joint. Comply with the following:

a. Material: Zinc-coated (galvanized) steel.
b. Yield Strength: 50 ksi.
c. Metal Thickness: 24 gauge minimum.
d. Joint Type: As standard with manufacturer.
f. Clip System: Floating to accommodate thermal movement.

2.11 OVERHEAD DOORS AND FRAMES

A. Overhead door support framing shall be designed to resist applicable wind loads and shall consist of channel or tube steel jambs as shown with a structural header at the top of the opening. Twenty four gauge galvanized steel flashing, color coordinated, provided to conceal panel edges around the opening unless otherwise specified. Provide weatherstripping at jambs and head.

B. Service Doors: Refer to Division 8 Section "Sectional Overhead Doors."

2.12 WINDOWS

A. Refer to sections 08520 & 08521 for windows.

2.13 ACCESSORIES

A. General: Provide accessories as standard with metal building system manufacturer, and complying with the following:

1. Provide sheet metal accessories of same material and in same finish as wall panels, unless otherwise indicated.

B. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of roof or wall sheets by means of plastic caps or factory-applied coating. Comply with the following:

1. Fasteners for Roof and Wall Panels: Self-drilling or self-tapping 410 stainless or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of panels.

2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.

3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

C. Flashing and Trim: Form from 0.0179-inch thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent wall panels.

1. Opening Trim: Painted subframing of suitable thickness to protect overhead door operation. Trim head and jamb of door openings, and head, jamb, and sill of other openings.

D. Gutters: Form from 0.0179-inch thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch long sections, sized according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced 36-inches o.c., fabricated from same metal as gutters. Provide bronze, copper, or aluminum wire ball strainers at outlets. Finish gutters with same finish system as adjacent wall panels.

1. See special detailing.

E. Downspouts: PVC piping 3" sealed water tight.

1. See special detailing.

F. Louvers: Refer to Division 10 Section "Louvers and Vents."

G. Snow Guards: Not Required.

H. Closures: Closed-cell, laminated polyethylene; minimum 1-inch thick, flexible closure strips; cut or premolded to match roof and wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

I. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.

2.14 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other

components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.15 SOURCE QUALITY CONTROL

A. Owner may employ an independent testing agency to perform source quality-control testing and special inspections, and to prepare test reports.

1. Testing agency will conduct and interpret tests and state in each report whether test specimens comply with or deviate from requirements.

2. Allow Owner's testing agency access to places where structural framing is being fabricated or produced. Cooperate with Owner's testing agency and provide samples of materials as may be requested for additional testing and evaluation.

3. Special inspections will not be required when fabrication is performed by a fabricator registered and approved by authorities having jurisdiction to perform such work without special inspection.

B. Correct deficiencies in or remove and replace structural framing that inspections and test reports indicate do not comply with requirements.

C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with requirements.

D. Shop-bolted connections will be tested and inspected according to RCSC's "Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

E. Shop-bolted connections will be tested and inspected according to RCSC's "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.

1. Direct-tension indicator gaps will be verified to comply with ASTM F 959, Table 2.

F. In addition to visual inspection, shop welding will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option:

1. Liquid-Penetrant Inspection: ASTM E 165.

G. In addition to visual inspection, shop-welded shear connectors will be inspected and tested according to requirements of AWS D1.1 for stud welding and as follows:

1. Bend tests may performed when visual inspections reveal either less than a continuous 360-degree flash or welding repairs to any shear connector.

2. Tests may be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to requirements of AWS D1.1.

H. Testing agency will report test results promptly and in writing to Owner, Contractor and Architect.

PART III – EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of metal building system.

B. Before erection proceeds, survey elevations and locations of concrete and masonry bearing surfaces, baseplates, and anchor bolts to receive structural framing. Verify compliance with requirements and metal building system manufacturer's tolerances.

1. Engage land surveyor to perform surveying.

3.2 PREPARATION

A. Clean substrates of substances, including oil, grease, rolling compounds, incompatible primers, and loose mill scale, that impair bond of erection materials.

B. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

3.3 ERECTION

A. Erect metal building system according to manufacturer's written instructions and erection drawings.

B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.

C. Set structural framing in locations and to elevations indicated and according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.

D. Baseplates and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces before setting baseplates and bearing plates. Clean bottom surface of baseplates and bearing plates.

1. Set baseplates and bearing plates for structural members on wedges, shims, or setting nuts.

2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of baseplate or bearing plate before packing with grout.

3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.

4. Comply with manufacturer's written instructions for proprietary grout materials.

E. Align and adjust framing members before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Make adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.

2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.

F. Primary Framing and End Walls: Erect framing true to line, level, plumb, rigid, and secure.

Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist cure grout for not less than seven days after placement.

1. Make field connections using high-strength bolts. Tighten bolts by turn-of-the-nut method.

G. Secondary Framing: Erect framing true to line, level, plumb, rigid, and secure. Fasten secondary framing to primary framing using clips with field connections using non-high-strength bolts. Hold rigidly to a straight line by sag rods.

1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.

2. Locate and space wall girts to suit door and window arrangements and heights.

3. Locate canopy framing as indicated.

4. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.

H. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.

1. Tighten rod and cable bracing to avoid sag.

2. Locate interior end bay bracing only where indicated.

I. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to building structural frame.

3.4 ROOF PANEL INSTALLATION

A. General: Provide roof panels of full length from eave to ridge when possible. Install panels perpendicular to purlins.

1. Field cutting by torch is not permitted.

2. Rigidly fasten eave end of roof panels and allow ridge end free movement due to thermal expansion and contraction. Predrill panels.

3. Provide weatherseal under ridge cap.

4. Flash and seal roof panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.

5. Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.

6. Use aluminum or stainless-steel fasteners for exterior applications and galvanized fasteners for interior applications.

7. Locate and space fastenings in true vertical and horizontal alignment.

8. Install ridge caps as roof panel work proceeds.

9. Locate panel splices over, but not attached to, structural supports. Stagger panel

splices to avoid a four-panel lap splice condition.

10. Provide weather-resistant escutcheons for pipe and conduit penetrating roofing panels.

B. Standing-Seam Roof Panels: Fasten roof panels to purlins with concealed clips at each standing-seam joint. Install clips over top of insulation at location and spacing determined by manufacturer.

1. Install clips to supports with self-drilling fasteners.

2. Crimp standing seams with manufacturer-approved motorized seamer tool so clip, panel, and factory-applied side-lap sealant are completely engaged.

3. At panel splices, nest panels with minimum 6-inch end lap, sealed with butyl sealant and fastened together by interlocking clamping plates.

3.5 WALL PANEL INSTALLATION

A. General: Provide panels full height of building. Install panels perpendicular to girts.

1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Install panels with vertical edges plumb. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weather tight enclosure. Avoid "panel creep" or application not true to line.

2. Unless otherwise indicated, begin panel installation at corners with center of rib lined up with line of framing.

3. Field cutting by torch is not permitted.

4. Align bottom of wall panels and fasten with blind rivets, bolts, or self-tapping screws.

5. Fasten flashing and trim around openings and similar elements with self-tapping screws.

6. When two rows of panels are required, lap panels 4 inches minimum. Locate panel splices over structural supports.

7. Install continuous thermal break on all girts.

8. Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.

9. Provide weather-resistant escutcheons for pipe and conduit penetrating exterior walls.

10. Flash and seal wall panels with weather closures under eaves and rakes, along lower panel edges, and at perimeter of all openings.

11. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as necessary for waterproofing. Handle and apply sealant and backup according to sealant manufacturer's written instructions.

12. Use aluminum or stainless-steel fasteners for exterior applications and galvanized

fasteners for interior applications.

13. Locate and space fastenings in true vertical and horizontal alignment.

14. Align wall panel joints with soffit panels and roof panel.

B. Uninsulated Panels: Install wall panels on exterior side of girts. Attach panels to supports with concealed fasteners as recommended by manufacturer.

3.6 FASCIA AND SOFFIT PANEL INSTALLATION

A. General: Provide panels full width of fasciae and soffits. Install panels perpendicular to support framing.

1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Install panels with vertical edges plumb. Lap ribbed or fluted panels one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.

2. Field cutting by torch is not permitted.

3. Fasten flashing and trim around openings and similar elements with self-tapping screws.

4. Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.

5. Use aluminum or stainless-steel fasteners for exterior applications and galvanized fasteners for interior applications.

6. Locate and space fastenings in true vertical and horizontal alignment.

7. Align all seams with wall panels.

B. Fascia Panels: Align bottom of panels and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

3.7 INSULATION INSTALLATION

A. General: Install insulation concurrently with panel installation, according to manufacturer's written instructions and as follows:

1. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.

2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

3. Replace any section of exposed vapor barrier / insulation that is exposed to view if the damage exceeds 1".

4. Fall protection requirements as required by authorities shall be maintained during installation.

B. Blanket Insulation: Install blankets straight and true in one-piece lengths. Install vapor retarder over insulation with both sets of facing tabs sealed to provide a complete vapor retarder. Comply with the following installation method:

1. Over-Framing Installation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing members. Hold in place by panels fastened to secondary framing.

2. Two-Layers-between-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder facing tabs up and over purlin, overlapping adjoining facing of next insulation course maintaining continuity of retarder. Install layer of filler insulation over first layer to fill space between purlins formed by thermal spacer blocks. Hold in place with bands and crossbands below insulation.

3. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

3.8 DOOR INSTALLATION

A. General: Comply with manufacturer's written instructions for installing doors, hardware, operators, and other door components. Coordinate installation with wall flashings and other components. Seal perimeter of each door frame with elastomeric sealant used for panels.

B. Hardware: N.A.

C. Personnel Doors and Frames: N.A.

3.9 WINDOW INSTALLATION

A. General: Comply with manufacturer’s written instructions for installing windows, hardware, Operators, and other door components. Coordinate installation with wall flashings and other components. Seal perimeter of each window frame with elastomeric sealant used for panels.

3.10 ACCESSORY INSTALLATION

A. General: Install gutters, downspouts, ventilators, louvers, and other accessories according to manufacturer's written instructions, with positive anchorage to building and weathertight mounting. Coordinate installation with flashings and other components.

1. Install gutter as shown on detail.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.

2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10-feet with no joints allowed within 24-

inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with mastic sealant (concealed within joints).

3. Separations: Separate metal from incompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.

C. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 4-feet o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

D. Downspouts: PVC down spouts as detailed. Join sections to provide a water tight Seal from gutter to birdsmooth flow into catch basin. Provide fasteners designed to hold downspouts securely 1-inch away from walls and structure; locate fasteners at top and bottom and at approximately 60-inches o.c. in between.

1. Provide elbow at base of downspout to direct water away from building.

E. Pipe Flashing: Form EPDM flashing around pipe penetration and roof panels. Fasten and seal to roof panel as recommended by manufacturer.

F. Continuous Roof Ventilators: Set ventilators complete with necessary hardware, anchors, dampers, weather guards, rain caps, and equipment supports according to manufacturer's written instructions. Join sections with splice plates and end-cap skirt assemblies where required to achieve indicated length. Install preformed filler strips at base to seal ventilator to roof panels.

G. Louvers: Set louvers complete with necessary hardware, anchors, dampers, weather guards, and equipment supports according to manufacturer's written instructions. Locate and place louver units level, plumb, and at indicated alignment with adjacent work.

1. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

2. Provide perimeter reveals and openings of uniform width for sealants and joint fillers.

3. Protect galvanized- and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

4. Install concealed gaskets, flashings, joint fillers, and insulation, as louver installation progresses, where required to make louver joints weathertight. Comply with Division 7 Section "Joint Sealants" for sealants applied during louver installation.

3.11 ERECTION AND LOCATION TOLERANCES

A. Structural-Steel Erection Tolerances: Comply with erection tolerance limits of AISC S303, "Code of Standard Practice for Steel Buildings and Bridges."

B. Roof Panel Installation Tolerances: Shim and align units within installed tolerance of 1/4 inch in 20-feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces

and of alignment of matching profiles.

C. Wall Panel Installation Tolerances: Shim and align units within installed tolerance of 1/4 inch in 20-feet on level, plumb, and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

D. Door Installation Tolerances: Fit doors in frames within clearances specified in SDI 100.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing agency to perform field quality-control testing.

B. Extent and Testing Methodology: Testing and verification procedures will be required of high-strength bolted connections. AISC and RCSC allow turn-of-the-nut method, calibrated wrench, alternative design bolts, and direct-tension indicators for bolt-tension testing. Add actual requirements if other than AISC's "10 percent" will be inspected.

1. Bolted connections will be visually inspected.

2. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

3.13 ADJUSTING

A. N.A. Delete paragraph and subparagraph below if hardware is specified in Division 8 Section "Door Hardware."

3.14 CLEANING AND PROTECTION

A. Touchup Painting: Immediately after erection, clean, prepare, and prime or reprime welds, bolted connections, and abraded surfaces of prime-painted primary and secondary framing, accessories, and bearing plates.

1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.

2. Apply compatible primer of same type as shop primer used on adjacent surfaces.

B. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

C. Roof and Wall Panels: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.

1. Replace panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

D. Windows: Clean metal surfaces promptly after installing windows. Exercise care to avoid damage to protective coatings and finishes. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and other moving parts. Clean

glass promptly after installing windows.

END OF SECTION

SECTION 13352

DUCT TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Test, balance, and adjust air duct systems as described in Contract Documents.

B. Related Sections:
   1. Division 15:
      a. Completing installation and start-up of mechanical systems, and changing sheaves, belts, and dampers as required for correct balance.
      b. Assisting Balancing Agency in testing and balancing of mechanical system.

1.2 SYSTEM DESCRIPTION

A. Performance Requirements:
   1. Perform testing and balancing in complete accordance with Associated Air Balance Council Standards for Field Measurement & Instructions, Form P1266, Volume I. Record test data on AABC standard forms or facsimile.
   2. Noise level shall not exceed PNC 35 in Chapel or Cultural Center when all mechanical equipment is operating.

1.3 SUBMITTALS

A. Quality Assurance / Control:
   1. Four copies of complete test data for evaluation and approval.
   2. Test And Balance Report:
      a. Complete with logs, data, and records as required herein. Print logs, data, and records on white bond paper bound together in report form.
      b. Certified accurate and complete by Balancing Agency's certified test and balance engineer.
      c. Contain following general data in format selected by Balancing Agency.
         1) Project Number.
         2) Project Title.
         3) Project Location.
         4) Project Architect and Mechanical Engineer.
         5) Test and Balance Agency and Certified Engineer.
         6) Contractor and mechanical sub-contractor.
         7) Dates tests were performed.
         8) Certification Document.
         9) Report Forms similar to AABC Standard format.
      d. Report shall include following:
         1) Preface suggesting abnormalities and problems encountered.
         2) Instrumentation List including type, model, manufacturer, serial number, and calibration dates.
         3) System Identification reporting location of VAV boxes, zones, supply, return, and exhaust openings.
         4) Record following for each piece of air handling equipment:
            a) Manufacturer, model number, and serial number.
            b) Design and manufacturer rated data.
            c) Actual CFM.
            d) Suction and discharge static pressure of each fan.

e) Outside-air and return-air total CFM.
f) Actual operating current, voltage, and brake horsepower of each fan motor.
g) Final RPM of each motor.
h) Fan and motor sheave manufacturer, model, size, number of grooves and center distance.
i) Belt size and quantity.
j) Static-pressure controls final operating set points.

3. Bind approved copy of report in Operations And Maintenance Manual for Division 15.

1.4 QUALITY ASSURANCE

A. Qualifications:
1. Work of this Section shall be performed by independent Air Testing And Balance Agency specializing in testing and balancing of heating, ventilating, and cooling systems to balance, adjust, and test air moving equipment, air distribution, and exhaust systems.
2. Agency shall provide proof of having successfully completed at least five years of specialized experience in air and hydronic system balancing. Work by this Agency shall be done under direct supervision of qualified heating and ventilating engineer employed by Agency.
3. Agency shall be approved in writing by Architect.
4. Neither Architect's engineering consultant or anyone performing work on this Project under Division 15 shall be permitted to do this work.

1.5 SCHEDULING

A. Award test and balance subcontract to Agency upon receipt of Notice To Proceed to allow Agency to schedule this work in cooperation with other Sections involved and to comply with completion date.

B. During construction, Agency shall inspect installation of pipe systems, sheet metal work, temperature controls, and other component parts of mechanical systems. Perform inspections as follows.
1. One inspection when 60 percent of ductwork is installed.
2. One inspection when 90 percent of equipment is installed.

C. Do not begin air testing and balancing until:
1. After completion of air cooling, heating, and exhaust systems including installation of specialties, devices, and new filters.
2. Proper function of control system components including electrical interlocks, damper sequences, air and water reset, and fire and freeze stats has been verified.
3. Automatic temperature controls have been calibrated and set for design operating conditions.
4. Verification of proper thermostat calibration and setting of control components such as static pressure controllers and other devices that may need set points changed during process of balancing system.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 PREPARATION

A. Heating, ventilating, and cooling systems and equipment shall be in full operation and continue in operation during each working day of testing and balancing.

3.2 FIELD QUALITY CONTROL

A. Site Tests:
   1. If requested, conduct tests in presence of Architect.
   2. Instruments used by Agency shall be accurately calibrated and maintained in good working order.
   3. Air Testing And Balancing Procedure:
      a. Perform tests at high and low speeds of multi-speed systems and single speed systems. Perform following testing and balancing functions in accordance with Associated Air Balance Council National Standards:
         1) Fan Speeds: Test and adjust fan RPM to achieve design CFM requirements.
         2) Current and Voltage: Measure and record motor current and voltage.
         3) Pitot-Tube Traverse: Perform pitot-tube traverse of main supply and return ducts to obtain total CFM.
         4) Outside Air: Test and adjust system minimum outside air by pitot-tube traverse.
         5) Static Pressure: Test and record system static pressures, including suction and discharge static pressure of each fan.
         6) Air Temperature: Take wet and dry bulb air temperatures on entering and leaving side of each cooling coil. Dry bulb temperatures shall be taken on entering and leaving side of each heating unit.
         7) Zone Ducts: Adjust zone ducts to within design CFM requirements. At least one zone balancing damper shall be completely open.
         8) Main Ducts: Adjust main ducts to within design CFM requirements and traverse for total CFM quantities.
         9) Branch Ducts: Adjust branch ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
         10) Tolerances: Test and balance each diffuser, grille, and register to within 10 percent of design requirements.
         11) Identification: Identify the location and area of each grille, diffuser, register, and terminal box. Record on air outlet data sheets.
         12) Description: Record size, type, and manufacturer of each diffuser, grille, and register on air outlet data sheets.
         13) Terminal Boxes: Set volume regulators on terminal boxes to meet design maximum and minimum CFM requirements. Check temperature controls for proper operation and calibration. Read out diffusers connected to terminal boxes shall be read out in heating and cooling modes and record their readings on air outlet data sheets.
         14) Drafts: Adjust diffusers, grilles, and registers to minimize drafts.
      b. Permanently mark all outside air, supply air, and return air damper positions after balancing has been completed.
   4. Smoke testing, or some other approved means, may be required to determine leak locations if air balance report indicates that any system's CFM total is less than 10 percent of design CFM. Prior to test, verify that system's duct joints have been sealed as specified and that air moving device in question is supplying required design system air flow. Architect will approve test method required. If smoke test is selected, use following procedure. Provide necessary precautions to protect those performing or observing test from being exposed to smoke.
      a. Use zinc chloride smoke candles, titanium tetrachloride ampules or sticks, or other devices acceptable to Architect to generate smoke.
      b. Close openings in duct except for one opening at farthest end of duct run.
      c. Circulate smoke at pressurized condition of 1/2 inch 13 mm minimum water gauge static pressure.
      d. Report findings to Architect in writing.

B. Final Inspection And Adjustments:
   1. System shall be balanced and reports submitted to Architect before final inspection.
   2. Balancing Agency shall be represented at final inspection meeting by qualified testing personnel with balancing equipment and two copies of air balancing test report.
      a. Architect will choose and direct spot balancing of one zone. Differences between the spot balance and test report will be justification for requiring repeat of testing and balancing for entire building. If recheck testing demonstrates measured flow deviation of 10 percent or more from recorded information on report, report will be rejected and new inspection and report will be made and resubmitted.

b. Perform re-balancing in presence of Architect and subject to its approval.
c. If re-balancing is required, submit revised air test and balance reports to Architect before Substantial Completion.
d. Spot balance and rebalance shall be performed at no additional cost to Owner.

3. Where furnace supplied to job site provides over 5 percent more air than schedule requirements, rooms supplied by that furnace shall have their supply air quantities increased by ratio of actual total air quantity supplied to minimum air quantity required by furnace schedule.

END OF SECTION

SECTION 13930

WET-PIPE FIRE-SUPPRESSION SPRINKLERS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install complete wet-pipe fire sprinkler system as specified in Contract Documents.

B. Products Installed But Not Supplied Under This Section:
   1. Firestopping

C. Related Sections:
   1. Site Fire Protection.
   2. Alarm And Detection System including connection of tamper switches and pressure flow detectors to alarm system and furnishing and installing of low temperature switch.

1.2 REFERENCES

A. American National Standards Institute / American Society of Mechanical Engineers:
   1. ANSI / ASME B 16.1-89, 'Cast Iron Pipe Flanges and Pipe Flanged Fittings.'
   2. ANSI / ASME B 16.3-85, 'Malleable Iron Threaded Fittings, Classes 150 and 300.'
   3. ANSI / ASME B 16.4-89, 'Cast Iron Threaded Fittings, Class 125 and Class 250.'

B. American National Standards Institute / National Fire Protection Association:
   1. ANSI / NFPA 13-2002, 'Installation of Sprinkler Systems.'

C. American Society For Testing And Materials:
   1. ASTM A 53-00, 'Standard Specification for Pipe, Steel and Hot-Dipped, Zinc-Coated, Welded and Seamless.'
   2. ASTM A 234-00a, 'Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperature Service.'
   3. ASTM A 536-84 (1999), 'Standard Specification for Ductile Iron Castings.'

D. American Water Works Association:
   1. AWWA C-606,

1.3 SUBMITTALS

A. Shop Drawings:
   1. Size sprinkler system by one of following methods:
      a. Pipe schedule method in accordance with ANSI/NFPA 13.
      b. Hydraulic calculation design method based on water supply evaluation performed at building site.
      c. On submittals, refer to sprinkler heads by sprinkler identification or model number published in appropriate agency listing or approval. Trade names and other abbreviated designations are not acceptable
   2. Submittal Procedure:
      a. After award of Contract and before purchase of equipment, submit 5 sets of shop drawings with specifications and hydraulic calculations, if pipe schedule method is not used, to Architect and two sets to local jurisdiction having authority for fire prevention for review.
      b. After integrating Architect's and AHJ's comments into drawings, licensed certified fire protection engineer of record submitting fire sprinkler system design construction documents

shall stamp, sign, and date each sheet of shop drawings and first page of specifications and calculations.

c. Submit stamped documents to Owner and to AHJ for fire prevention for final approval.
d. After final approval, submit four copies of approved stamped documents to Architect.
e. Failure of system to meet requirements of authority having jurisdiction shall be corrected at no additional cost to Owner.

B. Closeout:
1. Operation And Maintenance Manual Data:
a. Modify and add to requirements of Section 01700 as follows:
1) Provide master index showing items included.
2) Provide name, address, and phone number of Architect, Architect's Fire Sprinkler Consultant, General Contractor, and Fire Protection subcontractor.
3) Provide operating instructions to include:
a) General description of fire protection system.
b) Step by step procedure to follow in putting system into operation.
4) Maintenance instructions shall include:
a) List of system components used indicating name and model of each item.
b) Manufacturer's maintenance instructions for each component installed in Project. Instructions shall include installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance and lubrication instructions.
5) Include copies of approved shop drawings and copies of required warranties.
2. If system has both wet and dry segments, provide single Operations And Maintenance Manual for total Fire Suppression System.

1.4 QUALITY ASSURANCE

A. Qualifications:
1. Designer:
a. Licensed fire protection engineer or fire protection system designer certified by NICET to level three minimum and engaged in design of fire protection systems. Engineer / designer shall:
1) Be responsible for overseeing preparation of shop drawings, hydraulic calculations where applicable, and system installation.
2) Make complete inspection of installation.
3) Provide corrected record drawings to Owner with letter of acceptance.
4) Certify that installation is in accordance with Contract Documents.
2. Installer: Licensed by jurisdiction having authority over installed fire protection systems for location of Project. Furnish verified list of similar projects installed during past 5 years minimum.

B. Requirements of Regulatory Agencies:
1. Unless noted otherwise, system shall conform to:
a. ANSI / NFPA 13 - 2002 'Light, Ordinary Hazard and Extra Hazard Occupancies.'
b. ANSI / NFPA 24 - 2002 'Service Mains and Their Appurtenances, Private.'
c. ANSI / NFPA 101 - 2000 'Life Safety Code.'
d. Requirements of local water department and local authority having jurisdiction for fire protection.
e. Applicable rules, regulations, laws, and ordinances.
f. Underwriter's Laboratories Publication, 'Fire Protection Equipment Directory', January 1990.
g. Comply with backflow prevention requirements and, if required, include device in hydraulic calculations.

1.5 OWNER'S INSTRUCTIONS

A. Instruct Owner's personnel in operation and maintenance of system utilizing Operation And Maintenance Manual when so doing. Minimum instruction period shall be four hours.

B. Instruction periods shall occur after Substantial Completion inspection when system is properly working and before final payment is made.

1.6 MAINTENANCE

A. Extra Materials: Furnish twelve spare heads of each type and temperature rating used, properly boxed with sprinkler head wrench.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Pipe:
   1. Above Ground: Schedule 40 black welded steel meeting requirements of ASTM A 135 or ASTM A 795.
      a. 2 inches And Smaller: Welded, screwed, flanged, or roll grooved coupling system.
      b. 2-1/2 inches And Larger: Welded, flanged, or roll grooved coupling system.

B. Fittings:
   1. Screwed: Cast iron meeting requirements of ANSI B 16.4 or ductile iron meeting requirements of ANSI B 16.3 and ASTM A 536, Grade 65-45-12.
   2. Flanged: Cast iron meeting requirements of ANSI B 16.1.
   3. Welded: Carbon steel meeting requirements of ASTM A 234.
   4. Roll Grooved Pipe Coupling System:
      a. Ductile iron meeting requirements of ASTM A 395 and ASTM A 536, and UL listed and FM approved.
      b. Couplings:
         1) Rigid: Cast to provide rigidity for support and hanging in accordance with NFPA-13.
         2) Flexible: Use in locations where vibration attenuation and stress relief are required.
         3) Flange Adapters: Class 125 or 150.
      c. Grooved products used on Project shall be from same manufacturer. Grooving tools shall be as recommended by manufacturer of grooved products.
      d. Approved Manufacturers:
         1) Tyco grooved piping products
         2) Victaulic Coupling and FireLok fittings

C. Valves:
   1. Butterfly Valves:
      a. UL / FM / CASA approved.
      b. Indicating type.
      c. Approved Products:
         1) Kennedy: 93G1 or 93W1
         2) Nibco:
            a) WD3510-4 Wafer type with valve tamper switch
            b) GD4765-8N Grooved type with valve tamper switch
         3) Pratt Valves: IBV
         4) Victaulic: Series 705-W Grooved end type with internal supervisory switches
   2. Gate Valves:
      a. UL / FM / CASA approved.
      b. Outside Screw and Yoke Type (O.S.&Y).
      c. Class 150 psi.
      d. Approved Products:
         1) Nibco: F-637-31 Flanged Ends.
         2) Mueller: A-2073-6 Flanged Ends.
         3) Victallic: Series 771 Grooved Ends
   3. Ball Valves:

a. UL / FM / CASA approved.
b. Valve tamper switch.
c. Approved Products:
    1) Milwaukee: BBSC with threaded ends.
    2) Nibco: KT-505 with threaded ends.
    3) Nibco: KG-505 with grooved ends.
    4) Victaulic: Series 728 with grooved or threaded ends

4. Swing Check Valves:
    a. 1/2 to 3 inch horizontal check.
        1) Regrinding type.
        2) Renewable disk.
        3) Bronze Class 125 with threaded ends.
        4) Approved Products:
            a) Nibco: KT-403-W.
            b) Stockham: B319C.
    b. 2-1/2 to 12 inch Horizontal check:
        1) Bolted bonnet.
        2) Raised face flanges.
        3) Bronze mounted with ductile iron body.
        4) 125 lb Class A.
        5) Approved Products:
            a) Nibco: F-938-31.
            b) Stockham: G939.
            c) Mueller: A-2120-6.
5. Wafer Type Check Valves:
    a. 4 to 8 inch cast iron body.
    b. 175 psi minimum working pressure.
    c. Rubber Seat.
    d. Approved Products:
        1) Nibco: KW-900-W.
        2) Mueller: A-2102.
        3) Kennedy: Fig. 706
6. Grooved-End Check Valves:
    a. 2-1/2 to 12 inch ductile iron body
    b. 250 psi maximum working pressure
    c. Disc And Seat:
        1) 2-1/2 And 3 Inch: Aluminum bronze disc with mounted elastomer seal and PPS (polyphenylene sulfide) coated seat.
        2) 4 Inch And Larger: Elastomer encapsulated ductile iron disc with welded in nickel seat.
    d. Approved Product:
        1) Victaulic Series 717
7. Alarm Check Valves:
    a. Approved Products:
        1) Reliable: E with gauges and drain.
        2) Tyco: F with gauges and drain
        3) Victaulic: Series 751 with gauges and drain
        4) Viking: J-1 with gauges and drain.
8. Double Check Valve Assembly:
    a. UL / FM / CASA approved and domestically manufactured.
    b. Assembly shall consist of two independent check modules within single housing, required test cocks, and drip-tight shutoff valves.
        1) Performance:
            a) Rated Working Pressure: 175 psi
            b) Hydrostatic Test Pressure: 350 psi
            c) Temperature Range: 33 to 140 deg F.
            d) End Connection: Grooved in accordance with AWWA C-606 (IPS) or Flanged in accordance with ANSI / ASME B161, Class 125.
        2) Check valves shall have elastomer disks and provide drip-tight closure against reverse flow of liquid caused by back pressure or back siphonage.

3) Shutoff Valves: OS&Y gate valves or grooved end butterfly valves with integral tamper switchgear operator.
c. Approved Products:
1) Ames Colt / Maxim
2) Febco: Master Series 876V
3) Wilkins: 475DAV
9. Retard Chamber:
a. Self-draining.
b. Approved Products:
1) Reliable: E-1.
2) Tyco: F211
3) Victaulic: Series 752
4) Viking: C-1.
10. Inspector's Test Valve:
a. Ductile iron body with threaded ends.
b. Combination sight glass / orifice.
c. Bronze top works.
d. Approved Products:
1) Victaulic: Testmaster Alarm Test Module Style 720.

D. Sprinkler Heads:
1. Concealed Pendant:
a. Flush ceiling profile.
b. Adjustable cover.
c. UL / FM / CASA approved.
d. Coordinate concealed cover finish with Architect.
e. Approved Products:
1) Wet Pendant:
a) Reliable: G-4 'Adjustable Concealer'
b) Victaulic: Model V38
c) Viking: Model 'Horizon Mirage'
2) Dry Pendant:
a) Reliable: F3 Dry Pendant Concealed
b) Victaulic: Model V36
2. Horizontal Sidewall Sprinkler:
a. UL / FM / CASA approved.
b. Recess adjustable.
c. Where guards are required, use chrome plated sprinkler guards that are listed, that are approved by Sprinkler Manufacturer for use with head, and that are supplied by Sprinkler Manufacturer.
d. Wet System Approved Products:
1) Reliable: F-1 with Reliable recessed, 2-piece escutcheon Model GF1.
2) Tyco: Model TY-B with recessed escutcheon.
3) Victualic: Models V27 and V34, with recessed escutcheon
4) Viking: M HSW with Viking recessed, 2-piece escutcheon Model E-1.
e. Dry System Approved Products:
1) Reliable: F-3 with Reliable recessed, 2-piece escutcheon Model GF1.
2) Victualic: Model V36, with recessed escutcheon
3) Viking: M HSW with Viking recessed, 2-piece escutcheon Model E-1.
3. Attic Sprinklers, Upright:
a. UL / FM / CASA approved.
b. Approved for use in roof structures, combustible and non-combustible, with ceiling below.
c. Approved Products:
1) Tyco: BB, SD, or HIP.
4. Pendant And Upright Sprinkler:
a. UL / FM / CASA approved.
b. Where guards or escutcheons are required, use chrome plated sprinkler guards and escutcheons that are listed, that are approved by Sprinkler Manufacturer for use with head, and that are supplied by Sprinkler Manufacturer.
c. Approved Products:

1) Reliable: F-1.
2) Tyco: TY-B
3) Victaulic: Models V27 and V34
4) Viking: Micromatic.

5. Adjustable Drop Nipple:
   a. Steel tube, oxide coated.
   b. Double O-ring seal.
   c. 175 psi minimum working pressure.
   d. Approved Products:
      1) CECA: Cold Extrusion Company of America.
      2) Merit: 'M.'

E. Water Flow Alarm:
   1. Mechanical Flow Alarm: Water Gong.
      a. UL / FM approved.
      b. Approved Products:
         1) Reliable: C.
         2) Tyco: WMA-1
         3) Victaulic: Series 760
         4) Viking: F-2.

F. Pressure Gauges:
   1. Mechanical Water Pressure Gauges:
      a. UL / FM / CASA approved.
      b. 3-1/2 inch diameter dial.
      c. 0 to 300 psi in 5 psi increments.
      d. Approved Products:
         1) Reliable: UA.
         2) HO Trerice: 500.

G. Pressure Gauges:
   1. Mechanical Water Pressure Gauges -
      a. UL / FM approved.
      b. 3-1/2 inch diameter dial.
      c. 0 to 300 psi in 5 psi increments.
      d. Approved Products:
         1) Reliable
         2) HO Trerice: 500XB

H. Waterflow Detectors:
   1. Electrical Water Flow Switch -
      a. UL / FM approved.
      b. Switch activates with flow of 10 gpm or more.
      c. Two single pole double throw switches.
      d. Automatic reset.
      e. Approved Products -
         1) Potter: VSR-F
         2) System Sensor: WFD

I. Tamper Switch:
   1. Weather And Tamper Resistant Switch:
      a. UL / FM / CASA approved.
      b. Two Single Pole Double Throw Switches.
      c. Approved Products:
         1) Potter: PCVS.
         2) System Sensor: P1BV2.

J. Fire Department Connection:
   1. Two-way Inlet with single clapper.

2. Polished Brass.
3. 3/4 Inch Straight Design Automatic Drain Device by Potter-Roemer Fig. 5982.
4. Round 'AUTO. SPKR.' identification plate, polished brass by Potter-Roemer Fig. 5962.
5. Approved Products:
   a. Croker: 6405-PB
   b. Potter-Roemer: Fig. 5710.

K. Post Indicating Valve:
1. Polished brass.
2. Supervisory switch.
3. Approved Products:
   a. As required by Authority Having Jurisdiction (AHJ).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Drawings:
1. Fire Protection Drawings show general arrangement of piping. Follow as closely as actual building construction and work of other trades will permit.
2. Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over Fire Protection Drawings.
3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.

3.2 INSTALLATION

A. Connect system to flange provided under Section 02513.

B. Install system in accordance with NFPA 13.

C. Install system to drain. Drain trapped piping in accordance with NFPA 13, Paragraph 8.15.2.5 and 8.16.4.1.
1. Install main drain from riser.
2. Install auxiliary drains in low points of piping system and inspector's test valve drain to mechanical pad located outside building unless otherwise directed by Architect.

D. Install piping system so it will not be exposed to freezing temperatures.

E. Do not use dropped, damaged, or used sprinkler heads.

F. Install sprinkler lines concealed in offices and finished spaces.

G. Install tamper switches and flow detectors where located by Architect.

H. Install automatic ball drip device in lowest point of piping to fire department connection and drain to exterior of building.

I. Brace and support system to meet seismic zone requirements for building site.

3.3 FIELD QUALITY CONTROL

A. Site Tests:
   1. Test system according to 'Contractor's Material And Testing certificate for Above Ground Piping' NFPA-13, figure 8-1(a).
   2. Tests shall be witnessed by Architect and representative of local jurisdiction over fire prevention.
   3. Test blanks shall have red painted lugs protruding beyond flange to clearly indicate their presence and be numbered to assure their removal when testing is completed.

END OF SECTION

SECTION 14620 - TROLLEY HOISTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the complete monorail trolley hoist system, including monorail beam and bracing, trolley, hoist, all appurtenances, and installation.

B. Related Sections:
1. Division 13 Section "Metal Building Systems" for fabrication and erection requirements for special joists at monorail beam supports.
2. Division 5 Section “Metal Fabrications” for fabrications and erection requirements for monorail beam and bracing.
3. Division 16 Electrical.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data for each trolley hoist unit, indicating capacities, sizes, performances, operations, safety features, controls, finishes, and similar information. Indicate any variations from specified requirements.

C. Shop Drawings including dimensioned drawings showing plans, elevations, sections and large-scale details showing monorail beams, trolley, monorail beam bracing, hoist and all appurtenances.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage the hoist manufacturer or an installer approved by the manufacturer and who has completed crane and hoist installations similar in material, design, and extent to that indicated for Project which have resulted in installations with a record of successful in-service performance.

B. Regulatory Requirements: Comply with local governing regulations and the requirements of OSHA, the standards of the Crane Manufacturer's Association of America (CMAA), and the Hoist Manufacturer's Institute (HMI).

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering trolley hoists that may be incorporated in the Work include but are not limited to the following:

1. Five ton motorized trolley hoist:

a. CM - Meteor

b. R & M - Spacemaster II
c. Yale Hoists - EW

2.2 MATERIALS AND COMPONENTS

A. Five ton motorized trolley hoist:

1. Trolley: Adjustable for 6-inch to 18-inch American Standard beams.

a. Wheels: Cast iron with sealed, lifetime lubricated ball bearings.
b. Provide sideplates with heavy-duty bumpers to protect wheels.
c. Capacities: 5 tons
d. Operation: motorized
e. Motor: 1/3 hp min.
f. Speed: 15 fpm min.
g. Provided hoist rail seismic bracing per 2003 IBC.

2. Hoist: motorized wire rope operation.

a. Configuration: Standard headroom, wire rope
b. Load brake: Fully enclosed, self-adjusting friction type screw and disk design.
c. Motor: 5 hp min. Class “F” (TENV)
d. Speed: 15 fpm min. Single speed
e. Motor brake: Disc
f. H4 duty rating
g. Weight overload limit switch
h. Upper and lower limit switch
iI. NEMA 3R control enclosure
j. Helical gear train
k. Cast alloy gear case
l. Metallic sheaves
m. Vertical lift: 20'-0" feet min. Coordinate with plans.

3. Hoist Beam: ASTM A-36.

4. Electrification: Provide rolled galvanized insulated steel conductor system. 4 conductor (3 phase, 1 ground) mounted 2 on each side of monorail for bottom contact. Provide conductor hangers and all necessary hardware required for installation and operation of complete system (See plans for length).

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's instructions and recommendations for work during installation.

B. Provide permanent / removable stops on the beam to prevent trolley overrun.

C. Provide final electrical connection from junction box adjacent to monorail to conductor system (See plans for length).

END OF SECTION 14620

SECTION 13352

DUCT TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Test, balance, and adjust air duct systems as described in Contract Documents.

B. Related Sections:
   1. Division 15:
      a. Completing installation and start-up of mechanical systems, and changing sheaves, belts, and dampers as required for correct balance.
      b. Assisting Balancing Agency in testing and balancing of mechanical system.

1.2 SYSTEM DESCRIPTION

A. Performance Requirements:
   1. Perform testing and balancing in complete accordance with Associated Air Balance Council Standards for Field Measurement & Instructions, Form P1266, Volume I. Record test data on AABC standard forms or facsimile.
   2. Noise level shall not exceed PNC 35 in Chapel or Cultural Center when all mechanical equipment is operating.

1.3 SUBMITTALS

A. Quality Assurance / Control:
   1. Four copies of complete test data for evaluation and approval.
   2. Test And Balance Report:
      a. Complete with logs, data, and records as required herein. Print logs, data, and records on white bond paper bound together in report form.
      b. Certified accurate and complete by Balancing Agency's certified test and balance engineer.
      c. Contain following general data in format selected by Balancing Agency.
         1) Project Number.
         2) Project Title.
         3) Project Location.
         4) Project Architect and Mechanical Engineer.
         5) Test and Balance Agency and Certified Engineer.
         6) Contractor and mechanical sub-contractor.
         7) Dates tests were performed.
         8) Certification Document.
         9) Report Forms similar to AABC Standard format.
      d. Report shall include following:
         1) Preface suggesting abnormalities and problems encountered.
         2) Instrumentation List including type, model, manufacturer, serial number, and calibration dates.
         3) System Identification reporting location of VAV boxes, zones, supply, return, and exhaust openings.
         4) Record following for each piece of air handling equipment:
            a) Manufacturer, model number, and serial number.
            b) Design and manufacturer rated data.
            c) Actual CFM.
            d) Suction and discharge static pressure of each fan.

e) Outside-air and return-air total CFM.
f) Actual operating current, voltage, and brake horsepower of each fan motor.
g) Final RPM of each motor.
h) Fan and motor sheave manufacturer, model, size, number of grooves and center distance.
i) Belt size and quantity.
j) Static-pressure controls final operating set points.

3. Bind approved copy of report in Operations And Maintenance Manual for Division 15.

1.4 QUALITY ASSURANCE

A. Qualifications:
1. Work of this Section shall be performed by independent Air Testing And Balance Agency specializing in testing and balancing of heating, ventilating, and cooling systems to balance, adjust, and test air moving equipment, air distribution, and exhaust systems.
2. Agency shall provide proof of having successfully completed at least five years of specialized experience in air and hydronic system balancing. Work by this Agency shall be done under direct supervision of qualified heating and ventilating engineer employed by Agency.
3. Agency shall be approved in writing by Architect.
4. Neither Architect's engineering consultant or anyone performing work on this Project under Division 15 shall be permitted to do this work.

1.5 SCHEDULING

A. Award test and balance subcontract to Agency upon receipt of Notice To Proceed to allow Agency to schedule this work in cooperation with other Sections involved and to comply with completion date.

B. During construction, Agency shall inspect installation of pipe systems, sheet metal work, temperature controls, and other component parts of mechanical systems. Perform inspections as follows.
1. One inspection when 60 percent of ductwork is installed.
2. One inspection when 90 percent of equipment is installed.

C. Do not begin air testing and balancing until:
1. After completion of air cooling, heating, and exhaust systems including installation of specialties, devices, and new filters.
2. Proper function of control system components including electrical interlocks, damper sequences, air and water reset, and fire and freeze stats has been verified.
3. Automatic temperature controls have been calibrated and set for design operating conditions.
4. Verification of proper thermostat calibration and setting of control components such as static pressure controllers and other devices that may need set points changed during process of balancing system.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 PREPARATION

A. Heating, ventilating, and cooling systems and equipment shall be in full operation and continue in operation during each working day of testing and balancing.

3.2 FIELD QUALITY CONTROL

A. Site Tests:
   1. If requested, conduct tests in presence of Architect.
   2. Instruments used by Agency shall be accurately calibrated and maintained in good working order.
   3. Air Testing And Balancing Procedure:
      a. Perform tests at high and low speeds of multi-speed systems and single speed systems. Perform following testing and balancing functions in accordance with Associated Air Balance Council National Standards:
         1) Fan Speeds: Test and adjust fan RPM to achieve design CFM requirements.
         2) Current and Voltage: Measure and record motor current and voltage.
         3) Pitot-Tube Traverse: Perform pitot-tube traverse of main supply and return ducts to obtain total CFM.
         4) Outside Air: Test and adjust system minimum outside air by pitot-tube traverse.
         5) Static Pressure: Test and record system static pressures, including suction and discharge static pressure of each fan.
         6) Air Temperature: Take wet and dry bulb air temperatures on entering and leaving side of each cooling coil. Dry bulb temperatures shall be taken on entering and leaving side of each heating unit.
         7) Zone Ducts: Adjust zone ducts to within design CFM requirements. At least one zone balancing damper shall be completely open.
         8) Main Ducts: Adjust main ducts to within design CFM requirements and traverse for total CFM quantities.
         9) Branch Ducts: Adjust branch ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
         10) Tolerances: Test and balance each diffuser, grille, and register to within 10 percent of design requirements.
         11) Identification: Identify the location and area of each grille, diffuser, register, and terminal box. Record on air outlet data sheets.
         12) Description: Record size, type, and manufacturer of each diffuser, grille, and register on air outlet data sheets.
         13) Terminal Boxes: Set volume regulators on terminal boxes to meet design maximum and minimum CFM requirements. Check temperature controls for proper operation and calibration. Read out diffusers connected to terminal boxes shall be read out in heating and cooling modes and record their readings on air outlet data sheets.
         14) Drafts: Adjust diffusers, grilles, and registers to minimize drafts.
      b. Permanently mark all outside air, supply air, and return air damper positions after balancing has been completed.
   4. Smoke testing, or some other approved means, may be required to determine leak locations if air balance report indicates that any system's CFM total is less than 10 percent of design CFM. Prior to test, verify that system's duct joints have been sealed as specified and that air moving device in question is supplying required design system air flow. Architect will approve test method required. If smoke test is selected, use following procedure. Provide necessary precautions to protect those performing or observing test from being exposed to smoke.
      a. Use zinc chloride smoke candles, titanium tetrachloride ampules or sticks, or other devices acceptable to Architect to generate smoke.
      b. Close openings in duct except for one opening at farthest end of duct run.
      c. Circulate smoke at pressurized condition of 1/2 inch 13 mm minimum water gauge static pressure.
      d. Report findings to Architect in writing.

B. Final Inspection And Adjustments:
   1. System shall be balanced and reports submitted to Architect before final inspection.
   2. Balancing Agency shall be represented at final inspection meeting by qualified testing personnel with balancing equipment and two copies of air balancing test report.
      a. Architect will choose and direct spot balancing of one zone. Differences between the spot balance and test report will be justification for requiring repeat of testing and balancing for entire building. If recheck testing demonstrates measured flow deviation of 10 percent or more from recorded information on report, report will be rejected and new inspection and report will be made and resubmitted.

b. Perform re-balancing in presence of Architect and subject to its approval.
c. If re-balancing is required, submit revised air test and balance reports to Architect before Substantial Completion.
d. Spot balance and rebalance shall be performed at no additional cost to Owner.

3. Where furnace supplied to job site provides over 5 percent more air than schedule requirements, rooms supplied by that furnace shall have their supply air quantities increased by ratio of actual total air quantity supplied to minimum air quantity required by furnace schedule.

END OF SECTION

DIVISION 15 - MECHANICAL

15050 BASIC MECHANICAL MATERIALS AND METHODS

15051 GENERAL MECHANICAL REQUIREMENTS
15075 MECHANICAL IDENTIFICATION
15081 THERMAL DUCT INSULATION
15083 POTABLE WATER PIPING INSULATION
15087 REFRIGERANT PIPING INSULATION

15100 BUILDING SERVICES PIPING

15101 GENERAL PIPING REQUIREMENTS
15120 POTABLE WATER PIPING SPECIALTIES
15141 POTABLE WATER PIPING SYSTEMS
15150 SANITARY WASTE AND VENT PIPING SYSTEMS
15181 CONDENSATE DRAIN PIPING SYSTEMS
15184 REFRIGERANT PIPING SYSTEMS
15196 NATURAL GAS PIPING SYSTEM

15400 PLUMBING FIXTURES AND EQUIPMENT

15410 PLUMBING FIXTURES
15416 DRINKING WATER COOLING SYSTEM
15481 GAS-FIRED WATER HEATERS
15495 DOMESTIC WATER SOFTENERS

15500 HEAT-GENERATION EQUIPMENT

15532 GAS-FIRED FURNACES
15563 GAS FIRED UNIT HEATERS
15557 AIR PIPING

15600 REFRIGERATION EQUIPMENT

15671 AIR-COOLED REFRIGERANT CONDENSING UNITS

15700 HVAC EQUIPMENT

15725 EVAPORAITVE COOLERS
15735 GAS-FIRED RADIANT HEATERS

15800 AIR DISTRIBUTION

15801 GENERAL DUCT REQUIREMENTS
15817 LOW-PRESSURE STEEL DUCTS
15815 NON METAL DUCTS
15820 DUCT ACCESSORIES
15826 FIRE AND SMOKE DAMPERS
15836 EXTIAUST FANS
15851 DIFFUSERS, REGISTERS, AND GRILLES
15853 ROOF-MOUNTED AIR INLETS AND OUTLETS
15854 LOUVERS AND VENTS
15861 AIR FILTERS

15900 HVAC INSTRUMENTATION AND CONTROLS

15915 ELECTRIC AND ELECTRONIC CONTROL

END OF TABLE OF CONTENTS

SECTION 15051

GENERAL MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. General requirements and procedures for mechanical systems.
   2. Responsibility for proper operation of electrically powered equipment furnished under this Division.
   3. Interface with Testing And Balancing Agency.
   4. Furnish and install sealants relating to installation of systems installed under this Division.
   5. Furnish and install Firestop Penetration Systems for mechanical system penetrations as described in Contract Documents.

B. Products Supplied But Not Installed Under This Section:
   1. Sleeves, inserts, supports, and equipment for mechanical systems installed under other Sections.

1.2 SUBMITTALS

A. Product Data:
   1. Manufacturer's catalog data for each manufactured item.
      a. Provide section in submittal for each type of item of equipment. Include Manufacturer's catalog data of each manufactured item and enough information to show compliance with Contract Document requirements. Literature shall show capacities and size of equipment used and be marked indicating each specific item with applicable data underlined.
      b. Include name, address, and phone number of each supplier.

B. Shop Drawings:
   1. Schematic control diagrams for each separate fan system, heating system, control panel, etc. Each diagram shall show locations of all control and operational components and devices. Mark correct operating settings for each control device on these diagrams.
   2. Diagram for electrical control system showing wiring of related electrical control items such as firestats, fuses, interlocks, electrical switches, and relays. Include drawings showing electrical power requirements and connection locations.
   3. Drawing of each temperature control panel identifying components in panels and their function.
   4. Other shop drawings required by Division 15 trade Sections.

C. Closeout:
   1. Operation And Maintenance Manual Data:
      a. Modify and add to requirements of other sections as follows:
         1) At beginning of MECHANICAL section of Operations And Maintenance Manual, provide master index showing items included.
         2) Provide name, address, and phone number of Architect, Architect's Mechanical Engineer, General Contractor, and Mechanical, Plumbing, Sheet Metal, Refrigeration, and Temperature Control subcontractors.
         3) Provide operating instructions to include:
            a) General description of each plumbing and mechanical system.
            b) Step by step procedure to follow in putting each piece of mechanical equipment into operation.
            c) Provide diagrams for electrical control system showing wiring of items such as smoke detectors, fuses, interlocks, electrical switches, and relays.
         4) Identify maintenance instructions by using same equipment identification used in Contract Drawings. Maintenance instructions shall include:

a) List of mechanical equipment used indicating name, model, serial number, and nameplate data of each item together with number and name associated with each system item.
b) Manufacturer's maintenance instructions for each piece of mechanical equipment installed in Project. Instructions shall include name of vendor, installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance and lubrication instructions.
c) Summary list of mechanical equipment requiring lubrication showing name of equipment, location, and type and frequency of lubrication.
d) Manual for thermostats published by manufacturer.

5) Include copies of approved shop drawings and copies of warranties required in individual Sections of Division 15.

1.3 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
1. Perform work in accordance with applicable provisions of Plumbing Codes and Gas Ordinances applicable to Project. Provide materials and labor necessary to comply with rules, regulations, and ordinances.
2. In case of differences between building codes, laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Notify Architect in writing of such differences before performing work affected by such differences.

B. Identification:
1. Motor and equipment name plates as well as applicable UL / ULC and AGA / CGA labels shall be in place when Project is turned over to Owner.
2. Materials shall bear Manufacturer's name and trade name. Equipment and materials of same general type shall be of same make throughout work to provide uniform appearance, operation, and maintenance.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Storage:
1. In addition to requirements specified in Division 01, stored material shall be readily accessible for inspection by Architect until installed.
2. Store items subject to moisture damage, such as controls, in dry, heated spaces.

B. Handling: Protect bearings during installation. Thoroughly grease steel shafts to prevent corrosion.

1.5 WARRANTY

A. Guarantee heating, cooling, and plumbing systems to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.

B. Provide certificates of warranty for each piece of equipment made out in favor of Owner. Clearly record 'start-up' date of each piece of equipment on certificate.

C. If mechanical sub-contractor with offices located more than 150 miles from Project site is used, provide service / warranty work agreement for warranty period with local mechanical sub-contractor approved by Architect. Include copy of service / warranty agreement in warranty section of Operation And Maintenance Manual.

1.6 SYSTEM START-UP

A. Off-Season Start-up:

1. If Substantial Completion inspection occurs during heating season, schedule spring start-up of cooling systems. If inspection occurs during cooling season, schedule autumn start-up for heating systems.
2. Notify Owner seven days minimum before scheduled start-up.
3. Time will be allowed to completely service, test, check, and off-season start systems. During allowed time, train Owner's representatives in operation and maintenance of system.
4. At end of off-season start-up, furnish Owner with letter confirming that above work has been satisfactorily completed.

B. Preparations that are to be completed before start up and operation include, but are not limited to, following:
1. Dry out electric motors and other equipment to develop and properly maintain constant insulation resistance.
2. Make adjustments to insure that:
   a. Equipment alignments and clearances are adjusted to allowable tolerances.
   b. Nuts and bolts and other types of anchors and fasteners are properly and securely fastened.
   c. Packed, gasketed, and other types of joints are properly made up and are tight and free from leakage.
   d. Miscellaneous alignings, tightenings, and adjustings are completed so systems are tight and free from leakage and equipment performs as intended.
3. Motors and accessories are completely operable.
4. Inspect and test electrical circuitry, connections, and voltages to be properly connected and free from shorts.
5. Adjust drives for proper alignment and tension.
6. Make certain filters in equipment for moving air are new and of specified type.
7. Properly lubricate and run-in bearings in accordance with Manufacturer's directions and recommendations.

1.7 OWNER'S INSTRUCTIONS

A. Instruct building maintenance personnel and Stake Physical Facilities Representative in operation and maintenance of mechanical systems utilizing Operation And Maintenance Manual when so doing.
1. Minimum Instruction Periods:
   a. Mechanical: 4 hours.
   b. Temperature Control: 2 hours.
   c. Refrigeration: 2hours.
2. Conduct instruction periods after Substantial Completion inspection when systems are properly working and before final payment is made. None of these instructional periods shall overlap another.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS

A. Approved Mechanical Sub-Contractor shall be pre-approved in accordance with Supplementary Conditions and included in Construction Documents by Addendum.

3.2 EXAMINATION

A. Site Inspection:

1. Examine premises to understand conditions that may affect performance of work of this Division before submitting proposals for this work. Examine adjoining work on which mechanical work is dependent for efficiency and report work that requires correction.
2. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

B. Drawings:
1. Plumbing and Mechanical Drawings show general arrangement of piping, ductwork, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.
2. Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over Plumbing and Mechanical Drawings.
3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.

C. Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items to be furnished will fit space available.

3.3 PREPARATION

A. Check that slots and openings provided under other Divisions through floors, walls, ceilings, and roofs are properly located. Perform cutting and patching caused by neglecting to coordinate with Divisions providing slots and openings at no additional cost to Owner.

B. Changes Due To Equipment Selection:
1. Where equipment specified or otherwise approved requires different arrangement or connections from that shown in Contract Documents, submit drawings, if requested by Architect, showing proposed installations.
2. If proposed changes are approved, install equipment to operate properly and in harmony with intent of Contract Documents. Make incidental changes in piping, ductwork, supports, installation, wiring, heaters, panelboards, and as otherwise necessary.
3. Provide any additional motors, valves, controllers, fittings, and other additional equipment required for proper operation of the system resulting from selection of equipment, including all required changes in affected trades.
4. Be responsible for the proper location of roughing-in and connections provided under other Divisions.

3.4 INSTALLATION

A. Interface With Other Work:
1. Electrical: Furnish exact location of electrical connections and complete information on motor controls to installer of electrical system.
2. Testing And Balancing:
   a. Put mechanical systems into full operation and continue their operation during each working day of testing and balancing.
   b. Make changes in pulleys, belts, fan speeds, and dampers or add dampers as required for correct balance as recommended by appropriate Sections of Division 13 and at no additional cost to Owner.

B. Cut carefully to minimize necessity for repairs to previously installed or existing work. Do not cut beams, columns, or trusses.

C. Locating Equipment:
   1. Arrange pipes, ducts, and equipment to permit ready access to valves, cocks, unions, traps, filters, starters, motors, control components, and to clear openings of doors and access panels.
   2. Adjust locations of pipes, ducts, switches, panels, equipment, and fixtures to accommodate work to interferences anticipated and encountered.
   3. Install mechanical work to permit removal of equipment and parts of equipment requiring periodic replacement or maintenance without damage to or interference with other parts of equipment or structure.
   4. Determine exact route and location of each pipe and duct before fabrication.
      a. Right-Of-Way:
         1) Lines that pitch shall have right-of-way over those that do not pitch. For example, steam, steam condensate, and plumbing drains shall normally have right-of-way.
         2) Lines whose elevations cannot be changed shall have right-of-way over lines whose elevations can be changed.
      b. Offsets, Transitions, and Changes in Direction:
         1) Make offsets, transitions, and changes in direction in pipes and ducts as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.
         2) Furnish and install all traps, air vents, sanitary vents, and devices as required to effect these offsets, transitions, and changes in direction.

D. Penetration Firestops: Install Penetration Firestop System appropriate for penetration at mechanical system penetrations through walls, ceilings, roofs, and top plates of walls.

E. Sealants:
   1. Seal openings through building exterior caused by penetrations of elements of mechanical systems.
   2. Furnish and install acoustical sealant to seal penetrations through acoustically insulated walls and ceilings.

3.5 REPAIR / RESTORATION

A. Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.
   1. Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown.
   2. Surface finishes shall exactly match existing finishes of same materials.

B. Cutting, patching, repairing, and replacing pavements, sidewalks, roads, and curbs to permit installation of work of this Division is responsibility of Section installing work.

3.6 CLEANING

A. Clean exposed piping, ductwork, equipment, and fixtures. Remove stickers from fixtures and adjust flush valves.

B. No more than one week before Final Inspection, flush out bearings and clean other lubricated surfaces with flushing oil. Provide best quality and grade of lubricant specified by Equipment Manufacturer.

C. Replace filters in equipment for moving air with new filters of specified type no more than one week before Final Inspection.

3.7 PROTECTION

A. Do not operate pieces of equipment used for moving supply air without proper air filters installed properly in system.

B. After start-up, continue necessary lubrication and be responsible for damage to bearings while equipment is being operated up to Substantial Completion.

END OF SECTION

SECTION 15075

MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install identification of equipment and piping as described in Contract Documents.

PART 2 - PRODUCTS

2.1 LABELS

A. Equipment Identification: Black formica, with white reveal when engraved. Lettering to be 3/16 inch high minimum.

2.2 PAINT

A. One Coat Primer:
   1. 6-2 Quick Drying Latex Primer Sealer over fabric covers.
   2. 6-205 Metal Primer under dark color paint.
   3. 6-6 Metal Primer under light color paint.

B. Finish Coats: Two coats 53 Line Acrylic Enamel.

C. Quality Standard: Paints specified are from Pittsburgh Paint & Glass (PPG), Pittsburgh, PA (800) 441-9695. www.ppgaf.com or PPG Canada Inc, Missisauga, ON (800) 263-4350 or (905) 238-6441

PART 3 - EXECUTION

3.1 APPLICATION

A. Labels:
   1. Identify following items with specified labels fastened to equipment with screws:
      a. Thermostats and control panels.
      b. Furnaces.
      c. Condensing units.
      d. Evaporative Coolers
      e. Accessible exhaust fans.
   2. Engrave following data from Equipment Schedules on Drawings onto labels:
      a. Equipment mark.
      b. Area served.

B. Painting:
   1. Only painted legends, directional arrows, and color bands are acceptable.
   2. Locate identifying legends, directional arrows, and color bands at following points on exposed piping of each piping system:
      a. Adjacent to each item of equipment.
      b. At point of entry and exit where piping goes through wall.
      c. On each riser and junction.

d. Every 25 feet on long continuous lines.
e. Stenciled symbols shall be one inch high and black.

3.2 SCHEDULES

A. Schedule of Abbreviations for Pipe Stencils and Equipment Identification and Background Colors for Pipe Identification:

1. Apply stenciled symbols as follows:

Pipe Type	Symbol
Potable Hot Water	HW
Potable Cold Water	CW

2. Apply stenciled symbols and continuous painting as follows:

Pipe Type	Pipe Color	Symbol
Gas	Yellow	GAS

END OF SECTION

SECTION 15081

THERMAL DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install thermal wrap duct insulation as described in Contract Documents.

B. Related Work:
   1. Section 15812: Low-Pressure Steel Ducts.
   2. Section 15820: Acoustic duct liner.

1.2 REFERENCES

A. American Society for Testing and Materials:
   1. ASTM B 209-01, 'Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.'

PART 2 - PRODUCTS

2.1 MATERIALS

A. Thermal Wrap Duct Insulation:
   1. 1-1/2 inch thick fiberglass with factory-laminated, reinforced aluminum foil scrim kraft facing and density of one lb/ per cu ft.
   2. Thermal Conductivity: 0.27 BTU in/HR SF deg F at 75 deg F maximum.
   3. Approved Products:
      a. Type 100 standard duct insulation by Certainteed St Gobain, Valley Forge, PA (800) 233-8990 or (610) 341-7739. www.certainteed.com
      b. Microlite FSK by Johns-Manville, Denver, CO (800) 654-3103 or (303) 978-2000. www.jm.com
      c. Duct Wrap FSK by Knauf Fiber Glass, Shelbyville, IN (800) 825-4434 or (317) 398-4434 www.knauffiberglass.com.
      d. Alley Wrap FSK by Manson Insulation Inc, Brossard, PQ, Canada (800) 626-7661 or (450) 659-9101.
      e. FRK by Owens-Corning, Toledo, OH (800) 438-7465 or (419) 248-8000 www.owenscorning.com.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Thermal Wrap Duct Insulation:
   1. Install insulation as follows:
      a. On outside air ducts and combustion air ducts within building insulation envelope.
      b. On other air ducts where indicated on Drawings.
   2. Wrap insulation tightly on ductwork with circumferential joints butted and longitudinal joints overlapped minimum 2 inches.
      a. Do not compress insulation except in areas of structural interference. Minimum thickness at corners shall be one inch thick.

b. Remove insulation from lap before stapling.
c. Staple seams at approximately 16 inches on center with outward clenching staples.
d. Seal seams with foil vapor barrier tape or vapor barrier mastic. Seal penetrations of facing to provide vapor tight system.

B. Insulate outside of ceiling diffusers, diffuser drops, and duct silencers same as ductwork.

END OF SECTION

SECTION 15083

POTABLE WATER PIPE INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install insulation on hot and cold water lines, fittings, valves, and accessories as described in Contract Documents.

B. Related Sections:
   1. Section 15141: Potable Water Piping Systems.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Above Grade:
   1. Insulation For Piping:
      a. Snap-on glass fiber or melamine foam pipe insulation, or heavy density pipe insulation with factory vapor jacket.
      b. Insulation Thickness:

	Service Water Temp In Deg F	Pipe Sizes in inches Up to 1-1/4	1-1/2 to 2	Over 2
a)	170 - 180	1	1-1/2	2
b)	140 - 160	1/2	1	1-1/2
c)	45 - 130	1/2	1/2	1

      c. Quality Standards: Techlite SSL by Accessible Products or Fiberglas ASJ by Owens-Corning.
      d. Approved Manufacturers:
         1) Accessible Products.
         2) Childers Products.
         3) Knauf.
         4) Manson.
         5) Owens-Corning.
         6) Johns-Manville.
   2. Fitting, Valve, And Accessory Covers:
      a. PVC.
      b. Quality Standard: Techlite SSL-ASJ by Accessible Products.
      c. Approved Manufacturers:
         1) Accessible Products.
         2) Knauf.
         3) Speedline.
         4) Zeston by Johns-Manville.

B. Below Grade Piping:
   1. Insulation:
      a. 1/2 inch thick.
      b. Approved Products:
         1) DG Tubolit by Armacell.

2) ImcoLock or ImcoShield by Imcoa.
3) Nomalock or Nomaply by Nomaco.
4) Therma-Cel by Rubatex.

2. Joint Sealant:
   a. Armacell 520.
   b. Rubatex R-373.

PART 3 - EXECUTION

3.1 APPLICATION

A. Above Grade Piping:
   1. Apply insulation to clean, dry piping with joints tightly butted.
   2. Install insulation in manner to facilitate removal for repairs. Place sections or blocks so least possible damage to insulation will result from inspection or repairs of piping or equipment.
   3. Piping up to 1-1/4 Inch Diameter: Adhere 'factory applied vapor barrier jacket lap' smoothly and securely at longitudinal laps with white vapor barrier adhesive. Adhere 3 inch 75 mm wide self-sealing butt joint strips over end joints.
   4. Piping 1-1/2 Inch Diameter And Larger:
      a. Use broken-joint construction in application of two-layer covering.
      b. Fill cracks and depressions with insulating cement mixed to thick plastic paste. Apply by hand in several layers to make up total specified thickness. Final layer shall have smooth uniform finish before application of covering.
      c. Apply one heavy brush coat of sizing such as Foster Sealfast 30-36 or CP-10 or 11 lagging adhesive to canvas before painting.
   5. Fittings, Valves, And Accessories:
      a. Do not apply insulation over flanged joints or victaulic couplings until piping has been brought up to operating temperature and flange bolts have been fully tightened. Insulate valves so wheel, stem, and packing nut are exposed.
      b. Insulate with same type and thickness of insulation as pipe, with ends of insulation tucked snugly into throat of fitting and edges adjacent to pipe insulation tufted and tucked in.
      c. In Piping Up To 1-1/4 Diameter: Cover insulation with one piece fitting cover secured by stapling or taping ends to adjacent pipe covering.
         1) Alternate Method: Insulate fittings, valves, and accessories with one inch of insulating cement and vapor seal with two 1/8 inch wet coats of vapor barrier mastic reinforced with glass fabric extending 2 inches onto adjacent insulation.
      d. For Piping 1-1/2 inches To 2 Inches: Insulate with hydraulic setting insulating cement or equal, to thickness equal to adjoining pipe insulation. Apply final coat of fitting mastic over insulating cement.
      e. For Piping 2-1/2 inches and larger: Insulate with segments of molded insulation securely wired in place and coated with skim coat of insulating cement. Apply fitting mastic, fitting tape and finish with final coat of fitting mastic.
      f. Except where pre-formed, pre-finished covers are used, finish fittings, regardless of pipe size, with 4 oz canvas coated with vapor barrier adhesive.
   6. Pipe Hangers:
      a. Do not allow pipes to come in contact with hangers.
      b. Provide 16 ga by 6 inch long galvanized shields at each pipe hanger to protect pipe insulation from crushing by clevis hanger.
   7. Protect insulation wherever leak from valve stem or other source might drip on insulated surface, with aluminum cover or shield rolled up at edges and sufficiently large in area and of shape that dripping will not splash on surrounding insulation.

B. Below Grade Piping: Slip underground pipe insulation onto pipe and seal butt joints. Where slip-on technique is not possible, slit insulation, apply to pipe, and seal seams and joints.

END OF SECTION

SECTION 15087

REFRIGERANT PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install insulation on above ground refrigerant piping and fittings as described in Contract Documents.

B. Related Sections:
   1. Section 15184: Refrigerant Piping System.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Flexible Foamed Pipe Insulation:
   1. Thickness:
      a. 1/2 inch for one inch outside diameter and smaller pipe.
      b. 3/4 inch for 1-1/8 through 2 inch outside diameter pipe.
      c. One inch sheet for fittings as recommended by Manufacturer.
   2. Approved Products:
      a. AP Armaflex by Armacell.
      b. Rubatex.

B. Joint Sealer:
   1. Approved Products:
      a. Armaflex 520 by Armacell.
      b. BFG Construction Adhesive No. 105.
      c. Rubatex R-373.

C. Insulation Tape:
   1. Approved Products:
      a. Armaflex AP Tape by Armacell.
      b. R-180-FS Tape by Rubatex.

D. Exterior Finish:
   1. Approved Products:
      a. WB Armaflex Finish by Armacell.
      b. Protective Coating 67x944 by Rubatex.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
   1. Install insulation in snug contact with pipe and in accordance with Manufacturer's recommendations.
      a. Insulate flexible pipe connectors.
      b. Insulate thermal expansion valves with insulating tape.

c. Insulate fittings with sheet insulation and as recommended by Manufacturer.

2. Slip insulation on tubing before tubing sections and fittings are assembled keeping slitting of insulation to a minimum.
3. Do not install insulation on lines through clamp assembly of pipe support. Butt insulation up against sides of clamp assembly.
4. Stagger joints on layered insulation. Seal joints in insulation.
5. Install insulation exposed outside building so 'slit' joint seams are placed on bottom of pipe.
6. Paint exterior exposed insulation with two coats of specified exterior finish.

B. System Requirements:

1. Condensing Units: Install insulation on above-ground refrigerant suction piping and fittings, including thermal bulb, from thermal expansion valve.
2. Split System Heat Pump Units: Install insulation on above-ground refrigerant liquid and suction piping and fittings.

END OF SECTION

SECTION 15101

GENERAL PIPING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. General piping material requirements and installation procedures applicable to all piping systems.

B. Related Sections:
   1. Section 15051: General Mechanical Requirements.

1.2 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Pipe And Pipe Fittings: Use domestic made pipe and pipe fittings on Project. Weld-O-Let and Screw-O-Let fittings are acceptable.

B. Sleeves:
   1. In Framing: Standard weight galvanized iron pipe, Schedule 40 PVC, or 14 ga galvanized sheet metal two sizes larger than bare pipe or insulation on insulated pipe.
   2. In Concrete And Masonry: Sleeves through outside walls, interior shear walls, and footings shall be schedule 80 black steel pipe with welded plate.

2.2 MANUFACTURED UNITS

A. Valves: Valves of same type shall be of same manufacturer.

B. Hangers, Rods, And Inserts
   1. Galvanized and UL approved for service intended.
   2. Hangers and accessories shall be Grinnell numbers specified or equals by B-Line.
      a. Support horizontal piping from clevis hangers or on roller assemblies with channel supports, except where trapeze type hangers are explicitly shown on Drawings. Hangers shall have double nuts.
      b. Support insulated pipes with clevis hanger equal to Grinnell Fig 260 or roller assembly equal to Grinnell Fig 171 with an insulation protection shield equal to Grinnell Fig 167. Gauge and length of shield shall be according to Grinnell design data.
      c. Except uninsulated copper pipes, support uninsulated pipes from clevis hanger equal to Grinnell Fig 260. Support uninsulated copper pipe from Grinnell Fig CT-65 copper plated hangers and otherwise fully suitable for use with copper tubing.
   3. Support rods for single pipe shall be in accordance with following table:

Rod Diameter	Pipe Size

a. 3/8 inch 2 inches and smaller.
b. 1/2 inch 2-1/2 to 3-1/2 inches.

4. Support rods for multiple pipe supported on steel angle trapeze hangers shall be in accordance with following table:

	Rod		Number of pipes of Sizes Listed.						
	No	Diam	2"	2-1/2"	3"	4"	5"	6"	8"
a.	2	3/8 inch	2		-	-	-	-	-
b.	2	1/2 inch	3	3	2	-	-	-	-
c.	2	5/8 inch	6	4	3	2	-	-	-
d.	2	3/4 inch	9	7	5	3	2	2	-
e.	2	7/8 inch	12	9	7	5	3	2	2

5. Size trapeze angles so bending stress is less than 10,000 psi.
6. Riser Clamps For Vertical Piping: Grinnell Figure 261.
7. Concrete Inserts:
   a. Grinnell Figure 282.
   b. Suitable for special nuts size 3/8 inch through 7/8 inch with yoke to receive concrete reinforcing rods, and with malleable iron lugs for attaching to forms.
   c. Continuous inserts shall be Unistrut P-3200 series.
8. Steel Deck Bracket: Unistrut P1000 with clamp nut, minimum 6 inch length.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Interface With Other Work:
   1. Furnish sleeves, inserts, supports, and equipment that are to be installed by others in sufficient time to be incorporated into construction as work proceeds. Locate these items and see they are properly installed.

B. Furnish and install complete system of piping, valved as indicated or as necessary to completely control entire apparatus.
   1. Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Division from responsibility for proper erection of systems of piping in every respect.
   2. Arrange piping to not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings.
      a. Arrange so as to facilitate removal of tube bundles.
      b. Provide accessible flanges or ground joint unions, as applicable for type of piping specified, at connections to equipment and on bypasses.
         1) Make connections of dissimilar metals with di-electric unions.
         2) Install valves and unions ahead of traps and strainers. Provide unions on both sides of traps.
      c. Do not use reducing bushings, street elbows, bull head tees, close nipples, or running couplings.
      d. Install piping systems so they may be easily drained. Provide drain valves at low points and manual air vents at high points in hot water heating and cooling water piping.
      e. Install piping to insure noiseless circulation.
      f. Place valves and specialties to permit easy operation and access. Valves shall be regulated, packed, and glands adjusted at completion of work before final acceptance.
   3. Do not install piping in shear walls.

C. Properly support piping and make adequate provisions for expansion, contraction, slope, and anchorage.
   1. Cut piping accurately for fabrication to measurements established at site. Remove burr and cutting slag from pipes.

2. Work piping into place without springing or forcing. Make piping connections to pumps and other equipment without strain at piping connection. Remove bolts in flanged connections or disconnect piping to demonstrate that piping has been so connected, if requested.
3. Make changes in direction with proper fittings.
4. Except for underground pipe, suspend piping from roof trusses or clamp to vertical walls using Unistrut and clamps. Do not hang pipe from other pipe, equipment, or ductwork. Laying of piping on any building element is not allowed.
5. Supports For Horizontal Piping:
   a. Support metal piping at 96 inches on center maximum for pipe 1-1/4 inches or larger and 72 inches 1 on center maximum for pipe 1-1/8 inch or less.
   b. Support thermoplastic pipe at 48 inches on center maximum.
   c. Provide support at each elbow. Install additional support as required.
6. Supports for Vertical Piping:
   a. Place riser clamps at each floor or ceiling level.
   b. Securely support clamps by structural members, which in turn are supported directly from building structure.
   c. Provide clamps as necessary to brace pipe to wall.

D. Provide sleeves around pipes passing through concrete or masonry floors, walls, partitions, or structural members. Do not place sleeves around soil, waste, vent, or roof drain lines passing through concrete floors on grade. Seal sleeves with specified sealants.
   1. Sleeves through floors shall extend 1/4 inch above floor finish in mechanical equipment rooms above basement floor. In other rooms, sleeves shall be flush with floor.
   2. Sleeves through floors and foundation walls shall be watertight.

E. Provide spring clamp plates (escutcheons) where pipes run through walls, floors, or ceilings and are exposed in finished locations of building. Plates shall be chrome plated heavy brass of plain pattern and shall be set tight on pipe and to building surface.

3.2 FIELD QUALITY CONTROL

A. Site Tests:
   1. Perform tests on mechanical piping systems. Furnish devices required for testing purposes.
   2. Replace material or workmanship proven defective with sound material at no additional cost to Owner. Repeat tests on new material, if requested.

3.3 CLEANING

A. Remove dirt, grease, and other foreign matter from each length of piping before installation.
   1. After each section of piping used for movement of water is installed, flush with clean water, except where specified otherwise.
   2. Arrange temporary flushing connections for each section of piping and arrange for flushing total piping system.
   3. Provide temporary cross connections and water supply for flushing and drainage and remove after completion of work.

3.4 PROTECTION

A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system. Cap or plug open ends of pipes and equipment to keep dirt and other foreign materials out of system. Do not use plugs of rags, wool, cotton waste, or similar materials.

END OF SECTION

SECTION 15120

POTABLE WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install miscellaneous potable water piping specialties as described in Contract Documents.

B. Related Sections:
   1. Section 15101: General Piping Requirements.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Pressure Reducing Station:
   1. Pressure Gauges:
      a. Gauges shall have following features:
         1) Cast aluminum case.
         2) Chrome plated ring.
         3) Clear glass window.
         4) Phosphor bronze alloy steel bourdon tube.
         5) 1/2 percent scale range accuracy.
         6) 4-1/2 inch diameter dial face.
         7) Range 0 to 100 psig.
      b. Quality Standard: 500 by HO Trerice.
      c. Approved Manufacturers:
         1) HO Trerice.
         2) Marsh.
         3) Weiss.
   2. Brass Gauge Cocks:
      a. Approved Products:
         1) 1092 by Ashcroft.
         2) 123 by Ernst.
         3) 885 by HO Trerice.
         4) 557 by Walworth.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Gauges: Connect to pipe with 1/4 inch connections utilizing gauge cocks.

END OF SECTION

SECTION 15141

POTABLE WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform excavating and backfilling required by work of this Section.
   2. Furnish and install potable water piping complete with necessary valves, connections, and accessories inside building and connect with outside utility lines 5 feet from building perimeter as described in Contract Documents.

1.2 REFERENCES

A. American Society For Testing And Materials:
   1. ASTM B 88-99, 'Standard Specification for Seamless Copper Water Tube.'

1.3 SUBMITTALS

A. Quality Assurance / Control: Written report of sterilization test.

1.4 QUALITY ASSURANCE

A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 03313.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Pipe:
   1. Above-Grade: Copper meeting requirements of ASTM B 88. Type L.
   2. Below-Grade.
      a. Copper meeting requirements of ASTM B 88, Type K. 3/4 inch minimum under slabs.
         1) 2 inches And Smaller: Annealed soft drawn.
         2) 2-1/2 inches And Larger: Hard Drawn.

B. Fittings: Wrought copper.

C. Connections:
   1. Above-Grade:
      a. Sweat copper type with 95/5 or 96/4 Tin-Antimony solder, Bridgit solder, or Silvabrite 100 solder. Use only lead-free solder.
      b. Viega ProPress System
   2. Below Grade:
      a. Copper:
         1) Brazed using following type rods:
            a) Copper to Copper Connections:
               (1) AWS Classification BCuP-4 Copper Phosphorus (6 percent silver).
               (2) AWS Classification BCuP-5 Copper Phosphorus (15 percent silver).

b) Copper to Brass or Copper to Steel Connections: AWS Classification BAg-5 Silver (45 percent silver).
c) Do not use rods containing Cadmium.

2) Brazing Flux:
a) Approved Products.
(1) Stay-Silv white brazing flux by J W Harris.
(2) High quality silver solder flux by Handy & Harmon.

3) Joints under slabs acceptable only if allowed by local codes.

D. Ball Valves:
1. Use ball valves exclusively unless otherwise specified. Ball valves shall be by single manufacturer from approved list below.
2. Valves shall be two-piece, full port for 150 PSI SWP.
a. Operate with flow in either direction, suitable for throttling and tight shut-off. Full port, three-piece maintenance design.
b. Body: Bronze, 150 psig wsp at 350 deg F and 400 psig wog.
c. Seat: Bubble tight at 100 psig under water.
3. Quality Standard: Nibco T585 or S585, S595
4. Approved Manufacturers:
a. ConBraCo 'Apollo.'
b. Hammond.
c. Milwaukee.
d. Nibco.
e. Watts.
f. Honeywell-Braukmann.
g. Jenkins.
h. Stockham.

E. Combination Pressure Reducing Valve / Strainer.
1. Integral stainless steel strainer, or separate "Y" strainer installed upstream of pressure reducing valve.
2. Built-in thermal expansion bypass check valve.
3. Quality Standard: Watts U5B.
4. Approved Products:
a. Cash Valve.
b. Cla-Val: Hi Capacity.
c. Con Braco: 36C.
d. Honeywell-Braukmann.
e. Spence: Hi Capacity.
f. Watts.
g. Wilkins.

F. Stop And Waste Valves:
1. Approved Products:
a. Mueller: Mark II Oriseal stop and waste valve H10288.
b. Mueller: Buffalo screw type curb box H-10350 complete with lid and H-10349 enlarged base.
2.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Below Grade:
1. Install piping under slabs without joints where possible.
2. Insulate water piping buried within building perimeter.

3. Bury water piping 6 inches minimum below bottom of slab and encase in 2 inches minimum of sand.

B. Locate cold water lines a minimum of 6 inches from hot water line.

3.2 FIELD QUALITY CONTROL

A. Site Tests: Before pipes are covered, test systems in presence of Architect at 125 psi hydrostatic pressure for 4 hours and show no leaks. Disconnect equipment not suitable for 125 psig pressure from piping system during test period.

3.3 CLEANING

A. Sterilize potable water system with solution containing 200 parts per million minimum of available chlorine and maintaining pH of 7.5 minimum. Introduce chlorinating materials into system in manner approved by Architect. Allow sterilization solution to remain for 24 hours and open and close valves and faucets several times during that time.

B. After sterilization, flush solution from system with clean water until residual chlorine content is less than 0.2 parts per million.

C. Water system will not be accepted until negative bacteriological test is made on water taken from system. Repeat dosing as necessary until such negative test is accomplished.

END OF SECTION

SECTION 15150

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install soil, waste, and vent piping systems within building and connect with outside utility lines 5 feet out from building where applicable.
   2. Perform excavation and backfill required by work of this Section.

B. Related Sections:
   1. Section 15101: General Piping Requirements.

1.2 REFERENCES

A. American Society For Testing And Materials:
   1. ASTM A 74-98, 'Standard Specification for Cast Iron Soil Pipe and Fittings.'
   2. ASTM C 564-97, 'Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.'

1.3 QUALITY ASSURANCE

A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 03313.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Minimum size of waste piping installed under floor slab on grade shall be 2 inches.

B. Buried Piping:
   1. Approved Types: Service weight, single-hub or no-hub type cast iron soil pipe meeting requirements of ASTM A 74.
   2. Joint Material:
      a. Single-Hub: Rubber gaskets meeting requirements of ASTM C 564.
      b. No-Hub:
         1) SuperGrip 304 American Brass & Iron (AB&I), Oakland, CA (800) 468-4766 or (510) 632-3467. www.abifoundry.com
         2) Husky SD 4000 coupling by Husky Technologies, Anaheim, CA (800) 486-8188 or (909) 372-2732.
         3) Neoprene gaskets with type 304 stainless steel clamp and 24 ga type 304 stainless steel housing by Clamp-All Corp, Haverhill, MA (800) 762-7255 or (978) 372-9010. www.clampall.com
         4) MG Coupling by MG Piping Products Co, Stanton, CA (800) 761-8055 or (714) 761-8055. www.mgcoupling.com

C. Above Grade Piping And Vent Lines:
   1. Approved Types:
      a. Service weight, single-hub or no-hub type cast iron soil pipe meeting requirements of ASTM A 74.
      b. Vent lines 2-1/2 inches or smaller may be Schedule 40 galvanized steel.

2. Joint Material:
   a. Single-Hub: Rubber gaskets meeting requirements of ASTM C 564.
   b. No-Hub Pipe: Neoprene gaskets with stainless steel cinch bands.

D. Fittings:
   1. Cast Iron Pipe: Hub and spigot, except fittings for no-hub pipe shall be no-hub, and meet requirements of ASTM A 74.
      a. Joint Material: Rubber gaskets meeting requirements of ASTM C 564.
      b. Galvanized Pipe: Screwed Durham tarred drainage type.
   2. Traps installed on cast iron bell and spigot pipe shall be service weight cast iron. Traps installed on threaded pipe shall be recess drainage pattern type.
   3. P-Traps:
      a. Trap shall have clean out plug if installed in other than slab on grade.
      b. Approved Products.
         1) 7220 deep seal cast iron by JR Smith. Montgomery, AL (205) 277-8520.
         2) Zurn Z-1000 by Zurn Industries Inc, Erie, PA (814) 455-0921.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Excavate and backfill as specified in Section 02315 with following additional requirements:
   1. Runs shall be as close as possible to those shown on Drawings.
   2. Excavate to required depth and grade to obtain fall required. Grade soil and waste lines within building perimeter 1/4 inch fall in one foot in direction of flow.
   3. Bottom of trenches shall be hard. Tamp as required.
   4. Remove debris from trench before laying of pipe.
   5. Do not cut trenches near footings without consulting Architect.

B. Metal Pipe And Fittings:
   1. Provide depression under bell of each joint to maintain even bearing of sewer pipe.
   2. Connect to street main as required by local authorities.
   3. Use jacks to make-up gasketed joints.
   4. Do not calk threaded work.
   5. Use torque wrench to obtain proper tension in cinch bands when using hubless cast iron pipe. Butt ends of pipe against centering flange of coupling.

C. Install piping so cleanouts may be installed as follows:
   1. Where shown on Drawings and near bottom of each stack and riser.
   2. At every 135 degrees of accumulative change in direction for horizontal lines.
   3. Every 100 feet of horizontal run.
   4. Extend piping to accessible surface. Do not install piping so cleanouts must be installed in carpeted floors. In such locations, configure piping so wall type cleanouts may be used.

D. Each fixture and appliance discharging water into sanitary sewer or building sewer lines shall have seal trap in connection with complete venting system so gasses pass freely to atmosphere with no pressure or syphon condition on water seal.

E. Vent entire waste system to atmosphere. Join lines together in fewest practicable number before projecting above roof. Set back vent lines so they will not pierce roof near edge or valley. Vent line terminations shall be:
   1. 6 inches minimum above roof and 12 inches minimum from any vertical surface.
   2. Same size as vent pipe.
   3. In areas where minimum design temperature is below 0 deg F or where frost or snow closure may be possible:
      a. Vent line terminations shall be same size as vent pipe, except no smaller than 2 inches in diameter.

b. Vents shall terminate 10 inches minimum above roof or higher if required by local codes.

F. Furnish and install firestopping at penetrations of fire-rated structures as required under Sections 07840 and 15051.

3.2 FIELD QUALITY CONTROL

A. Site Tests:
   1. Conduct tests for leaks and defective work. Notify Architect before testing.
   2. Metal Pipe System: After backfilling and compacting of trenches is complete but before placing floor slab, fill waste and vent system to roof level with water, 10 feet minimum, and show no leaks for two hours. Uncover pipe and correct leaks and defective work. Re-backfill and compact and re-test.

END OF SECTION

SECTION 15181

CONDENSATE DRAIN PIPING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install condensate drain piping as described in Contract Documents.

B. Related Sections:
   1. Section 15101: General Piping Requirements

1.2 REFERENCES

A. American Society For Testing And Materials:
   1. ASTM B 88-99, 'Standard Specification for Seamless Copper Water Tube.'

PART 2 - PRODUCTS

2.1 MATERIALS

A. Condensate Drains:
   1. Schedule 40 PVC for condensate drains from furnace combustion chambers and furnace cooling coils.
   2. 3 inch deep seal, vented water trap adjacent to cooling coil connection.
   3. Type M copper for Evaporative cooler bleed off drains.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Condensate Drains:
   1. Support piping and protect from damage.
   2. Do not combine PVC condensate drain piping from furnace combustion chamber with copper condensate drain piping from cooling coil.

END OF SECTION

SECTION 15184

REFRIGERANT PIPING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install piping and specialties for refrigeration systems as described in Contract Documents.

B. Related Sections:
   1. Section 15084: Refrigerant Piping Insulation.
   2. Section 15101: General Piping Requirements.

1.2 REFERENCES

A. American National Standards Institute / American Welding Society.
   1. ANSI / AWS A5.8-92, 'Standard Specification for Brazing Alloys.'

B. American Society For Testing And Materials:
   1. ASTM A 36-00a, 'Standard Specification for Carbon Structural Steel.'
   2. ASTM A 361-94, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process for Roofing and Siding.'
   3. ASTM B 280-99, 'Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.'

1.3 SUBMITTALS

A. Shop Drawings: Show each individual equipment and piping support.

B. Quality Assurance / Control: Technician certificate for use of CFC and HCFC refrigerants.

1.4 QUALITY ASSURANCE

A. Qualifications: Refrigerant piping shall be installed by a refrigeration contractor licensed by State and by technicians certified in use of CFC and HCFC refrigerants.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Refrigerant Piping:
   1. Meet requirements of ASTM B 280, hard drawn straight lengths. Soft copper tubing not permitted.
   2. Do not use pre-charged refrigerant lines.

B. Refrigerant Fittings:
   1. Wrought copper with long radius elbows.
   2. Approved Manufacturers:
      a. Mueller Streamline.

b. Nibco Inc.
c. Grinnell.
d. Elkhart.

C. Suction Line Traps:
1. Manufactured standard one-piece traps.
2. Approved Manufacturers:
a. Mueller Streamline.
b. Nibco Inc.
c. Grinnell.
d. Elkhart.

D. Connection Material:
1. Brazing Rods in accordance with ANSI / AWS A5.8:
a. Copper to Copper Connections:
1) Classification BCuP-4 Copper Phosphorus (6 percent silver).
2) Classification BCuP-5 Copper Phosphorus (15 percent silver).
b. Copper to Brass or Copper to Steel Connections: Classification BAg-5 Silver (45 percent silver).
c. Do not use rods containing Cadmium.
2. Flux:
a. Approved Products:
1) Stay-Silv White Brazing Flux by J W Harris.
2) High quality silver solder flux by Handy & Harmon.

E. Valves:
1. Expansion Valves:
a. For pressure type distributors, externally equalized with stainless steel diaphragm, and same refrigerant in thermostatic elements as in system.
b. Size valves to provide full rated capacity of cooling coil served. Coordinate selection with evaporator coil and condensing unit.
c. Approved Manufacturers:
1) Alco.
2) Henry.
3) Mueller.
4) Parker.
5) Sporlan.
2. Manual Refrigerant Shut-Off Valves:
a. Ball valves designed for refrigeration service and full line size.
b. Valve shall have cap seals.
c. Valves with hand wheels are not acceptable.
d. Provide service valve on each liquid and suction line at compressor.
e. If service valves come as integral part of condensing unit, additional service valves shall not be required.
f. Approved Manufacturers:
1) Henry.
2) Mueller.
3) Superior.
4) Virginia.

F. Filter-Drier:
1. On lines 3/4 inch outside diameter and larger, filter-drier shall be replaceable core type with Schraeder type valve.
2. On lines smaller than 3/4 inch outside diameter, filter-drier shall be sealed type using flared copper fittings.
3. Size shall be full line size.
4. Approved Manufacturers:
a. Alco.
b. Mueller.

c. Parker.
d. Sporlan.
e. Virginia.

G. Sight Glass:
1. Combination moisture and liquid indicator with protection cap.
2. Sight glass shall be full line size.
3. Sight glass connections and sight glass body shall be solid copper or brass, no copper-coated steel sight glasses allowed.
4. Approved Product:
a. Alco AMI.

H. Flexible Connectors:
1. Designed for refrigerant service with bronze seamless corrugated hose and bronze braiding.
2. Approved Products:
a. Vibration Absorber Model VAF by Packless Industries.
b. Vibration Absorbers by Virginia KMP Corp.
c. Anaconda 'Vibration Eliminators' by Universal Metal Hose.
d. Style 'BF' Spring-flex freon connectors by Vibration Mountings.

2.2 MATERIALS

A. Refrigerant Piping Supports:
1. Base, Angles, And Uprights: Steel meeting requirements of ASTM A 36.
2. Securing Channels:
a. At Free-Standing Pipe Support:
1) Acceptable Products:
a) P-1000 channels by Unistrut.
b) HS-158-12 channels by Hilti.
c) Equal as approved by Architect prior to installation. See Section 01600.
b. At Wall Support:
1) Acceptable Products:
a) P-3300 channels by Unistrut.
b) HS-1316-12 channels by Hilti.
c) Equal as approved by Architect prior to installation. See Section 01600.
c. At Suspended Support:
1) Acceptable Products:
a) P-1001 channels by Unistrut.
b) MS-41 channels by Hilti.
c) Equal as approved by Architect prior to installation. See Section 01600.
3. Angle Fittings:
a. Acceptable Products:
1) P-2626 90 degree angle by Unistrut.
2) MW2 angle by Hilti.
3) Equal as approved by Architect prior to installation. See Section 01600.
4. Pipe Clamps:
a. Acceptable Manufacturers:
1) Hilti Cush-A-Clamp.
2) Hydra-Zorb.
3) Klo-Shure coupling
4) ZSI Cush-A-Clamp.
5) Equal as approved by Architect prior to installation. See Section 01600.
5. Protective Cover: 18 ga steel, hot-dipped galvanized to meet requirements of ASTM A 361, 1.25 oz/sq ft.

2.3 INSTALLATION

A. Refrigerant Lines:
   1. Install as high in upper mechanical areas as possible. Do not install underground or in tunnels.
   2. Slope suction lines down toward compressor one inch/10 feet. Locate traps at vertical rises against flow in suction lines.

B. Connections:
   1. Refrigeration system connections shall be copper-to-copper, copper-to-brass, or copper-to-steel type properly cleaned and brazed with specified rods. Use flux only where necessary. No soft solder (tin, lead, antimony) connections will be allowed in system.
   2. Braze manual refrigerant shut-off valve, sight glass, and flexible connections.
   3. Circulate dry nitrogen through tubes being brazed to eliminate formation of copper oxide during brazing operation.

C. Specialties:
   1. Install valves and specialties in accessible locations. Install refrigeration distributors and suction outlet at same end of coil.
   2. Install thermostatic bulb as close to cooling coil as possible. Do not install on vertical lines.
   3. Install equalizing line in straight section of suction line, downstream of and reasonably close to thermostatic bulb. Do not install on vertical lines.
   4. Provide flexible connectors in each liquid line and suction line at both condensing unit and evaporator on systems larger than five tons. Anchor pipe near each flexible connector.

D. Refrigerant Supports:
   1. Support Spacing:
      a. Piping 1-1/4 inch And Larger: 8 feet on center maximum.
      b. Piping 1-1/8 inch And Smaller: 6 feet on center maximum.
      c. Support each elbow.
   2. Isolate pipe from supports and clamps with Hydrozorb or Cush-A-Clamp systems.
   3. Run protective cover continuous from condensing units to risers or penetrations at building wall.

2.4 FIELD QUALITY CONTROL

A. Make evacuation and leak tests in presence of Architect's Engineer after completing refrigeration piping systems. Positive pressure test will not suffice for procedure outlined below.
   1. Draw vacuum on each entire system with two stage vacuum pump. Draw vacuum to 300 microns using micron vacuum gauge capable of reading from atmosphere to 10 microns. Do not use cooling compressor to evacuate system nor operate it while system is under high vacuum.
   2. Break vacuum with nitrogen and re-establish vacuum test. Vacuum shall hold for 30 minutes at 300 microns without vacuum pump running.
   3. Conduct tests at 70 deg F ambient temperature minimum.
   4. Do not run systems until above tests have been made and systems started up as specified. Inform Owner's Representative of status of systems at time of final inspection and schedule start-up and testing if prevented by outdoor conditions before this time.
   5. After testing, fully charge system with refrigerant and conduct test with Halide Leak Detector.
   6. Recover all refrigerant in accordance with applicable codes. Do not allow any refrigerant to escape to atmosphere.

B. If it is observed that refrigerant lines are being or have been brazed without proper circulation of nitrogen through lines, all refrigerant lines installed up to that point in time shall be removed and replaced at no additional cost to Owner.

END OF SECTION

SECTION 15196

NATURAL GAS PIPING SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform excavation and backfill required for work of this Section.
   2. Furnish and install gas piping and fittings within building and from building to meter including connection to meter as described in Contract Documents.

B. Related Sections:
   1. Section 15101: General Piping Requirements.

1.2 REFERENCES

A. American Society For Testing And Materials:
   1. ASTM A 53-01, 'Standard Specification for Pipe, Steel and Hot-Dipped, Zinc-Coated, Welded and Seamless.'
   2. ASTM A 234-00a, 'Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperature Service.'
   3. ASTM D 2513-00, 'Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.'

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Welders shall be certified and bear evidence of certification 30 days before commencing work on project. If there is doubt as to proficiency of welder, Owner's Representative may require welder to take another test. This shall be done at no cost to Owner. Certification shall be by Pittsburgh Testing Laboratories or other approved authority.
   2. Polyethylene pipe installers shall be properly trained and certified in procedure for joining polyethylene pipe.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not store polyethylene pipe so it is exposed to sunlight.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Above-Ground Pipe And Fittings: Black carbon steel, butt welded, Schedule 40 pipe meeting requirements of ASTM A 53. Welded forged steel fittings meeting requirements of ASTM A 234 or standard weight malleable iron screwed.

B. Below-Ground Pipe And Fittings: Polyethylene pipe and fittings meeting requirements of ASTM D 2513 with No. 14 coated copper trace wire.

2.2 MANUFACTURED UNITS

A. Valves:
   1. 125 psi bronze body ball valve, UL listed.
   2. Approved Products:
      a. Apollo Series 80-100 by ConBraCo.
      b. FIG-30-A by Jenkins Valves.
      c. Model T-204 by Jomar International.
      d. 3410 by McDonald Valves & Fittings.
      e. BCI-100T (with tee handle) by Milwaukee Valve.
      f. 'Red Cap' gas ball valve by PGL Corp.
      g. Model B-6000-UL by Watts Regulator.

B. Cocks:
   1. Gauge Cocks: Conbraco 41-560 bronze gauge cock.
   2. Lubricated Balancing Cocks:
      a. Square head type suitable for 175 psig wog at 150 deg F.
      b. Wrench handle for each valve.
      c. 2 inches And Smaller:
         1) Cast iron body with screwed connections.
         2) Approved Products:
            a) Powell: 2200.
            b) Walworth: 1796.
      d. 2-1/2 to 5 inches:
         1) Cast iron body with flanged connections.
         2) Approved Products:
            a) Powell: 2201.
            b) Walworth: 1797F.
      e. 6 inches And Larger:
         1) Cast iron body with flanged connections.
         2) Approved Products:
            a) Powell: 2201.
            b) Walworth: 1718F.

C. Flexible Connector:
   1. Type 304 stainless steel corrugated tube coated for corrosion protection.
   2. Approved Manufacturers and Models:
      a. Dormont Series 41.
      b. Brass Craft Procoat.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Steel pipe installed through air plenums, in walls, and pipes 2-1/2 inches 63 mm and larger shall have welded fittings and joints. Other steel pipe may have screwed or welded fittings.

B. Lay underground pipe in accordance with Manufacturer's recommendations and local gas utility company regulations and specifications.
   1. Provide 24 inch minimum steel pipe between vertical rise of riser and end of polyethylene line if anode-less riser is not used. Use plastic-to-steel transition or compression fitting between end of polyethylene line and steel meter riser. Provide cathodic protection for steel riser or use anode-less riser.
   2. Place tracer wire along side of polyethylene pipe from meter to point where pipe rises inside building.
   3. Place 4 inches of sand around gas line buried underground.
   4. Do not install gas piping under building floor slabs-on-grade.

C. On lines serving gas-fired equipment, install gas cocks adjacent to equipment outside of equipment cabinet and easily accessible.

D. Install 6 inch long minimum dirt leg, with pipe cap, on vertical gas drop serving each gas-fired equipment unit.

E. Use fittings for changes of direction in pipe and for branch runouts.

3.2 FIELD QUALITY CONTROL

A. Site Tests: Before pipes are buried or concealed from view, test systems in Architect's presence at 60 psig for 4 hours and show no drop in pressure.

END OF SECTION

SECTION 15410

PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install plumbing fixtures as described in Contract Documents.

B. Related Sections:
   1. Section 15141: Potable Water Piping System.

PART 2 - PRODUCTS

2.1 GENERAL

A. Interior exposed pipe, valves, and fixture trim, including trim behind custom casework doors, shall be chrome plated.

B. Do not use flexible water piping.

C. Flow Control Fittings: Vandal proof type and fit faucet spout of fixture used. Flow shall be controlled as required by local codes.

2.2 MANUFACTURED UNITS

A. Water Closets:
   1. Maximum water usage of 1.6 gallons per flush.
   2. Handicap Accessible Fixture:
      a. 18 inch maximum rim height.
      b. Approved Products:
         1) Toto: 'ADA Drake' CST744SL. (**Use as quality standard**)
         2) American Standard.
         3) Crane
         4) Eljer.
         5) Kohler
   3. Seats:
      a. Provide split front type with check hinge.
      b. Approved Products:
         1) Standard And Handicap Accessible Fixtures:
            a) Bemis: 1655-C.
            b) Beneke Corporation: Series 527 – CH.
            c) Church: No. 9500-C.
            d) Kohler: K-4666-C.
            e) Olsonite: 95CC.
            f) Toto SC534.
   4. Supply Pipe And Stop:
      a. Provide stuffing box and chrome plating.
      b. Approved Products:
         1) Brass Craft: TCR 1912 DL-CP.
         2) Zurn: Z8804-LR-PC.

B. Urinals:
   1. Standard and Handicap Fixture:
      a. Approved Products:
         1) Toto: UT370 (**Use as quality standard**).
         2) American Standard
         3) Crane
         4) Eljer
         5) Kohler
   2. Carrier / Support:
      a. Approved Manufacturers:
         1) Josam.
         2) J. R. Smith.
         3) Mifab.
         4) Wade.
         5) Watts Drainage
         6) Zurn
   3. Flush Valve:
      a. Low flow, 1.6 gallons per flush maximum.
      b. Proximity sensor type.
      c. Approved Products:
         1) Sloan: Regal 186-SMO with override button.
         2) Taiko: TSS-603.
         3) Toto: TEUIDNCR-12 with maintenance override button.
         4) Zurn: ZR-6003-AV with maintenance override button.

C. Standard and Handicap Lavatories:
   1. Self Supporting Fixtures:
      a. Size: 20 by 18 inches.
      b. Approved Products:
         1) Toto: LT307. (**Use as quality standard**).
         2) American Standard
         3) Crane
         4) Eljer
         5) Kohler
      c. Carrier / Support:
         1) Approved Products:
            a) Josam.
            b) J. R. Smith.
            c) Mifab.
            d) Wade.
            e) Watts Drainage
            f) Zurn.
   2. Fittings:
      a. Faucet and Drain:
         1) Provide flow control fitting on each spout in place of aerator.
         2) Approved Products:
            a) American Standard: 5502.140.
            b) Cambridge Brass: 21T341CB with metal HDL.
            c) Chicago: 1802A with 327A.
            d) Delta: 2500.
            e) Grohe: 20831660 8-inch center faucet, 4-inch blade handle, and drain.
            f) Kohler: K-7404 with K-7715 strainer.
            g) Sloan: Polaris SL-2971 with SL-899
            h) Speakman: SC-3073 complete with drain.
            i) T S Brass: B-2971 with B-899 Drain.
            j) Zurn: Z-81103.
      b. Supply pipes with stops:
         1) Provide stuffing box and chrome plating.
         2) Approved Products:
            a) Brass Craft: TCR 1912 A-CP.

b) Zurn: Z8804 LR-PC.

c. Trap:

1) 17 ga tube 'P' trap, chrome plated.

2) Approved Manufacturers:

a) Dearborn.

b) Keeney Manufacturing.

c) Watts Drainage Brass And Tubular.

d) Zurn Traps & Supplies.

e) Keeney Manufacturing.

f) Watts Drainage Brass And Tubular

g) Zurn Traps & Supplies.

3. Safety Covers:

a. Provide protection on water supply pipes and on trap.

b. Approved Products:

1) Trapwrap by Brocar Products Inc.

2) Pro Wrap by McGuire Products.

3) Handy-Shield by Plumberex Specialty Products.

4) Handi Lav-Guard by TrueBro.

5) Zurn Traps & Supplies.

D. Service Sink:

1. Fixture:

a. Wall Hung, 22 X 20 inches with Stainless Steel rim guard.

b. Approved Products:

1) Eljer: Radford Sink 241-0330. (**Use as quality standard**).

2) Kohler

3) American Standard

2. Fittings:

a. Supply:

1) Approved Products:

a) American Standard: 8344.112 with threaded spout.

b) Cambridge Brass: 28T2383CB.

c) Chicago: 897.

d) Kohler: K-8928.

e) Sloan: Polaris SL-665-BSTR

f) T & S Brass: B-665-BSTR.

g) Zurn: Z-841M1.

b. Drain and Strainer:

1) Approved Products:

a) American Standard: 7721.038.

b) Eljer: 803-C630.

c) Kohler: K-9146, 3 inch IPS.

c. Trap: Cast iron, to match piping.

E. Break Room Sinks:

1. Fixtures:

a. Self-rimming, 18 ga stainless steel, satin finish.

b. Approved Products:

1) Two Compartment:

a) Elkay: LR 3319.

b) Just: DL-1933-A-GR.

2. Fittings:

a. Provide flow control fittings on spouts in place of aerator.

b. Supply:

1) Approved Products Two-Compartment Sinks:

a) American Standard: 7270.342H.

b) Cambridge Brass: 27T2443CB with 11 inch 275 mm spout.

c) Chicago: 1888.

d) Delta: 2100 HDF modified with 4381 handles.

e) Eljer: 718-1000.

f) Grohe: Kitchen Faucet 20707000 body with 18754000 handles.
g) Kohler: K-7761-K with handles K-16012-5.
h) Sloan: Polaris SL-855 and B-199-1
i) Speakman: SC-5763.
j) T & S Brass. B-855 and B-199-1.
k) Zurn: Z-831J3.

c. Waste:
1) Approved Products:
a) Eljer: 603-C580.
b) Elkay: LK-99.
c) Just: JB-99.
d) Kohler: K-8801.
e) Zurn: Z-8740.

d. Supply pipes with stops:
1) Provide stuffing box and chrome plating.
2) Approved Products:
a) Brass Craft: TCR 1912 A-CP.
b) Zurn: Z8804 LR-PC.

e. Trap:
1) 17 ga tube 'P' trap, chrome plated.
2) Approved Products:
a) Dearborn.
b) Keeney Manufacturing.
c) Watts Drainage Brass And Tubular
d) Zurn Traps & Supplies.

F. Hydrants:
1. Provide with integral anti-siphon device.
2. Approved Products:
a. Josam: 71050.
b. J. R. Smith: 5609-QT.
c. Mifab: MHY-10
d. Wade: W-8600.
e. Watts Drainage: HY-420.
f. Woodford: 67.
g. Zurn: Z-1310.

G. Floor Sink:
1. 8 inch square top, medium receptor cast iron body with flanged receptor, acid resistant coated interior, and acid resistant coated half grate. Aluminum sediment bucket and 2 inch calked regular outlet connection.
2. Approved Products:
a. J. R. Smith: 3411-12.
b. Josam: 49002-3.
c. Mifab: 1520
d. Wade: W9112-15-64-1C.
e. Watts Drainage: FS-720-22-5.
f. Zurn: 1910-K-2-23.

H. Drains And Drain Accessories:
1. Floor Drain FD-1:
a. Approved types with deep seal trap and chrome plated strainer.
b. Approved Products:
1) Josam: 30000Z-5A with 88250 trap.
2) J. R. Smith: 2010-A with 7222 trap.
3) Mifab: F1100C
4) Wade: 1100 with 2450-T trap.
5) Watts Drainage: FD-100-A5-3.
6) Zurn: 415 with Z 1000 trap.

I. Cleanouts:
1. Furnish wall cleanouts with chrome wall cover and screw.
2. Finish Floors:
   a. Approved Products:
      1) Josam: 56010.
      2) J. R. Smith: 4023.
      3) Mifab: C1100R-1.
      4) Wade: W-6000.
      5) Watts Drainage: CO-200-R.
      6) Zurn: Z-1402.
3. Finished Wall:
   a. Approved Products:
      1) Josam: 58790.
      2) J. R. Smith: 4530.
      3) Mifab: C2462R-1.
      4) Wade: W8460R.
      5) Watts Drainage: CO-460-RD.
      6) Zurn: Z-1446.
4. General Purpose:
   a. Approved Products:
      1) Josam: 58900.
      2) J. R. Smith: 4100.
      3) Mifab: C1453.
      4) Wade: W8550A.
      5) Watts Drainage: CO-380.
      6) Zurn: Z-1440-4.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fixtures including traps and accessories with accessible stop or control valve in each hot and cold water branch supply line.

B. Mounting:
1. Urinals:
   a. Standard: 20 inches from floor to bottom lip.
   b. Handicap Accessible: 17 inches from floor to bottom lip.
   c. Install urinals using carriers.
2. Self-Supporting Lavatories: Install using carriers.

C. Make fixture floor connections with approved brand of cast iron floor flange, soldered or calked securely to waste pipe. Make joints between fixtures and floor flanges tight with approved fixture setting compound or gaskets. Calk between fixtures and wall and floor with sealant specified in Section 07920. Point edges.

3.2 CLEANING

A. Polish chrome finish at completion of Project.

END OF SECTION

SECTION 15416

DRINKING WATER COOLING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install drinking water cooling system units as described in Contract Documents.

B. Related Sections:
   1. Section 15051: General Mechanical Requirements.
   2. Section 15141: Potable Water Piping System.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Handicap Accessible Fountain:
   1. Include accessory fountain. Vandal proof operating bar on front and both sides. 7.8 GPH minimum of 50 deg F water with 90 deg F room temperature, 1/5 horsepower motor, 120 V, 60 Hz, single phase. Flexi-guard or chrome plated brass bubbler.
   2. Approved Manufacturers:
      a. Elkay
      b. Halsey
      c. OasisSunroc

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fixtures with accessible stop or control valve.

B. Mounting:
   1. Coordinate location of fountain with location and height of electrical outlet to ensure concealment of outlet by fountain.
   2. Anchor bottom of fountain to wall.
   3. Install 3/8 inch IPS union connection and Chicago No. 376 stop to building supply line.
   4. Install 1-1/4 inch IPS slip cast brass 'P' trap. Install trap so it is concealed.
   5. Top surfaces to be 32 inches floor unless required otherwise by local code.

3.2 CLEANING

A. Polish chrome finish at completion of Project.

END OF SECTION

SECTION 15481

GAS-FIRED WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install gas-fired storage type water heater as described in Contract Documents.

B. Related Sections:
   1. Section 15051: General Mechanical Requirements.
   2. Section 15141: Potable Water Piping System.

1.2 WARRANTY

A. Three-year on tank and one-year for parts.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Power Vented Water Heaters:
   1. Pressure tested and rated for 150 psi w.p. complete with thermostat, high limit control, gas pressure regulator, 100 percent safety shutoff and powered combustion air blower. AGA and CGA approved.
   2. Temperature and pressure relief valve sized to match heat input and set to relieve at 120 psi.
   3. 45 - 50 Gallon:
      a. Approved Products:
         1) Bradford White TW-50T-65-3N
         2) Equal by American, Rheem-Ruud or AO Smith.

2.2 ACCESSORIES

A. Anchoring Components:
   1. One inch by 18 ga galvanized steel straps.
   2. No. 10 by 2-1/2 inch screws.

B. Thermal Expansion Absorbers:
   1. Bladder type for use with potable water systems.
   2. Acceptable Products:
      a. Therm-X-Trol ST-12 by Amtrol.
      b. Equal as approved by Architect before bidding.

C. Vent Kit for sidewall venting:
   1. #239-39089-00A EPDM vent tubing for installation up to 8 ft. from outside wall.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install temperature-pressure relief valve on hot water heater and pipe discharge to directly above funnel of floor drain.

B. Anchor water heaters to wall using two anchoring straps and specified screws.

END OF SECTION

SECTION 15495

DOMESTIC WATER SOFTENERS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install automatic water softening system as described in Contract Documents.

B. Related Sections:
   1. Section 22 0501: Common Plumbing Requirements.

1.2 SYSTEM DESCRIPTION

A. Performance Requirements:
   1. Under actual operating conditions:
      a. Effluent shall contain zero grains of hardness as determined by soap test.
      b. Loss of mineral through attrition during first three years of operation shall not exceed 3 percent per year.
      c. Mineral shall not be washed out of system during service run or back washing period.
      d. Turbidity and color of effluent by reason of passing through softener system shall not be greater than incoming water.
   2. Softener Tanks:
      a. 100 psig working pressure.
      b. 150 psig test pressure.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: ASME rated and stamped tanks.

1.4 SYSTEM START-UP, OWNER'S INSTRUCTIONS

A. Secure services of competent supervising engineer from Water Softener Manufacturer to inspect complete installation, place water-softening system in operation, and acquaint Owner's operators with proper operation and care of equipment.

1.5 MAINTENANCE

A. Extra Materials: Water hardness testing set, complete with metal container for wall mounting and appropriate logbook.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Softener Tanks:
   1. 60 percent or more freeboard and:

a. Hot-dipped galvanized inside and out after fabrication.
b. Lining 7 mil epoxy approved by FDA for potable waters specified for 8 to 10 mil epoxy linings.

2. Lower distribution system shall consist of radial network of full-flow, non-clogging, individual strainers evenly spaced on tanks cross sectional area.

B. Brining System:
1. Capaci-Trol type with:
a. Dry salt storage compartment sufficient for at least four regenerations at full salting.
b. Saturated brine compartment.
c. Float operated plastic-fitted brine valve.
d. Allow for simple adjustment of salt dosage without removing brine valve.
e. Tank Options:
1) 3/16 inch thick epoxy coated steel tank.
2) 3/8 inch thick polyethylene tank with cover.

C. Main Operating Valve:
1. Automatic multi-port diaphragm type, slow opening and closing, and free of water hammer.
2. Valve seats shall be bronze.
3. Shaft shall be Monel metal.
4. Valve shall have soft-water sampling cock.
5. Valve shall be equipped with automatic self-adjusting brine injector to draw in brine and rinse at constant rate regardless of water pressure in range of 30 to 100 psig.

D. Zeolite: Approved type of high-capacity resinous polystyrene with supporting graded gravel bed 12 inches deep.

E. Piping:
1. Standard weight, galvanized steel.
2. Fittings of galvanized iron or malleable iron.

F. Controls:
1. Adjustable duration of regeneration steps and allow for PUSH-BUTTON start and complete manual operation.
2. Regeneration initiated by automatic reset water meter providing fully automatic operation.
3. Furnish electrical lockouts as required.
4. Electronic programmable type.

G. Pressure Gauges: Provide on inlet and outlet of main valve.

H. Miscellaneous Equipment:
1. Sampling cock for water supply to softener.
2. Fully automatic flow controls for backwash and flush, requiring no field adjustment.

I. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
1. Columbia Water Conditioning Systems, Div R&M, Lindon, UT www.columbia-water.com.
2. Culligan International, Northbrook, IL www.culligan.com.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Regeneration Sequence:
1. Backwash.
2. Brine.
3. Slow rinse.
4. Fast down-flow flush.

5. Return to service.

END OF SECTION

SECTION 15532

GAS-FIRED FURNACES

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install horizontal gas-fired condensing furnaces as described in Contract Documents.

B. Related Sections:
   1. Section 15051: General Mechanical Requirements.
   2. Section 15184: Refrigerant Piping System.
   3. Section 15196: Natural Gas Piping System.
   4. Section 15861: Air Filters.

1.2 SYSTEM DESCRIPTION

A. Performance Requirements: Rated at 90 percent minimum AFUE (Annual Fuel Utilization Efficiency) calculated in accordance with DOE test procedures.

1.3 SUBMITTALS

A. Quality Assurance / Control: Equipment check-out sheets.

1.4 WARRANTY

A. Provide 15-year minimum limited warranty on heat exchanger.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Furnaces:
   1. Factory assembled units certified by AGA complete with blower section, steel casing, piped, and wired.
   2. Blower section shall consist of cabinet, blower, and motor.
      a. Cabinet shall be of 22 ga minimum cold rolled steel and have finish coat of baked-on enamel.
      b. Blower shall be Class 1, full DIDW, statically and dynamically balanced.
   3. Automatic controls shall consist of:
      a. 100 percent cut-off safety pilot.
      b. Manual gas shut-off valve.
      c. Operating automatic gas valve.
      d. Solid-state type fan and thermal limit controls.
      e. 24-volt transformer.
      f. Electronic ignition system.
   4. Blower shall be driven by motor with adjustable pitch V-belt drive or by multi-speed direct driven motor.
   5. Furnace section shall be enclosed in 22 ga minimum enameled steel casing lined with foil covered insulation.

6. Heat Exchanger: Aluminized steel.
7. Gas Burners: Aluminized steel.
8. PVC intake of outside air and PVC combustion product exhaust, with sealed combustion, direct vent system.
9. Concentric roof termination kit for roof mounting.
10. Approved Products:
    a. Standard Furnaces:
        1) Carrier 58 MXA / Bryant 350 MAV.
        2) Lennox G51MP.
        3) Trane TUXC.
        4) York P3DH.

B. Cooling Coil:
1. Cooling coil shall consist of heavy gauge steel cabinet with baked-on enamel finish to match furnace.
    a. Coil shall have aluminum fins bonded to seamless copper tubing.
    b. Coil shall be ARI rated. Provide drain pans with connections at one end.
    c. Use thermal expansion valve with brazed joints in place of capillary tube metering device. Compression fittings not acceptable.
    d. Do not include cooling coil and coil cabinet on furnaces serving zones where cooling is not required.
2. Approved Products:
    a. Horizontal:
        1) Carrier / Bryant CK3B.
        2) Lennox CH23 or CH33.
        3) Trane TXC.
        4) York G1HA, G2FD.
    b. Vertical:
        1) Carrier / Bryant CK5A.
        2) Lennox C26.
        3) Trane TXC.
        4) York G1FA, G2FD.

2.2 ACCESSORIES

A. Build filter frame external to furnace as detailed on Drawings.

B. Vibration Isolators:
1. Horizontal Installation:
    a. Neoprene hanger type with load of 75 lbs maximum.
    b. Approved Products:
        1) RH by Kinetics Noise Control.
        2) HD by Mason Industries
        3) RH by Vibration Mounting & Controls

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install vibration isolator on each hanger rod supporting horizontal furnace and under each corner of vertical furnace.

3.2 FIELD QUALITY CONTROL

A. Manufacturer's Field Service:

1. Furnace distributor's technical service representative shall:
   a. Verify proper gas orifice size.
   b. Clock gas meter for rated input.
   c. Verify and set gas pressure at furnace.
   d. Check and measure temperature rise.
   e. Check safety controls for proper operation.
   f. Check combustion vent sizes and combustion air sizes.
2. In addition, furnace distributor's technical service representative shall start up, check out, and adjust furnaces using equipment check-out sheet provided by Manufacturer. Complete and sign all items on sheet.

END OF SECTION

SECTION 15543

GAS-FIRED UNIT HEATERS

PART 1 GENERAL

1.1 SUMMARY

A. Includes But Not Limited To
   1. Furnish and install gas-fired unit heaters as described in Contract Documents.

B. Related Sections
   1. Section 15051 - General Mechanical Requirements 15051
   2. Section 15196 - Gas piping systems

1.2 SUBMITTALS

A. Shop Drawings
   1. Show dimensions, weight loading, required clearances, and methods of assembly of components.
   2. Manufacturer's electrical requirements for power supply wiring for gas fired unit heaters.
      a. Manufacturer's ladder-type wiring diagram for interlock and control wiring
      b. Clearly differentiate between portions of wiring that are factory installed and portions to be field installed.

1.3 QUALITY ASSURANCE

A. Qualifications - Manufacturer shall have minimum three years field operating experience with gas fired unit heaters utilizing sealed flue product collection chambers.

B. Regulatory Requirements - Gas fired unit heaters shall be design certified by American Gas Association and bear AGA label.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

A. Unit Heater
   1. Propeller type designed for fuel use improvement of 25 percent through use of factor-installed power venter, sealed vent product collection chamber, and intermittent spark-ignited pilot as standard equipment.
   2. Provide with -
      a. 24 volt control transformer
      b. Single stage regulated combination redundant gas valve
      c. Intermittent spark pilot with electronic flame supervision and timed lockout.
      d. Limit and safety controls, including combustion air pressure switch to verify proper vent flow before allowing operation of gas valve.

B. Propeller Fan Models
   1. Equip each unit for use with natural gas and 120/1. volt power supply.
      a. Heat exchanger shall be equal to Reznor Thermocore design of aluminized steel.
      b. Die formed burners of aluminized steel. Include flared ports (burner air shutters) and stainless steel insert.
   2. Each unit shall have propeller fan, 120 volt motor with internal overloads, and

safety fan guard.

a. Horizontal louvers shall be provided for directing air flow.

b. Arrange unit for ceiling suspension with threaded hanger connections and provide with hanger kits.

c. Construct cabinet of cold-rolled steel and finish with

C. Approved Manufacturers

1. Modine Manufacturing Co, Racine, WI (800) 828-4328 or (262) 636-1200 www.modine.com
2. Reznor, Memphis, TN (800) 695-1901 or (901) 682-7766 www.tnb.com/mpd/
3. Equal by The Trane Co, La Crosse, WI (608) 787-2000

2.2 ACCESSORIES

A. Electrical Control System - Include high limit automatic fan control with 24 volt gas valve, transformer, 'summer-winter' changeover fan switch, and thermostat.

PART 3 EXECUTION

3.1 INSTALLATION

A. Conceal control wiring and conned in accordance with NEC. Locate thermostat and change over on wall at breathing level.

END OF SECTION

SECTION 15557

AIR PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install heating equipment exhaust piping and combustion air intake piping as described in Contract Documents.

B. Related Sections:
   1. Sections Under 09900 Heading: Painting.
   2. Section 15101: General Piping Requirements.

1.2 REFERENCES

A. American Society For Testing And Materials:
   1. ASTM D 1785-99, 'Standard Specification for Poly(Vinyl Chloride)(PVC) Plastic Pipe, Schedules 40, 80, and 120.'
   2. ASTM D 2564-96a, 'Standard Specification for Solvent Cements for Poly(Vinyl Chloride)(PVC) Plastic Piping Systems.'
   3. ASTM D 2661-97a, 'Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Drain, Waste, and Vent Pipe and Fittings.'
   4. ASTM D 2665-00, 'Standard Specification for Poly(Vinyl Chloride)(PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.'

PART 2 - PRODUCTS

2.1 MATERIALS

A. Air Piping: Schedule 40 pipe and fittings meeting requirements of ASTM D 1785, ASTM D 2661, or ASTM D 2665.

B. Piping Primer And Cement: Meet requirements of ASTM D 2564.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation For Condensing Furnaces:
   1. Run individual vent and individual combustion intake piping from each furnace to concentric roof termination kit provided by Furnace Manufacturer. Slope lines downward toward furnace.
   2. Slope combustion chamber drain downward to funnel drain. Anchor to wall with wall clamps, allowing free movement through clamp for expansion.
   3. Use concentric roof termination kit provided by Furnace Manufacturer. Install vent and combustion air intake piping at clearance and distances required by Furnace Manufacturer.
   4. Attach factory-supplied neoprene coupling to combustion-air inlet connection and secure with clamp.
   5. Ensure that factory-supplied perforated metal disc is installed in flexible coupling, unless its removal is required.

B. Support:
   1. Support concentric roof termination kit at ceiling or roof line with 20 ga sheet metal straps as detailed on Drawings.
   2. Support horizontal sections of pipe in accordance with requirements of Section 15101. Anchor securely to structure, not allowing pipe to sway.

END OF SECTION

SECTION 15671

AIR-COOLED REFRIGERANT CONDENSERS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install condensing units as described in Contract Documents.

B. Related Sections:
   1. Section 15051: Common HVAC Requirements.

1.2 SYSTEM DESCRIPTION

A. Performance Requirements: SEER rating as defined by ARI shall be:
   1. Units Less Than 6 Tons: 13.0 or greater

1.3 SUBMITTALS

A. Quality Assurance / Control:
   1. Equipment check-out sheets.

1.4 QUALITY ASSURANCE

A. Qualifications: Refrigerant piping shall be installed by refrigeration contractor licensed by State and by technicians certified in use of CFC and HCFC refrigerants.

B. Requirements of Regulatory Agencies: Each unit shall be UL / ULC labeled.

1.5 WARRANTY

A. Five-year warranty on compressors from date of 'start-up.' Record 'start-up' date on warranty certificate for each unit.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Condensing Units:
   1. General:
      a. Units shall be operable down to 0 deg F outdoor temperature when outside winter design temperature is below 35 deg F.
      b. Use R-410a refrigerant.
      c. Only one liquid line, one suction line, and one power connection shall be made to each compressor. Provide charging valves.
   2. Condenser Coils:

a. Aluminum plate fins mechanically bonded to seamless copper tubes or 'Spine Fin' trade mark system which has aluminum fins epoxy bonded to aluminum tubes.
b. Provide coil guard for unit.

3. Fans:
   a. Direct driven propeller upflow type.
   b. Fan motor shall be single or two speed, thermostatically controlled, permanently lubricated, and designed with permanent protection.
   c. Motors shall be resiliently mounted.
   d. Each fan shall have a safety guard.
4. Compressor:
   a. Each condenser unit shall have only one compressor.
   b. Hermetic design with following features:
      1) Externally mounted brass service valves with charging connections.
      2) Crankcase heater.
      3) Resilient rubber mounts.
      4) Compressor motor-overload protection.
      5) Single speed.
5. Controls:
   a. Factory wired and located in separate enclosure.
   b. Factory installed safety devices:
      1) High and low pressure cutout.
      2) Condenser fan motor-overload devices.
   c. Factory-installed anti-cycle timers to prevent units from starting up again for five minutes after any power interruption.
   d. Low ambient kit.
6. Casing:
   a. Fully weatherproof for outdoor installation. Finish shall be weather resistant.
   b. Openings shall be provided for power and refrigerant connections.
   c. Panels shall be removable for servicing.
7. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
   a. Furnace or Fan Coil / Boiler Systems:
      1) Carrier 24ACA3 / Bryant 123ANA.
      2) Trane 4TTR
      3) York CZB.

2.2 ACCESSORIES

A. Vibration Isolators: 4 inches square by 3/4 inch thick minimum neoprene type vibration isolation pads. (Do not use vibration Isolators with York model as per manufacturer requirements).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set condensing units level on concrete slab on vibration isolation pads located at each corner of unit.

3.2 FIELD QUALITY CONTROL

A. Manufacturer's Field Service:
   1. Condensing units shall be started up, checked out, and adjusted by Condensing Unit Manufacturer's authorized factory trained service mechanic.
   2. Use equipment checkout sheet provided by Manufacturer. Complete and sign all items on sheet.

END OF SECTION

SECTION 15725

EVAPORATIVE COOLERS

PART 1 GENERAL

1.1 SUMMARY

A. Includes But Not Limited To
   1. Furnish and install evaporative cooling units as described in Contract Documents.

B. Related Sections
   1. Section 15051 - General Mechanical Requirements

1.2 SYSTEM DESCRIPTION

A. Furnish and install evaporative coolers of the size, type and capacity listed. Units are to be complete with CELDEK evaporative cooling media, recirculation pump and water distribution, drain and fill, centrifugal fan and high efficiency motor.
   1. Cabinet to be constructed of hot dipped galvanized heavy gauge all welded steel with primer and finish baked enamel finish. Bottom pan to have multilayer protection against rust and corrosion.
   2. Unit to have balanced blower wheel with adjustable speed belt drive. Motors to be high efficiency type.

1.3 WARRANTY

A. 10 year warranty on cabinet covering leakage.
B. 2 year warranties on the pump and motor.
C. 5 year warranty on the CELdek evaporative media pad.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

A. Evaporative Cooler Units
   1. Units shall be completely factory assembled and tested. Units shall include following components and features -
      a. Single Inlet, side discharge blower section
      b. Separate wet section keeping blower assembly separated from water and cooling section.
      c. 8" Thick CELdek evaporative media Pad.
      d. 2 speed High efficiency blower motor of HP rating shown on drawings.
      e. Recirculation Pump with 3.2 GPM at 3 ft head minimum.
      f. Provide with 5 position switch for remote operation.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install units as shown on drawings and according to manufactures recommendations.

END OF SECTION

SECTION 15735
GAS FIRED RADIANT HEATERS

PART I- GENERAL

1.1 DESCRIPTION OF WORK

A. The work covered under this section consists of furnishing all materials, equipment and labor necessary to make the installation of the heat generating equipment, piping and specialties complete as indicated on the plans and as specified.

B. Types of heating system specified in this section include the following:

1. Natural Gas. Radiant Heaters.

PART II- PRODUCTS

2.1 RADIANT HEATERS

A. Approved Manufacturers:

1. Roberts-Gordan
2. Ambi-Rad
3. Superior Radiant
4. Detroit Radiant

B. General:

1. System shall be fired on Propane Gas.

2. System shall operate under negative pressure created by a vacuum pump. to preclude the possibility of gases escaping into the building.

3. System is to be the low intensity type to assure even heat distribution.

4. System shall operate in a non-condensing mode for standard efficiency.

5. System is to have aluminized or hot rolled steel combustion chambers and 4" aluminized steel pipe or hot rolled steel pipe.

6. A system shall consist of a number of burner units, utilizing one vacuum pump, radiant pipe. reflectors and a control system.

7. A building may require one or more of these systems as shown on the plans.

C. Standards.

1. The heating system shall be design certified by the American Gas Association and this per American National standards Z 83.6b ``Vented Infrared Radiant Heaters."

2. Combustion System: the combustion system will be the non-condensing type and the

system shall meet or exceed American National Standards for a radiant pipe, non-condensing appliances.

3. Each burner shall have a name plate affixed bears the seal of the American Gas Association.

5. The manufacturer, on the requests of the Engineer, will supply a copy of the current design certification to cover the entire system. Manufacturer must comply by not altering the approved design certification.

6. To assure safe operation, clearances to combustibles must not exceed those measured from the surface of the radiant pipe as follows and as recommended by manufacturer:

   a. Top (above piping): 4"
   b. Below (under piping): 60"
   c. Sides: 36"
   d. Sides: 12" with side deflector
   e. Test results must be listed in current AGA Directory.

D. Pre-mix, Burner Units:

1. Each burner shall consist of a burner head, pre-wired gas controls, transformer, direct spark ignition (DSI) or hot surface igniter (HSI).

2. Combustion chamber shall have factory installed sight ports on the side of the combustion chamber.

3. Design firing rates shall be as called out on the drawing schedule. To assure even heat distribution. BTU size shall not exceed the size indicated on the Contract Drawings. The system shall employ the proper number of firing units as indicated on the plans.

4. Outside Air: When specified, the system shall be capable of supplying air from the outside to each burner and end vent assembly in order to support combustion in contaminated environments.

E. Burner Control:

1. All burners shall be factory wired for 110 volts with transformer for 24 volt direct spark ignition (DSI) or hot surface igniter (HSI) operation and supplied with grounded 18" three-wire pigtail located at rear of the burner.

2. To assure a high degree of fail safe operation, the design shall preclude main flow of gas if any or all of the following abnormal conditions occur.

   a. Vacuum pump motor fails (vacuum proving switch cuts power to burners).

   b. Power Fails (gas valves in burners close in safe position).

   c. Gas Regulator

F. Radiant Tubing — Heat Exchanger:

1. Tubing in the radiant tube section shall be 16 gauge aluminized or hot rolled steel.

2. Tailpipe shall be 4" tubing aluminized or porcelain coated inside and out steel with a minimum construction of 16 gauge.

3. Hanging of the system must be in accordance with the AGA manufacturer recommendations, local codes and be to professional trade standards.

4. Tubing in the radiant pipe section must be secured with a stainless steel coupler. Tubing in the talepipe section must be secured with a 12" long stainless steel coupler that is lined for corrosion prevention. A pin in the coupler is required to assure each section of tubing is equally held in place. Short muffler type clamps are not acceptable means of fastening tube lengths.

H. Reflectors

1. Reflectors shall be of a highly reflective material (mirrored finish) such as aluminum with a minimum reflectivity of 0.91 (reference A.G.A. Research Bulletin #83 and Critical Table — Nat. Bureau of Standards).

2. Reflector shall provide continuous coverage over the entire system, from end burners up to the vacuum pump. All reflectors shall be overlapped a minimum of 9", with no gaps.

3. To assure a minimum of convection loss, reflector end caps and joint pieces shall be used at elbows and tees.

4. Reflectors shall be of the "deep dish" design, effectively "wrapping" three sides of the piping.

5. When indicated: reflector side extensions shall be installed and secured to both the reflectors with "Z" Clips, and to piping with support brackets. Tilting of reflectors is not an acceptable alternative.

I. Vacuum Pump:

1. The system shall vent all products of combustion by means of a vacuum pump.

2. Vacuum pump shall be equipped with a 3/4 HP, 60 Hz 120 Volt 3450 RPM, 1 phase motor. This motor shall have thermal overload protection: and sealed ball bearings. Motor must have the same rotation as indicated on the fan scroll.

3. The scroll of the pump shall be cast iron or cast aluminum with a minimum thickness of 3/16 inch. The impeller wheel shall be cast 319 alloy aluminum with a minimum metal thickness of 3.32 inch. The scroll shall discharge in the vertical direction with a non-restrictive weather cap installed exterior of the building.

4. There shall be a low voltage (24 volt) two-wire circuit from the vacuum proving switch (located at the inlet of the vacuum pump) to the thermostat.

5. To further assure a high degree of safety, the system will be under negative pressure at all times during operation to preclude the possibility of the escape of combustion gases into the building.

J. System Controls:

1. All control circuits must be properly polarized. All burner units located on one radiant branch must be on the same zone. All burner units using the same tail pipe branch must also be on the same zone.

2. All vacuum pumps shall be provided with a vacuum proving switch to prevent opening of the gas valves until a vacuum in the pipe is established.

K. Warranty/Performance & Prior Approval Requirements:

1. The entire system shall have a minimum of a three year warranty on ALL components.

2. All warranties must be submitted, in writing, from the manufacturer.

PART III — EXECUTION 3.1

EQUIPMENT

A. Install all equipment in strict accordance with manufacturers recommendation, local codes and ordinances and installation standards.

B. Verify all equipment is installed with proper clearances around units to provide easy maintenance, service and repair.

C. Verify all electrical characteristics of equipment with manufacturer to make certain all wiring is in accordance with the national electric Code and coordinate size of motor loads and power service requirements with electrical contractor.

END OF SECTION

SECTION 15801

GENERAL DUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. General procedures and requirements for ductwork.
   2. Repair leaks in ductwork, as identified by smoke test, at no additional cost to Owner.

B. Products Installed But Not Supplied Under This Section:
   1. Seismic Restraints.

C. Related Sections:
   1. Section 13352: Air test and balance and smoke testing of ductwork.
   2. Section 15051: General Mechanical Requirements.

1.2 SUBMITTALS

A. Quality Assurance / Control:
   1. Manufacturer's installation manuals providing detailed instructions on assembly, joint sealing, and system pressure testing for leaks.
   2. Specification data on sealer and gauze proposed for sealing ductwork.

1.3 QUALITY ASSURANCE

A. Requirements: Construction details not specifically called out in Contract Documents shall conform to applicable requirements of SMACNA HVAC Duct Construction Standards.

PART 2 - PRODUCTS

A. Finishes. Where Applicable: Colors as selected by Architect.

B. Duct Hangers:
   1. One inch by 22 ga 1 galvanized steel straps or steel rods as shown on Drawings, and spaced not more than 96 inches apart. Do not use wire hangers.
   2. Attaching screws at trusses shall be 2 inch No. 10 round head wood screws. Nails not allowed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. During installation, protect open ends of ducts by covering with plastic sheet tied in place to prevent entrance of debris and dirt.

B. Make necessary allowances and provisions in installation of sheet metal ducts for structural conditions of building. Revisions in layout and configuration may be allowed, with prior written approval of Architect. Maintain required airflows in suggesting revisions.

C. Hangers And Supports:

1. Install pair of hangers close to each transverse joint and elsewhere as required by spacing indicated in table on Drawings.
2. Install upper ends of hanger securely to floor or roof construction above by method shown on Drawings.
3. Attach strap hangers to ducts with cadmium-plated screws. Use of pop rivets or other means will not be accepted.
4. Where hangers are secured to forms before concrete slabs are poured, cut off flush all nails, strap ends, and other projections after forms are removed.
5. Secure vertical ducts passing through floors by extending bracing angles to rest firmly on floors without loose blocking or shimming. Support vertical ducts, which do not pass through floors, by using bands bolted to walls, columns, etc. Size, spacing, and method of attachment to vertical ducts shall be same as specified for hanger bands on horizontal ducts.

3.2 CLEANING

A. Clean interior of duct systems before final completion.

END OF SECTION

SECTION 15812

LOW-PRESSURE STEEL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install above-grade low-pressure steel ducts and related items as described in Contract Documents.

B. Products Installed But Not Furnished Under This Section:
   1. Duct smoke detectors.

C. Related Sections:
   1. Section 13352: Smoke testing.
   2. Section 15081: Thermal Insulation for ducts, plenum chambers, and casings.
   3. Section 15801: General Duct Requirements.
   4. Section 15915: Temperature control damper actuators and actuator linkages.

1.2 REFERENCES

A. American Society For Testing And Materials:
   1. ASTM A 653-00, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.'

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Sheet Metal:
   1. Fabricate ducts, plenum chambers and casings of zinc-coated, lock-forming quality steel sheets meeting requirements of ASTM A 653, with G 60 coating.

B. Ducts:
   1. Round Duct:
      a. Spiral Seam: 28 ga minimum for ducts up to and including 14 inches in diameter.
      b. Longitudinal Seam:
         1) 28 ga minimum for ducts up to and including 8 inches in diameter.
         2) 26 ga minimum for ducts over 8 inches and up to 14 inches in diameter.

C. Duct Sealer For Interior Ducts:
   1. Approved Products:
      a. Duct Butter or Butter Tak by Cain Manufacturing Co Inc, Pelham, AL (800) 554-0342 or (205) 663-2200. www.cainmfg.com
      b. DP 1010 by Design Polymerics, Fountain Valley, CA (800) 641-0808 or (714) 432-0600. www.designpoly.com
      c. S2 by Duro Dyne, Farmingdale, NY (800) 899-3876 or (516) 249-9000 www.durodyne.com.
      d. Versa Grip 102 by Hardcast Inc, Wylie, TX (800) 527-7092 or (972) 442-6545. www.hardcast.com
      e. 15-325 by Kingco, King Adhesive Corp, St Louis, MO (800) 233-8171 or (314) 772-9953.
      f. 44-41 by Mon-Eco Industries Inc, East Brunswick, NJ (800) 899-6326 or (908) 257-7942.
      g. Airseal #11 by Polymer Adhesive Sealant Systems Inc, Irving, TX (888) 721-7325.

h. Multipurpose Duct Sealant by Trans-Continental Equipment Co.
i. Water Base Duct Sealer by United McGill Corp. Columbus, OH (800) 624-5535 or (614) 836-9981. www.unitedmcgillcorp.com

D. Duct Sealer For Exterior Ducts:
1. Approved Products:
a. Hardcast Tape and RTA-50 adhesive by Hardcast Inc, Wylie, TX (800) 527-7092 or (972) 442-6545. www.hardcast.com

2.2 FABRICATION

A. Ducts:
1. Straight and smooth on inside with joints neatly finished.
2. Ducts shall be large enough to accommodate inside acoustic duct liner. Dimensions shown on Drawings are net clear inside dimensions after duct liner has been installed.
3. Duct panels having acoustic duct liner need not be cross-broken or beaded.
a. Apply cross-breaking to sheet metal between standing seams or reinforcing angles.
b. Center of cross-break shall be of required height to assure surfaces being rigid.
4. Duct drops to diffusers shall be round, square, or rectangular to accommodate diffuser neck. Drops shall be same gauge as branch duct.
a. Seal joints air tight.
b. Externally insulate round drops.
c. Internally line square and rectangular drops.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Interface With Other Work: Reseal transverse joint duct leaks and seal longitudinal duct joint leaks discovered during air test and balance procedures specified in Section 13352, at no additional cost to Owner.

B. Install internal ends of slip joints in direction of flow. Seal transverse and longitudinal joints air tight using specified duct sealer.

C. Securely anchor ducts and plenums to building structure with specified duct hangers attached with screws. Do not hang more than one duct from a duct hanger. Brace and install ducts so they shall be free of vibration under all conditions of operation.

D. Ducts shall not bear on top of structural members.

E. Paint ductwork visible through registers, grilles, and diffusers flat black.

F. Under no conditions will pipes, rods, or wires be allowed to penetrate ducts.

END OF SECTION

SECTION 15815

NON-METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install supply air branch duct runouts to diffusers as described in Contract Documents.

B. Related Sections:
   1. Section 15801: General Duct Requirements.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Ducts:
   1. Formable, flexible, circular duct which shall retain its cross-section, shape, rigidity, and shall not restrict airflow after bending.
   2. Insulation: Nominal 1-1/2 inches, 3/4 lb/cu ft density fiberglass insulation with air-tight, polyethylene or polyester core, sheathed in seamless vapor barrier jacket factory installed over flexible assembly.
   3. Assembly, including insulation and vapor barrier, shall meet Class I requirement of NFPA 90A-1989 and be UL 181 rated, with flame spread of 25 or less and smoke developed rating of 50 or under.
   4. Approved Products:
      a. ANCO-FLEX 4625 by Anco Products Inc. Elkhart, IN (800) 837-2626 or (574) 213-5574. www.ancoproductsinc.com
      b. PF/UPC #090 by Flex-Aire.
      c. RJ-30 by Flexible Air Movers Inc.
      d. M-KC by Thermaflex by Flexible Technologies, Abbeville, SC (864) 459-5441. www.wereflexible.com
      e. Type 4m Insulated by Flexmaster USA Inc. Houston, TX (713) 462-7694 www.flexmasterusa.com or Flexmaster Canada, Ltd, Richmond Hill, ON (905) 731-9411.

B. Cinch Bands: Nylon, 3/8 inch removable and reusable type.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct in fully extended condition free of sags and kinks, using 72 inch maximum lengths.

B. Make duct connections by coating exterior of duct collar for 3 inches with duct sealer and securing duct in place over sheet metal collar with specified cinch bands.

END OF SECTION

SECTION 15820

DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install duct accessories in specified ductwork as described in Contract Documents.

B. Related Sections:
   1. Section 15801: General Duct Requirements.
   2. Section 15915: Temperature control damper actuators and actuator linkages.

1.2 REFERENCES

A. American Society for Testing and Materials:
   1. ASTM A 653-00, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.'
   2. ASTM C 665-98, 'Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.'
   3. ASTM C 1071-00, 'Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Acoustical Material).'

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Acoustical Liner System:
   1. Duct Liner:
      a. One inch thick, 1-1/2 lb density fiberglass conforming to requirements of ASTM C 1071. Liner will not support microbial growth when tested in accordance with ASTM C 665.
      b. Approved Products:
         1) Ultralite or ToughGard by CertainTeed.
         2) Duct Liner E-M by Knauf Fiber Glass.
         3) Akousti-Liner by Manson Insulation.
         4) Aeroflex Plus by Owens Corning.
         5) Linacoustic by Johns-Manville.
   2. Adhesive:
      a. Approved Water-Based Products:
         1) Cain: Hydrotak.
         2) Design Polymerics: DP2501 or DP2502 (CMCL-2501).
         3) Duro Dyne: WSA.
         4) Hardcast: IA-901, 925, 921.
         5) Kingco: 10-568.
         6) Miracle: PF-101.
         7) Mon-Eco: 22-67 or 22-76.
         8) Polymer Adhesive: Glasstack #35.
         9) Techno Adhesive: 133.
         10) United McGill: Uni-tack.
      b. Approved Solvent-Based (non-flammable) Products:
         1) Cain: Safetak.
         2) Duro Dyne: FPG.

3) Hardcast: Glas-Grip 648-NFSE, 658.
4) Kingco: 15-137.
5) Miracle: PF-91.
6) Mon-Eco: 22-24.
7) Polymer Adhesive: Q-Tack.
8) Techno Adhesive: 'Non-Flam' 106.

c. Approved Solvent-Based (flammable) Products:
1) Cain: HV200.
2) Duro Dyne: MPG.
3) Hardcast: Glas-Grip 636-SE.
4) Kingco: 15-146.
5) Miracle: PF-96.
6) Mon-Eco: 22-22.
7) Polymer Adhesive: R-Tack.
8) Techno Adhesive: 'Flammable' 106.

3. Fasteners:
a. Adhesively secured fasteners not allowed.
b. Approved Products:
1) AGM Industries Inc: 'DynaPoint' Series RP-9 pin.
2) Cain.
3) Duro Dyne.
4) Dyn Air: DWT or FWT
5) Omark dished head 'Insul-Pins.'
6) Gripnails may be used if each nail is installed by 'Grip Nail Air Hammer' or by 'Automatic Fastener Equipment' in accordance with Manufacturer's recommendations.

B. Flexible Equipment Connections:
1. 30 oz closely woven UL approved glass fabric, double coated with neoprene.
2. Fire retardant, waterproof, air-tight, resistant to acids and grease, and withstand constant temperatures of 250 deg F.
3. Approved Products:
a. Cain: N-100.
b. Duro Dyne: MFN.
c. Dyn Air: CPN with G-90 galvanized off-set seam
d. Elgen: ZLN.
e. Ventfabrics: Ventglas.
f. Ductmate: ProFlex.

C. Duct Access Doors:
1. Factory built insulated access door with hinges and sash locks. Construction shall be galvanized sheet metal. 24 ga minimum.
2. Fire and smoke damper access doors shall have minimum clear opening of 12 inches square or larger as shown on Drawings.
3. Approved Products:
a. Air Balance: Fire/Seal FSA 100.
b. Air-Rite: Model HAD-2.
c. Cesco: HDD.
d. Flexmaster: Spin Door.
e. Kees Inc: ADH-D.
f. Nailor: 085H-01.
g. Pottorff: 60-HAD.
h. Ruskin: ADH-24.

D. Dampers And Damper Accessories:
1. Locking Quadrant Damper Regulators.
a. Approved Products:
1) Duro Dyne: KS-38.
2) Dyn Air: QPS-385
3) Ventfabrics: Ventline 555.

4) Young: No. 1.

2. Volume Dampers:
   a. Factory-manufactured 16 ga galvanized steel, single blade and opposed blade type with 3/8 inch axles and end bearings. Blade width 8 inches maximum. Blades shall have 1/8 inch clearance all around.
      1) Damper shall operate within acoustical duct liner.
      2) Provide channel spacer equal to thickness of duct liner.
   b. Dampers above removable ceiling and in Mechanical Rooms shall have locking quadrant on bottom or side of duct. Otherwise, furnish with concealed ceiling damper regulator and cover plate.
   c. Approved Products:
      1) Air-Rite: Model CD-2.
      2) American Warming: VC-2-AA.
      3) Arrow: OBDAF-207.
      4) C & S: AC40.
      5) Cesco: AGO.
      6) Daniel: CD-OB.
      7) Greenheck: VCD-20.
      8) Pottorff: CD-42.
      9) Ruskin: MD-35.
      10) UTEMP: CD-OB.
3. Motorized Outside Air Dampers:
   a. Low leakage type. AMCA certified.
   b. Damper Blades:
      1) Steel or aluminum airfoil type with mechanically locked blade seals, 8 inch blade width maximum measured perpendicular to axis of damper.
      2) Jamb seals shall be flexible metal compression type.
      3) Opposed or single blade type.
   c. Make provision for damper actuators and actuator linkages to be mounted external of air flow.
   d. Approved Products:
      1) Air Balance: AC 526.
      2) American Warming: AC526.
      3) Arrow: AFD-20.
      4) C & S: AC50.
      5) Cesco: AGO3.
      6) Honeywell: D-643.
      7) Pottorff: CD-52.
      8) Ruskin: CD-60.

E. Air Turns:
   1. Single thickness vanes. Double thickness vanes not acceptable.
   2. 4-1/2 inch wide vane rail. Junior vane rail not acceptable.

F. Branch Tap for Flexible Ductwork:
   1. Factory-manufactured rectangular-to-round 45 degree leading tap fabricated of 24 ga zinc-coated lock-forming quality steel sheets meeting requirements of ASTM A 653, with G-90 coating.
   2. One inch wide mounting flange with die formed corner clips, pre-punched mounting holes, and adhesive coated gasket.
   3. Manual Volume Damper:
      a. Single blade, 22 ga minimum
      b. 3/8 inch minimum square rod with brass damper bearings at each end.
      c. Heavy-duty locking quadrant on 1-1/2 inch high stand-off mounting bracket attached to side of round duct.
   4. Approved Products:
      a. ST-1HD by Air-Rite.
      b. STO by Flexmaster.
      c. HET by Sheet Metal Connectors.

2.2 FABRICATION

A. Duct Liner:
   1. Install mat finish surface on air stream side. Secure insulation to cleaned sheet metal duct with continuous 100 percent coat of adhesive and with 3/4 inch 19 mm long mechanical fasteners 12 inches 300 mm on center maximum unless detailed otherwise on Drawings. Pin all duct liner.
   2. Accurately cut liner and thoroughly coat ends with adhesive. Butt joints tightly. Top and bottom sections of insulation shall overlap sides. If liner is all one piece, folded corners shall be tight against metal. Ends shall butt tightly together.
   3. Coat longitudinal and transverse edges of liner with adhesive.

B. Air Turns:
   1. Permanently install vanes arranged to permit air to make abrupt turn without appreciable turbulence, in 90 degree elbows of above ground supply and return ductwork.
   2. Quiet and free from vibration when system is in operation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Duct Liner:
   1. Furnish and install acoustic lining in following types of ducts:
      a. Supply air.
      b. Return air.
      c. Mixed air.
      d. Exhaust air.
      e. Elbows, fittings, and diffuser drops greater than 12 inches in length.

B. Flexible Connections: Install flexible inlet and outlet duct connections to each furnace.

C. Access Doors In Ducts:
   1. Install at each manual outside air damper and at each motorized damper. Locate doors within 6 inches of installed dampers.
   2. Install within 6 inches of fire dampers and in Mechanical Room if possible. Install on side of duct that allows easiest access to damper.

D. Dampers And Damper Accessories:
   1. Install concealed ceiling damper regulators.
      a. Paint cover plates to match ceiling tile.
      b. Do not install damper regulators for dampers located directly above removable ceilings or in Mechanical Rooms.
   2. Provide each take-off with an adjustable volume damper to balance that branch.
      a. Anchor dampers securely to duct.
      b. Install dampers in main ducts within insulation.
      c. Dampers in branch ducts shall fit against sheet metal walls, bottom and top of duct, and be securely fastened. Cut duct liner to allow damper to fit against sheet metal.
      d. Where concealed ceiling damper regulators are installed, provide cover plate.
   3. Install motorized dampers.

END OF SECTION

SECTION 15826

FIRE AND SMOKE DAMPERS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install fire and smoke dampers described in Contract Documents.

B. Related Sections:
   1. Section 15801: General Duct Requirements.

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
   1. Dampers shall conform to NFPA and SMACNA requirements and bear UL label.
   2. Dampers shall be approved by fire authorities having jurisdiction where so required.
   3. Wall and floor fire dampers shall conform to UL 555 'Fire Damper Test Standard.'
   4. Ceiling fire dampers shall conform to UL 555C 'Ceiling Damper Test Standard.'
   5. Smoke Dampers shall conform to UL 555S 'Leakage Rated Damper Test Standard.'
   6. Combination fire / smoke dampers shall conform to UL 555 'Fire Damper Test Standard' and to UL 555S 'Leakage Rated Damper Test Standard.'

1.3 MAINTENANCE

A. Extra Materials: Leave six fusible links of each rating type used on Project with Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Fire Dampers:
   1. Walls And Floors (Type 1):
      a. Type 'B.'
      b. Approved Products:
         1) Air Balance: Model 119BLX.
         2) Cesco: Model 15SB.
         3) Greenheck: Model FD150XB.
         4) Pottorff: Model VFD-10 ISB, D-ISB.
         5) Ruskin: Model IBD20B.
         6) Safe-Air: Model 150B Sleeved.

2.2 FABRICATION

A. General:
   1. 16 ga frames.
   2. Integral sleeves, except for Type 2 Fire Dampers.

B. Type 1 Dampers: Fabricate with blades out of airstream.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Placement:
   1. Fire Dampers): Install in ducts where ducts penetrate fire-rated walls and floors and at registers, grilles, and diffusers penetrating fire rated assemblies.

B. Sequences of Operation:
   1. Dampers shall close when temperatures at damper exceed 165 deg F link unless indicated otherwise on Drawings.

END OF SECTION

SECTION 15836

EXHAUST FANS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install exhaust fans as described in Contract Documents.

B. Related Sections:
   1. Section 15801: General Duct Requirements.
   2. Division 16: Control device and electrical connection.

1.2 QUALITY ASSURANCES

A. Requirements of Regulatory Agencies: Bear AMCA seal and UL label.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Ceiling Mounted Exhaust Fans:
   1. Acoustically insulated housings. Sound level rating of 4.6 sones maximum for fan RPM and CFM listed on Drawings.
   2. Include chatterproof integral back-draft damper with no metal-to-metal contact.
   3. True centrifugal wheels.
   4. Entire fan, motor, and wheel assembly shall be easily removable without disturbing housing.
   5. Suitably ground motors and mount on rubber-in shear vibration isolators.
   6. Provide wall or roof cap, as required.
   7. Quality Standards: Greenheck SP or Penn Zephyr.
   8. Approved Manufacturers:
      a. Acme.
      b. Breidert.
      c. Broan.
      d. Carnes.
      e. Cook-Gemini.
      f. Greenheck.
      g. Penn.

B. General Exhaust Propeller Fans:
   1. Belt Driven sidewall Propeller fan
   2. Propeller shall be six blade, die formed, galvanized steel.
   3. Fan panels shall be heavy gauge galvanized steel.
   4. Bearing shall be pre-lubricated permanently sealed.
   5. Motors shall be mounted on adjustable slide base for belt tensioning.
   6. Provide wall box with guard
   7. Provide automatic gravity damper with felt edges and blades linked.
   8. Quality Standards: Carnes model LABA.
   9. Approved Manufacturers:
      a. Carnes.
      b. Cook
      c. Greenheck

PART 3 - EXECUTION

3.1 INSTALLATION

A. Anchor fan units securely to structure.

END OF SECTION

SECTION 15851

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install diffusers, registers, and grilles connected to ductwork as described in Contract Documents.

B. Related Sections:
   1. Section 15801: General Duct Requirements.

1.2 MAINTENANCE

A. Extra Materials: Leave tool for removing core of each different type of grille for building custodian.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Evaporative cooler Supply Grilles Registers:
   1. Finish: Off-white baked enamel.
   2. Quality Standard: Titus: 301 FS
   3. Approved Manufacturers:
      a. Titus.
      b. Carnes.
      c. J & J.
      d. Krueger.
      e. Metal*Aire.
      f. Nailor: .
      g. Price: .
      h. Tuttle & Bailey.

B. Ceiling Return Grilles:
   1. Finish: Off-white baked enamel.
   2. 1/2 inch spacing.
   3. Approved Products:
      a. Carnes: RSLA.
      b. J & J: S90H.
      c. Krueger: S85H.
      d. Metal*Aire: SRLL.
      e. Nailor: S155H.
      f. Price: 535.
      g. Titus: 355RL or 355 SL.
      h. Tuttle & Bailey: T70D.

C. Ceiling Diffusers:
   1. Finish: Off-white baked enamel.
   2. Approved Products:
      a. Carnes: SKSA.
      b. J & J: R-1400.

c. Krueger: SH.
d. Metal*Aire: 5500S.
e. Nailor: 5500B.
f. Price: SMD-6.
g. Titus: TDC-6.
h. Tuttle & Bailey: MS.

3.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Anchor securely into openings. Secure frames to ductwork by using four sheet metal screws, one per side.

END OF SECTION

SECTION 15853

ROOF-MOUNTED AIR INLETS AND OUTLETS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install roof vents as described in Contract Documents.

B. Related Sections:
   1. Section 15801: General Duct Requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Louvered Penthouses:
   1. Fabricated from 12 ga extruded aluminum.
      a. All welded construction.
      b. Screws or rivets will not be allowed.
   2. Blades:
      a. Horizontal at 45 degree angle with return bends at upper edges.
      b. Welded, mitered corners for continuous blade effect.
   3. Bird Screens: 1/2 inch square mesh 16 ga aluminum in extruded aluminum, rewirable frames on interior of louvers.
   4. Penthouse Finish: Clear anodized aluminum.
   5. Curbs:
      a. Extruded aluminum, insulated, factory-fabricated curb.
      b. Insulation: Minimum 1-1/2 inch thick, 3 lb m density fiber glass.
      c. Curb Extension: 8 inches above finished roof level.
   6. Provide automatic back draft damper on Relief Air Penthouses. Provide motorized damper where indicated on Drawings.
   7. Approved Products:
      a. Carnes: GLAB.
      b. Cook: Type TRE.
      c. Jenn-Aire: Model MPH.
      d. Vent Products: Model 7100.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 15854

LOUVERS AND VENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install louvers connected to ductwork as described in Contract Documents.

B. Products Supplied But Not Installed Under This Section:
   1. Architectural louvers not connected to ductwork.

C. Related Sections:
   1. Section 06201: Installation of architectural louvers not connected to ductwork.
   2. Section 15801: General Duct Requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Louvers:
   1. General:
      a. Extruded aluminum, with blades welded or screwed into frames.
      b. Frames shall have mitered corners.
      c. Louvers shall be recessed, flanged, stationary, or removable as noted on Drawings.
      d. Finish:
         1) Polyvinyledene Fluoride (PVF_2) Resin-base finish (Kynar 500 or Hylar 5000) containing 70 percent minimum PVF_2 in resin portion of formula. Thermo-cured two coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
         2) Color as selected by Architect from Manufacturer's standard colors.
   2. Louvers Connected To Ductwork:
      a. 1/2 inch mesh 16 ga aluminum bird screen.
      b. Approved Products:
         1) L-10SLXKB45 by Air Control Products.
         2) K638 by Airolite.
         3) LE48 by American Warming & Ventilating.
         4) EA-405 by Arrow United Industries.
         5) FKDA by Carnes.
         6) X4K4 by Cesco.
         7) 455-XP-S by Industrial Louvers.
         8) ELF81S30 by Ruskin.
         9) 2740 31 by Vent Products.
         10) EX-WPL by Wonder Metals.Architectural Louvers:
      a. Aluminum bug screen.
      b. Approved Products:
         1) T608 by Airolite.
         2) LE57 by American Warming & Ventilating.
         3) Equals by Air Control Products, Arrow United Industries, Carnes, or Industrial Louvers as approved by Architect before installation. See Section 01600.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Anchor securely into openings.

B. Where louvers touch masonry or dissimilar metals, protect with heavy coat of asphaltum paint.

END OF SECTION

SECTION 15861

AIR FILTERS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install filters used in mechanical equipment.

B. Related Sections:
   1. Section 15801: General Duct Requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Furnace Filters: One inch thick throw-away type as recommended by Furnace Manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide ample access for filter removal.

3.2 FIELD QUALITY CONTROL

A. Inspection: At date of Substantial Completion, air filters shall be new, clean, and approved by Owner's representative.

END OF SECTION

SECTION 15915

ELECTRIC AND ELECTRONIC CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install automatic temperature control system as described in Contract Documents.
   2. Furnish and install conductors and make connections to control devices, motors, and associated equipment.
   3. Assist in air test and balance procedure.

B. Related Sections:
   1. Section 13352: Air test and balance.
   2. Section 15051: General Mechanical Requirements.
   3. Section 15820: Furnishing and installing of temperature control dampers.
   4. Division 16:
      a. Furnishing and installing of raceway, conduit, and junction boxes, including pull wires, for temperature control system except as noted above.
      b. Power wiring to magnetic starters, disconnect switches, and motors.
      c. Motor starters and disconnect switches, unless integral with packaged equipment.

1.2 SYSTEM DESCRIPTION

A. Design Criteria: Stand alone Zone thermostats.

B. Performance Criteria: Install low voltage electrical wiring in accordance with Division 16 of these Specifications.

1.3 SUBMITTALS

A. Provide shop drawings and equipment cut sheets for all temperature control equipment
   1. Distributor and have available on Project site when work of this Section is being performed.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Room Thermostats:
   1. Programable Thermostats:
      a. Low voltage type provided with automatic change over feature for both heating and cooling stages, seven-day program with two starts and stops per day, and provisions for damper operators.
      b. Approved Manfuacturers:
         1) Honeywell
         2) Robertshaw
         3) Maple Chase
         4) Others as approved prior to bidding.
   2. Non-Programmable Thermostat:
      a. Low voltage type.
      b. ApprovedMaufacturers:

1) Honeywell.
2) Robertshaw
3) Maple Chase
4) Others as approved prior to bidding.

3. Evaporative Cooler Control:
   a. Provide standard 5 position switch for control of each evaporative cooler independently .

B. Damper Actuators:
   1. Electric type equipped for Class I wiring.
   2. Shall not consume power during UNOCCUPIED cycle or use chemicals or expandable media.
   3. Have built in spring return.
   4. Approved Product:
      a. Honeywell S0524-2POS. Also shown as MS8105 1008
      b. Honeywell S0524-2POS-SW2 w/ Auxiliary switches.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Interface With Other Work:
   1. Calibrate room thermostats as required during air test and balance.
   2. Instruct air test and balance personnel in proper use and setting of control system components.

B. Mount damper actuators and actuator linkages external of airflow. Make certain dampers operate freely without binding or with actuator housing moving.

C. Sequence of Control:
   1. Programmable thermostat shall control unoccupied and occupied status of fan system based on adjustable seven day program and remote room sensor **/** push button. Fan shall run continuously in occupied mode and cycle in unoccupied mode.
   2. Adjustable heating and cooling set points shall control space temperature by activating either heating or cooling equipment. Programmable thermostat provides automatic change over between heating and cooling.
   3. Minimum outside air damper, spring return type, shall open in occupied mode and remain closed in unoccupied mode in zones using outside air.
   4. Evaporative coolers shall control by 5 position switch with pump only, low and high fan and low and high cool positions. When either equipment bay evaporative coolers are energized, louver L-4 damper is to open and close when evaporative coolers are off.

3.2 FIELD QUALITY CONTROL

A. Manufacturer's Field Service:
   1. Calibrate, adjust, and set controls for proper operation, operate systems, and be prepared to prove operation of any part of control system. This work is to be completed before pre-substantial completion inspection.
      a. Test each individual heating, cooling, and damper control for proper operation using control system.

3.3 ADJUSTING

A. Program minimum of one day-s operation into thermostat's memory function.

END OF SECTION

TABLE OF CONTENTS

DIVISION 16 - ELECTRICAL

16050	GENERAL ELECTRICAL REQUIREMENTS
16060	GROUNDING AND BONDING
16070	HANGERS AND SUPPORTS
16075	ELECTRICAL IDENTIFICATION
16121	HEATING CABLES
16123	BUILDING WIRE AND CABLE
16131	CONDUIT
16138	BOXES
16140	WIRING DEVICES
16155	EQUIPMENT WIRING
16210	ELECTRICAL UTILITY SERVICES
16412	ENCLOSED SWITCHES
16413	ENCLOSED TRANSFER SWITCHES
16414	REMOTE CONTROL SWITCHING DEVICES
16423	ENCLOSED MOTOR CONTROLLERS
16426	ENCLOSED CONTACTORS
16443	PANELBOARDS
16510	INTERIOR LUMINAIRES
16710	STRUCTURED TELECOMMUNICATIONS CABLING AND ENCLOSURES

SECTION 16050 - GENERAL ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Provide labor, materials, and equipment necessary for completion of work of this Division as described in Contract Documents.

1.2 RELATED SECTIONS

A. General Conditions and Division 01 apply to this Section

1.3 SUBMITTALS

A. As-Built Drawings
1. Provide complete set with all changes made to original drawings. Provide CADD files as well as mylar prints. Hand-drawn changes are not acceptable.
2. Product Data
a. Submit for the following:
1) Wiring devices
2) Disconnects
3) Panelboards
4) Motor Starters
5) Lighting fixtures, poles, and associated control equipment
6) Emergency lighting packs
7) Fire alarm & detection equipment
8) Voice & data cabling & termination equipment
b. Provide the following information for each item of equipment:
1) Catalog sheets
2) Assembly details of dimension drawings
3) Installation instructions
4) Manufacturer's name and catalog number
5) Name of local supplier
6) Name of electrical contractor
3. Operation & Maintenance Manual
a. Provide two copies of Operation and Maintenance Manuals.
1) Binder - Loose-leaf type with hard cover. Title on outside of front cover and on spine.
2) Title Page - List the following information
(a) Name of Project
(b) Date Project Completed
(c) Name and Address of Architect, Electrical Engineer, General Contractor, Electrical Contractor, and Suppliers.
3) Table of Contents -
(a) List equipment in order that it appears in Binder.
4) Dividers -
(a) Provide one divider with tab for each type of equipment listed in Table of Contents. Properly label tabs.
5) Equipment Information - Provide following information for each item of equipment
(a) Catalog Sheets.
(b) Assembly details or dimension drawings.
(c) Installation, operating, and maintenance instructions.
(d) manufacturer's name and catalog number
(e) Name of local supplier.
6) Furnish such information for following equipment and arrange as listed -
(a) Disconnect Switches.

(b) Wiring Devices.
(c) Lighting Fixtures.
(d) Panelboards
(e) Safety Switches
(f) Communications systems equipment
(g) Security and surveillance system
(h) Emergency Battery Packs

1.4 REQUIREMENTS OF REGULATORY AGENCIES

A. Furnish UL listed equipment where such label is available. Install in conformance with UL standards where applicable.

B. Install electrical work in accordance with Drawings and Specifications, edition of NEC in effect at project location, recommendations of NFPA, state and local electrical and building codes, and special codes having jurisdiction over specific portions of work. This includes, but is not limited to the the following
1. National Electrical Code with applicable local amendments
2. International Fire Code with applicable state or local amendments
3. Life Safety Code, NFPA 101
4. International Building Code
5. In the event of conflict between Drawings, Specifications and such codes, notify Architect in writing prior to bid. A ruling will then be made by Architect in writing.
6. Obtain permits and certificates of approval from all authorities having jurisdiction over the installation and pay all fees required for scope of work being done including connection fees, impact fees, power company installation costs, etc.

1.5 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Guarantee work to be free from defects of materials and workmanship for a period of one year from date of final acceptance of building by authorities having jurisdiction.

C. Furnish owner with three written copies of Guarantee-Warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Substitutions: See Section 01 6000 - Product Requirements.
1. Where Manufacturer's names appear, other Manufacturers may be substituted upon obtaining written approval of Architect at least 10 days prior to opening of bids
2. Any prior approval of alternate equipment does not automatically exempt the supplier from meeting the intent of these specifications. Failure to comply with the operational and functional intent of these specifications may result in the total removal of the alternate system at the expense of the contractor.

PART 3 EXECUTION

3.1 EXAMINATION

A. Confirm dimensions, ratings, and specifications of equipment to be installed and coordinate these with site dimensions and with other Sections. Coordinate electrical equipment locations with other trades to maintain required working clearances and prevent encroachment into such working spaces.

B. Confirm and verify electrical power specifications (i.e., voltage, phase, amperage, etc.) and electrical equipment and material requirements for all HVAC equipment, water heaters, water coolers, appliances, pumps, and other powered equipment provided by others, before beginning rough-in. All coordination shall be done with approved shop drawings or submittals.

3.2 INSTALLATION

A. Electrical drawings are diagrammatic. Do not scale for exact sizes or locations. Drawings are not intended to disclose absolute or unconditional knowledge of actual field conditions. Some equipment may need to be relocated from the locations indicated on the drawings to maintain working spaces around equipment. Any such coordination and relocation shall be the responsibility of the electrical contractor.

B. Be prepared to relocate any outlet or device 6 feet in any direction without additional charge to the owner prior to wall, ceiling, or floor finish materials being installed.

C. Install equipment according to manufacturer's recommendations.

D. In the event of conflict between specifications and drawings, or between various areas on drawings or specifications, notify Engineer in writing in sufficient time prior to bid to prepare the supplementary drawings and specification addenda required to resolve the conflict. In the event of a conflict, the most stringent requirement shall govern.

E. Provide electrical equipment and materials for, and make all connections to equipment furnished by others, including but not limited to items such as building and pole-mounted signs, etc. as required for a complete and operable system.

3.3 FIELD QUALITY CONTROL

A. Test systems and demonstrate equipment as working and operating properly. Rectify defects at no additional cost to Owner.

B. All work under this division shall be executed in a thorough workmanlike manner, as determined by the Engineer, by competent and experienced journeyman electricians.

C. All work shall be installed in strict conformance with all manufacturers' requirements and recommendations.

3.4 FIRE STOPPING AND SEALING

A. Seal around conduits or other wiring materials passing through fire rated walls in accordance with Architectural details and/or specifications using U.L. listed fire caulk.

3.5 TEMPORARY LIGHTING AND POWER

A. Provide, maintain and remove after construction is completed, temporary lighting adequate for workman safety and temporary power for all trades including any 3-phase power required.

B. Provide and maintain barricade lighting where required to adequately protect owner against liability for damage to public or personnel.

3.6 CUTTING AND PATCHING

A. Cut all openings required to install the work of this Division or to repair any defective work. Cost for all cutting and patching required by the work of this Division shall be included, however, the actual cutting and patching shall be under the Prime Contractor's direction. Exercise due diligence to avoid cutting openings larger than required or openings that are in the wrong locations.

B. It is the intent to minimize the amount of exposed conduit on the roof and penetrations through the roof. Install conduit below roof and up through the inside of the equipment where possible.

In the event roof penetrations must be made, the conduit shall be installed through waterproof sheetmetal housings or water proof pitch pans as detailed on the drawings.

3.7 IDENTIFICATIONS

A. Provide for each panelboard, terminal cabinet, motor starter, motor controller, pushbutton, control switch, time clock, etc., furnished and/or installed under this Division of the Specifications, with identification as to its designation or specific function. Identification shall be a laminated, white core, black plastic nameplate with beveled edges. Lettering shall be machine-engraved, not less than 3/16 in. high, cut through the black surface to the white core. Secure nameplate to the identified item by the use of stainless steel self-tapping screws. Impressed plastic shall not be used to satisfy this requirement. Panel schedules shall be typed.

3.8 INSPECTIONS:

A. All work of this division shall be inspected periodically by the Engineer. The contractor shall notify the engineer minimum one week prior to the requested inspection date. At a minimum, inspections shall be performed upon completion of the following phases of construction -
   1. Completion of underground conduit rough-in, prior to concrete floor installation.
   2. Completion of above-grade conduit rough-in, prior to installation of wall material (gypboard).
   3. Substantial completion of entire electrical system.
   4. Failure to notify the engineer at the indicated times during construction may result in removal of concrete, wall board or other materials to allow a complete inspection.
   5. At the request of the Engineer, the contractor shall remove panel covers, fixture lenses, ballast covers, wall plates, wiring devices, and any other items as required to allow a complete inspection and determination of compliance with the contract documents.

END OF SECTION

SECTION 16060 - GROUNDING AND BONDING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding components.

B. Provide all components necessary to complete the grounding system(s) consisting of:
   1. Metal underground water pipe.
   2. Metal frame of the building.
   3. Concrete-encased electrode.
   4. Rod electrodes.

1.2 REFERENCE STANDARDS

A. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2007.

B. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.3 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 5 ohms.

1.4 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 ELECTRODES

A. Rod Electrodes: Copper.
   1. Diameter: 3/4 inch.
   2. Length: 10 feet.

B. Foundation Electrodes: 2/0 AWG.

2.2 CONNECTORS AND ACCESSORIES

A. Mechanical Connectors: Bronze.

B. Wire: Stranded copper with green insulation.

C. Insulated grounding bushings: Plated malleable iron body with 150 degree centigrade molded plastic insulating throat, lay-in grounding lug with hardened stainless steel fasteners.

D. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

E. Grounding Well:
   1. Well Pipe: 8 inch by 24 inch long clay tile pipe with belled end.
   2. Well Cover: Cast iron with legend "GROUND" embossed on cover.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions prior to beginning work.

B. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.2 INSTALLATION

A. Install ground electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.

B. Pull ground conductors in all non-metallic raceways, flexible conduit, and liquid tight flexible conduit. Use same size ground as phase conductors up through #10 AWG. Use NEC Table 250-66 for all others unless noted otherwise on Drawings.

C. Provide grounding well pipe with cover at each rod location. Install well pipe top flush with finished grade.

D. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing where indicated. Bond steel together.

E. Provide bonding jumpers across expansion and deflection couplings in conduit runs, across pipe connections at water meters, and across dielectric couplings in metallic cold water piping systems

F. Provide bonding jumpers from all wiring device grounding terminals to metal backbox.

G. Provide bonding to meet requirements described in Quality Assurance.

H. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA STD ATS except Section 4.

B. Perform inspections and tests listed in NETA STD ATS, Section 7.13.

END OF SECTION

SECTION 16070 - HANGERS AND SUPPORTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Conduit and equipment supports.

B. Anchors and fasteners.

1.2 REFERENCE STANDARDS

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

B. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.3 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MATERIALS

A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.

B. Supports: Fabricated of structural steel or formed steel members; galvanized or painted.

C. Anchors and Fasteners:
1. Concrete Structural Elements: Use expansion anchors, powder-actuated anchors, or preset inserts.
2. Steel Structural Elements: Use beam clamps, steel spring clips, or welded fasteners.
3. Concrete Surfaces: Use expansion anchors.
4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.
5. Solid Masonry Walls: Use expansion anchors or preset inserts.
6. Sheet Metal: Use sheet metal screws.
7. Wood Elements: Use wood screws.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install hangers and supports as required to adequately and securely support electrical system components, in a neat and workmanlike manner, as specified in NECA 1.
1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
2. Obtain permission from Architect before drilling or cutting structural members.

B. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

C. Install surface-mounted cabinets and panelboards with minimum of four anchors.

D. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1 inch off wall.

E. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION

SECTION 16075 - ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates and labels.

B. Wire and cable markers.

1.2 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

PART 2 PRODUCTS

2.1 NAMEPLATES AND LABELS

A. Nameplates: Engraved three-layer laminated plastic, black letters on white background.

B. Locations:
1. Each electrical distribution and control equipment enclosure.

C. Letter Size:
1. Use 1/4 inch letters for identifying grouped equipment and loads.

D. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background. Use only for identification of individual wall switches and receptacles, control device stations, and _____.

2.2 WIRE MARKERS

A. Description: Cloth type wire markers.

B. Locations: Each conductor at panelboard gutters, outlet boxes, and junction boxes each load connection.

C. Legend:
1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
2. Control Circuits: Control wire number indicated on schematic and interconnection diagrams on drawings.

2.3 UNDERGROUND WARNING TAPE

A. Description: 4 inch wide plastic tape, detectable type colored red with suitable warning legend describing buried electrical lines.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.2 INSTALLATION

A. Install nameplates and labels parallel to equipment lines.

B. Secure nameplates to equipment front using screws or adhesive.

C. Secure nameplates to inside surface of door on panelboard that is recessed in finished locations.

D. Identify underground conduits using underground warning tape. Install one tape per trench at 3 inches below finished grade.

END OF SECTION

SECTION 16121 - HEATING CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Heating Cables for Roof and Gutter De-icing.

1.2 REFERENCES

A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

B. UL 1588-1993

C. IEEE 515-1997

1.3 SYSTEM DESCRIPTION

A. Furnish and install a complete UL Listed, CSA Certified system of specified heating cable, components, and controls listed specifically for keeping roof eaves, gutters, and downspouts from being clogged by ice and snow. .

1.4 WARRANTY

A. The system shall be warranteed for a period of 10-years

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Raychem: www.tycothermal.com

B. Substitutions: See Section 01600 - Product Requirements.

2.2 Heating Cable

A. Construction:
1. Shall consist of two (2) 16 AWG nickel-coated copper bus wires embedded in a self-regulating polymer core that varies its power output to respond to temperature along its length, allowing the cable to be crossed over itself without overheating, to be used with wood, plastic, and asphalt building materials and to be cut-to-length in the field.
2. Outer Jacket: abrasion-resistant fluoropolymer with minum impact resistance of 10 ft-lb at 0 deg C.

B. Ratings:
1. Power Output: 12 watts per foot in snow, 5 watts per foot in air

C. Manufacturers:
1. Raychem Model GM-1XT.

2.3 Control

A. Contactor: 4-pole, 30 amps per pole

B. The system shall be controlled by one or more GIT-1 gutter-mounted sensors along with a CIT aerial-mounted sensor in combination with an APS control panel through the contactor.

2.4 Electrical

A. Ground-Fault Circuit Breaker: Per the National Electrical Code, Article 426, the system shall be protected by a 30-mA trip ground-fault circuit breaker

PART 3 EXECUTION

3.1 INSTALLATION

A. The heating cable shall be laid in gutters and shall be suspended in downspouts either as a loop or a single length and held in place by a downspout hanger.

B. The heating cable shall be protected from damage and installed according to manufacturer's instructions.

C. Tests
   1. After installation, the dielectric jacket's insulation resistance from the conductors to the shield shall be greater than 1000 megohms.

3.2 ADJUSTING

A. Adjust location of sensors for accurate and reliable control of cables.

END OF SECTION

SECTION 16123 - BUILDING WIRE AND CABLE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wire and cable for 600 volts and less.

B. Wiring connectors and connections.

1.2 RELATED REQUIREMENTS

A. Section 16075 - Electrical Identification.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

B. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2007.

C. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.4 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Furnish products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 WIRING REQUIREMENTS

A. Concealed Dry Interior Locations: Use only building wire in raceway.

B. Exposed Dry Interior Locations: Use only building wire in raceway.

C. Above Accessible Ceilings: Use only building wire in raceway.

D. Wet or Damp Interior Locations: Use only building wire in raceway.

E. Exterior Locations: Use only building wire in raceway.

F. Underground Installations: Use only building wire in raceway.

G. Use solid conductor for feeders and branch circuits 10 AWG and smaller.

H. Use stranded conductors for control circuits.

I. Use conductor not smaller than 12 AWG for power and lighting circuits.

J. Use conductor not smaller than 16 AWG for control circuits.

K. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.

L. Conductor sizes are based on copper unless indicated as aluminum or "AL".

2.2 BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation: NFPA 70, Type THHN/THWN.

2.3 WIRING CONNECTORS

A. Spring Wire Connectors:
   1. Product: Type 512, 3M tapeless steel spring wire connectors

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that mechanical work likely to damage wire and cable has been completed.

C. Verify that raceway installation is complete and supported.

D. Verify that field measurements are as indicated.

3.2 INSTALLATION

A. Install conductors in raceway unless indicated otherwise.

B. Install wire and cable securely, in a neat and workmanlike manner, as specified in NECA 1.

C. Route wire and cable as required to meet project conditions.
   1. Wire and cable routing indicated is approximate unless dimensioned.
   2. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.
   3. Include wire and cable of lengths required to install connected devices within 10 ft of location shown.

D. Use wiring methods indicated.

E. Conductors shall be continuous from outlet to outlet.

F. Pull all conductors into raceway at same time.

G. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

H. Protect exposed cable from damage.

I. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.

J. Neatly train and lace wiring inside boxes, equipment, and panelboards.

K. Clean conductor surfaces before installing lugs and connectors.

L. Where common neutral is run for two or three home run circuits, connect phase conductors to breakers in panel which are attached to separate phase legs in order that neutral conductors will carry only unbalanced current.

M. Branch circuit neutral conductors shall be one size larger than the phase conductors unless specifically noted otherwise.

N. Run conductors of different voltage systems in separate conduits.

O. Conductors size #10 and smaller shall be colored throughout.

P. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

Q. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

R. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

S. Identify and color code wire and cable under provisions of Section 16075. Identify each conductor with its circuit number or other designation indicated.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA STD ATS, except Section 4.

B. Perform inspections and tests listed in NETA STD ATS, Section 7.3.2.

END OF SECTION

SECTION 16131 - CONDUIT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Conduit, fittings and conduit bodies.

1.2 RELATED REQUIREMENTS

A. Section 07840 - Firestopping.

B. Section 16060 - Grounding and Bonding.

C. Section 16070 - Hangers and Supports.

D. Section 16075 - Electrical Identification.

E. Section 16138 - Boxes.

1.3 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.

B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.

C. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

D. NECA 101 - Standard for Installing Steel Conduit (Rigid, IMC, EMT); National Electrical Contractors Association; 2006.

E. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2007.

F. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit; National Electrical Manufacturers Association; 2003.

G. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing; National Electrical Manufacturers Association; 2004.

H. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.4 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept conduit on site. Inspect for damage.

B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

C. Protect PVC conduit from sunlight.

PART 2 PRODUCTS

2.1 CONDUIT REQUIREMENTS

A. Conduit Size: Comply with NFPA 70.
   1. Minimum Size: 1/2 inch unless otherwise specified.

B. Underground Installations:
   1. In or Under Slab on Grade: Use rigid steel conduit, intermediate metal conduit, or thickwall non-metallic conduit.
   2. Minimum Size: 3/4 inch.

C. Outdoor Locations Above Grade: Use rigid steel conduit or intermediate metal conduit.

D. In Slab Above Grade:

E. Wet and Damp Locations: Use rigid steel conduit, intermediate metal conduit, or electrical metallic tubing.

F. Dry Locations:
   1. Concealed: Use rigid steel conduit, intermediate metal conduit, or electrical metallic tubing.
   2. Exposed: Use rigid steel conduit, intermediate metal conduit, or electrical metallic tubing.

2.2 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

B. Intermediate Metal Conduit (IMC): Rigid steel.

C. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

2.3 FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction.

B. Fittings: NEMA FB 1.

C. Used only for connections to motorized equipment.

2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction with PVC jacket.

B. Fittings: NEMA FB 1.

2.5 ELECTRICAL METALLIC TUBING (EMT)

A. Description: ANSI C80.3; galvanized tubing.

B. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron compression type.

2.6 NONMETALLIC CONDUIT

A. Description: NEMA TC 2; Schedule 40 PVC.

B. Fittings and Conduit Bodies: NEMA TC 3.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on drawings.

B. Verify routing and termination locations of conduit prior to rough-in.

C. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3.2 INSTALLATION

A. Install conduit securely, in a neat and workmanlike manner, as specified in NECA 1.

B. Install steel conduit as specified in NECA 101.

C. Install nonmetallic conduit in accordance with manufacturer's instructions.

D. Arrange supports to prevent misalignment during wiring installation.

E. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

F. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

G. Fasten conduit supports to building structure and surfaces under provisions of Section 16070.

H. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

I. Do not attach conduit to ceiling support wires.

J. Arrange conduit to maintain headroom and present neat appearance.

K. Route exposed conduit parallel and perpendicular to walls.

L. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

M. Route conduit in and under slab from point-to-point.

N. Maintain adequate clearance between conduit and piping.

O. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.

P. Cut conduit square using saw or pipecutter; de-burr cut ends.

Q. Bring conduit to shoulder of fittings; fasten securely.

R. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

S. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations.

T. Install insulated bushings on each end of conduit 1 1/4 inches in diameter and larger.

U. Bending of PVC shall be by hot box.

V. Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one shot bender to fabricate bends in metal conduit larger than 2 inch size.

W. Run a minimum of one 3/4 inch spare conduit for every three single pole spare circuit breakers or spaces, but not less than three conduits from each new panel to ceiling access area above and below (if applicable) panel and cap so no foreign matter will enter conduit while not in use.

X. Coat buried rigid or IMC conduit with approved asphaltic compound or wrap with two layers of approved corrosion protection tape.

Y. Conduit in concrete slabs shall not exceed 3/4 inch I.P. size and shall be spaced no closer than 8 inches on center except at panel and junction boxes where they are to be spread as widely as possible; special framing may be required where conduits enter a panel board.

Z. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

AA. When PVC conduit is used, turn up with rigid galvanized elbhws and risers and provide equipment grounding conductor in accordance with NEC, Article 250

AB. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic.

AC. Provide long-sweep elbows for telephone and power service entrance conduits.

AD. Provide suitable pull string in each empty conduit except sleeves and nipples.

AE. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

AF. Ground and bond conduit under provisions of Section 16060.

AG. Identify conduit under provisions of Section 16075.

3.3 PROHIBITED PROCEDURES

A. Use of wooden plugs inserted in concrete or masonry units as base for fastening conduits, tubing, boxes, cabinets, or other equipment.

B. Torches for bending PVC conduit.

C. Installation of conduit or tubing which has been crushed or deformed.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07840.

END OF SECTION

SECTION 16138 - BOXES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall and ceiling outlet boxes.

B. Floor boxes.

C. Pull and junction boxes.

1.2 REFERENCE STANDARDS

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

B. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2007.

C. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association; 2003.

D. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; National Electrical Manufacturers Association; 2003.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2003.

F. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.3 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Provide products listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 OUTLET BOXES

A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
   1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.

B. Nonmetallic Outlet Boxes: NEMA OS 2.

C. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs.

D. Wall Plates for Finished Areas: As specified in Section 16140.

2.2 FLOOR BOXES

A. Approved Manufacturers -
   1. Concrete Floors
      a. 1-Gang: Hubbell PFBRG1 Box; PFBRFGY1 Carpet Flange w/collar, PFBR826GY cover plate (1)
      b. 2-Gang: Hubbell PFBRG2 Box; PFBRFGY2 Carpet Flange w/collars, PFBR826GY cover plate (2).
      c. 3-Gang: Hubbell PFBRG3 Box; PFBRFGY3 Carpet Flange w/collars, PFBR826GY cover plate (3).
   2. Wood Floors

a. 1-Gang: Walker 880W1 Box, 828R (828S for tel/data) Cover, 817B Carpet/tile Flange.
b. 2-Gang: Walker 880W2 Box, (2) 828R (828S for tel/data) Cover, 827B Carpet/tile Flange
c. 3-Gang: Walker 880W3 Box, (3) 828R (828S for tel/data) Cover, 837B Carpet/tile Flange

2.3 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify locations of floor boxes and outlets in offices and work areas prior to rough-in.

3.2 INSTALLATION

A. Label all circuits and source panels on exterior of each junction box.

B. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.

C. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.

D. Set wall-mounted boxes at elevations to accommodate mounting heights indicated.

E. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
1. Adjust box locations up to 10 feet if required to accommodate intended purpose.

F. Orient boxes to accommodate wiring devices oriented as specified in Section 16140.

G. Maintain headroom and present neat mechanical appearance.

H. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

I. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

J. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07840.

K. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

L. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.

M. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

N. Use flush mounting outlet box in finished areas.

O. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

P. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in acoustic rated walls.

Q. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

R. Use stamped steel bridges to fasten flush mounting outlet box between studs.

S. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

T. Use adjustable steel channel fasteners for hung ceiling outlet box.

U. Do not fasten boxes to ceiling support wires.

V. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.

W. Use gang box where more than one device is mounted together. Do not use sectional box.

X. Use gang box with plaster ring for single device outlets.

Y. Use cast outlet box in exterior locations exposed to the weather and wet locations.

Z. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.

AA. Set floor boxes level.

3.3 ADJUSTING

A. Adjust floor boxes flush with finish flooring material.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

C. Install knockout closures in unused box openings.

3.4 CLEANING

A. Clean interior of boxes to remove dust, debris, and other material.

B. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 16140 - WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Device plates and decorative box covers.

1.2 RELATED REQUIREMENTS

A. Section 16138 - Boxes.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

B. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2005).

C. NEMA WD 6 - Wiring Device -- Dimensional Requirements; National Electrical Manufacturers Association; 2002.

D. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.4 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.5 EXTRA MATERIALS

A. See Section 01600 - Product Requirements, for additional provisions.

B. Furnish two of each style, size, and finish wall plate.

PART 2 PRODUCTS

2.1 MANUFACTURERS

2.2 WALL SWITCHES

A. Wall Switches: General Duty, AC only general-use snap switch, complying with NEMA WD 6 and WD 1.
   1. Body and Handle: plastic with toggle handle.
   2. Ratings: Match branch circuit and load characteristics.

B. Verify color with Architect before ordering devices.

C. Switch Types: Single pole, double pole, 3-way, and 4-way.

D. Approved Manufacturer
   1. Hubbell: CS1221 series
   2. Equal as approved by Architect prior to bidding

2.3 OCCUPANCY SENSORS

A. Ultrasonic Type
   1. Complete with sensor and combined relay / control transformer.

2. Ceiling mount
3. Approved Manufacturers and Models -
   a. Honeywell -
      1) Sensor - EL7612A1001
      2) Relay / Transformer - EL7621A1002
   b. Greengate -
      1) Sensor - OEC-U-o501
      2) Relay / Transformer - SP05-SR
   c. Pass & Seymour -
      1) Sensor - US1001
      2) Relay / Transformer - PWP120
   d. Unenco -
      1) Sensor - C-600-R-QT1
      2) Relay / Transformer - 211-QT1
   e. Watt Stopper -
      1) Sensor - W-500A
      2) Relay / Transformer - A120-E

B. Passive Infrared Type with Integral Override Switch
1. Wall mount
2. 180 deg coverage
3. Integral light level sensor
4. Adjustable sensitivity from 20% to 100%
5. Time delay - 30 sec to 30 minutes
6. Approved Manufacturers and Models -
   a. Greengate OSW-P-0451-MV

2.4 RECEPTACLES

A. Receptacles: General duty, complying with NEMA WD 6 and WD 1.
1. Device Body: plastic.
2. Configuration: NEMA WD 6, type as specified and indicated.
3. Convenience Receptacles: Type 5 to 15.
4. Approved Manufacturers
   a. Hubbell: CR5252 series
   b. Equal as approved by Architect prior to bidding.

B. GFCI Receptacles: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.
1. Approved Manufacturer
   a. Hubbell: GF5352I
   b. Leviton: 6899-I

2.5 WALL PLATES

A. Decorative Cover Plates: nylon.

B. Jumbo Cover Plates: smooth plastic.

C. Weatherproof Cover Plates: Corrosion resistant, in-use type
1. Pass & Seymour: WIUC10-GL

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that outlet boxes are installed at proper height.

B. Verify that wall openings are neatly cut and will be completely covered by wall plates.

C. Verify that floor boxes are adjusted properly.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean debris from outlet boxes.

3.3 INSTALLATION

A. Install securely, in a neat and workmanlike manner, as specified in NECA 1.

B. Install devices plumb and level.

C. Install switches with OFF position down.

D. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

E. Do not share neutral conductor on load side of dimmers.

F. Mount wall switches on lock side of doors not more than 12 inches from trim and in accordance with barrier free design standards. Prior to rough-in, coordinate with architectural drawings to determine lock-side of door.

G. Label source panel and circuit number on the back of all device cover plates.

H. Install receptacles with grounding pole on bottom.

I. Connect wiring device grounding terminal to outlet box with bonding jumper.

J. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

K. Connect wiring devices by wrapping conductor around screw terminal.

L. Use jumbo size plates for outlets installed in masonry walls.

M. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

N. Provide GFI receptacles in areas required by the National Electrical Code whether indicated on the drawings or not.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 16138 to obtain mounting heights specified and indicated on drawings.

B. Install wall switch 48 inches above finished floor.

C. Install convenience receptacle 18 inches above finished floor.

D. Install convenience receptacle 6 inches above counter.

3.5 FIELD QUALITY CONTROL

A. Perform field inspection, testing, and adjusting in accordance with Section 01400.

B. Inspect each wiring device for defects.

C. Operate each wall switch with circuit energized and verify proper operation.

D. Verify that each receptacle device is energized.

E. Test each receptacle device for proper polarity.

F. Test each GFCI receptacle device for proper operation.

3.6 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.7 CLEANING

A. Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION

SECTION 16155 - EQUIPMENT WIRING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical connections to equipment.

1.2 RELATED REQUIREMENTS

A. Section 16131 - Conduit.

B. Section 16123 - Building Wire and Cable.

C. Section 16138 - Boxes.

D. Section 16140 - Wiring Devices.

1.3 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2005).

B. NEMA WD 6 - Wiring Devices - Dimensional Requirements; National Electrical Manufacturers Association; 2002.

C. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.4 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.5 COORDINATION

A. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.

B. Determine connection locations and requirements.

C. Sequence rough-in of electrical connections to coordinate with installation of equipment.

D. Sequence electrical connections to coordinate with start-up of equipment.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
   1. Colors: Conform to NEMA WD 1.
   2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
   3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Disconnect Switches: As specified in Section 26 2818.

C. Wiring Devices: As specified in Section 16140.

D. Flexible Conduit: As specified in Section 16131.

E. Wire and Cable: As specified in Section 16123.

F. Boxes: As specified in Section 16138.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 16210 - ELECTRICAL UTILITY SERVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metering transformer cabinets.

1.2 REFERENCE STANDARDS

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

B. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.3 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide ratings and dimensions of transformer cabinets and meter bases.

C. Submit utility company-prepared drawings.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with utility company written requirements and NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.5 PRE-INSTALLATION MEETING

A. Convene one week prior to commencing work of this section. Review service entrance requirements and details with Utility Company representative.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. GE Industrial: www.geindustrial.com.

B. Milbank Manufacturing: www.milbankmfg.com.

C. Square D: www.squared.com.

D. Substitutions: See Section 01600 - Product Requirements.

2.2 COMPONENTS

A. Metering Transformer Cabinets: Sheet metal cabinet with hinged door, conforming to utility company requirements, with provisions for locking and sealing.

B. Utility Transformer Pad: Concrete reinforced as specified by power company.

C. Other Components: As required by utility company.

PART 3 EXECUTION

3.1 PREPARATION

A. Arrange with utility company to obtain permanent electric service to the Project.

B. Verify that field measurements are as indicated on utility company drawings.

3.2 INSTALLATION

A. Install transformer pad, metering transformer cabinets and meter base as required by utility company.

B. Install securely, in a neat and workmanlike manner, as specified in NECA 1.

END OF SECTION

SECTION 16412 - ENCLOSED SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fusible switches.

B. Nonfusible switches.

1.2 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Same as panelboard manufacturer.

2.2 COMPONENTS

A. Fusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch.
   1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
   2. Handle lockable in OFF position.
   3. Fuse clips: Designed to accommodate NEMA FU1, Class R fuses.

B. Nonfusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch.
   1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
   2. Handle lockable in OFF position.

C. Enclosures: NEMA KS 1.
   1. Interior Dry Locations: Type 1.
   2. Exterior Locations: Type 3R.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install fuses in fusible disconnect switches.

C. Label equipment, such as Fan Coil Unit FC-1. Label disconnects to indicate equipment served. Use 1/16 inch thick laminated plastic composition material with contrasting color core. Engraved letter shall be 1/4 inch high. Attach labels with screws.

D. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

3.2 FIELD QUALITY CONTROL

A. Perform field inspection in accordance with Section 01400.

B. Inspect and test in accordance with NETA STD ATS, except Section 4.

C. Perform inspections and tests listed in NETA STD ATS, Section 7.5.1.2.

END OF SECTION

SECTION 16413 - ENCLOSED TRANSFER SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manual Transfer Switch.

1.2 RELATED REQUIREMENTS

A. Section 16075 - Electrical Identification: Engraved nameplates.

1.3 REFERENCE STANDARDS

A. NEMA ICS 10 - Industrial Control and Systems: AC Transfer Switch Equipment; National Electrical Manufacturers Association; 2005.

B. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2007.

C. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.4 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide catalog sheets showing voltage, switch size, ratings and size of switching and overcurrent protective devices, operating logic, short circuit ratings, dimensions, and enclosure details.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Operation Data: Instructions for operating equipment under emergency conditions when engine generator is running.

E. Maintenance Data: Routine preventative maintenance and lubrication schedule. List special tools, maintenance materials, and replacement parts.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Supplier Qualifications: Authorized distributor of specified manufacturer with minimum three years documented experience.

C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 MAINTENANCE SERVICE

A. Provide service and maintenance of transfer switches for one year from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. ASCO Power Technologies, LP: www.asco.com.

B. Eaton Electrical/Cutler-Hammer: www.eatonelectrical.com.

C. Russelectric: www.russelectric.com.

D. Generac: www.generac.com

E. Substitutions: See Section 01600 - Product Requirements.

2.2 MANUAL TRANSFER SWITCH

2.3 SERVICE CONDITIONS

A. Service Conditions: NEMA ICS 10.

B. Temperature: 110 degrees F.

C. Altitude: 4500 feet.

2.4 COMPONENTS

A. Indicating Lights: Mount in cover of enclosure to indicate NORMAL SOURCE AVAILABLE.

B. Enclosure: NEMA 3R if installed outdoors, NEMA 1 if installed indoors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surface is suitable for transfer switch installation.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide engraved plastic nameplates under the provisions of Section 16075.

3.3 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01400.

B. Inspect and test in accordance with NETA STD ATS, except Section 4.

C. Perform inspections and tests listed in NETA STD ATS, Section 7.22.3.

3.4 MANUFACTURER'S FIELD SERVICES

A. Provide the services of the manufacturer's technical representative to check out transfer switch connections and operations and place in service.

3.5 CLOSEOUT ACTIVITIES

A. Demonstrate operation of transfer switch in bypass, normal, and emergency modes.

END OF SECTION

SECTION 16414 - REMOTE CONTROL SWITCHING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Programmable switching controls.

B. Remote switches.

C. Power supplies.

D. Relay cabinets.

1.2 RELATED REQUIREMENTS

A. Section 16131 - Conduit.

B. Section 16138 - Boxes: Switch outlets and installation of switch devices.

C. Section 16443 - Panelboards.

1.3 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.4 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate wiring diagrams of system, showing interface with branch circuit wiring.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Advanced Control Technologies, Inc: www.act-solutions.com.

B. Lightolier: www.lightolier.com.

C. Lithonia Lighting: www.lithonia.com.

D. PCI Lighting Controls: www.pcilightingcontrols.com

E. Lutron: www.lutron.com

2.2 PROGRAMMABLE RELAY PANELS

A. Manufacturers:
   1. Advanced Control Technologies, Inc: www.act-solutions.com.
   2. Lightolier: www.lightolier.com.
   3. Lithonia Lighting: www.lithonia.com.
   4. PCI Lighting Controls: www.pcilightingcontrols.com
   5. Lutron: www.lutron.com

B. Description: Relay cabinet with power supply, terminal blocks, and shall be microprocessor controlled with an integral display and with a programming keypad.

C. Relays per Panel: As indicated.

D. Programming Functions:
   1. Programmable intelligence shall include Time-Of-Day control, 32 holiday dates, warn occupants of an impending off, timed inputs, preset control, auto daylight savings, astronomical clock w/offsets, and local control.
   2. Relays may be designated as either normally open or normally closed from software. Relay status shall not only disclose commanded relay status but next scheduled state to occur.
   3. Each control panel shall provide a Warn Off (flash the lights) to inform the occupants of an impending Off command. The Warn Off command shall provide an adjustable time duration of 1 second to 99 extra minutes. The occupants may exit the premises with adequate lighting or cancel the Warn Off by overriding the lighting zone. This option occurs with all Off commands except local overrides.
   4. The controller shall permit lighting to be overridden On for after hours use or cleaning. The controller shall provide optional switch timer assignments or timed overrides. The override choices for various relays shall provide special event occurrences and the controller shall return to the programmed state. Also, the controller shall provide priority and masking choices to customize the functions of switch inputs, thereby enabling switches to function differently at different times of the day to meet special facility operational requirements. These overrides shall be hard-wired inputs.
   5. Programming the controller shall be through the local integral keypad. Descriptive information shall assist the user to employ the system without a programming manual.
   6. Priorities and/or Masking shall be assigned to inputs, telephone override, and global commands to insure building integrity. Priorities enable or disable the inputs based on Time-Of-Day scheduling in the controller. Masks shall permit: On only, Off only and On & Off control for intelligent after hours utilization of the controlled facility.
   7. The lighting control system may be fully programmed through PC programming software. Programming shall be permitted through a direct RS-232 connection, modem or ethernet.
   8. The control system shall provide networking between lighting control panels. One network may support a maximum of a 127 control panels. Panels shall permit data sharing for global control. All inputs (no limitation) are transferable over the network to create any switching pattern required.

E. Hardware Features:
   1. Operator Interface
      a. The control panel programming interface resides in firmware in the control panel. The programming interface shall consist of a circuit board mounted keypad capable of linking switch inputs to relay outputs and schedule assignments. Systems that utilize blocking diode technology for relay assignments shall not be acceptable.
      b. The integral keypad shall provide access to the main programming features. The keypad shall permit the user to manually command any or all relays individually. Each panel shall control its own loads from internal memory. A control system that relies on a central control computer/processor or external time clocks shall not be permitted.
   2. Contact inputs
      a. The control system shall permit 32 dry contacts (Digital/Switch Inputs) for override purposes. Momentary 3 wire or 2 wire (toggle) inputs shall be supported. Maintained contacts shall be supported as 2 wire (SPST) inputs. Inputs shall be dry contacts (24 VDC @ 12 ma. internally supplied to the inputs). An input shall be software linked to any number of relays for override control.
      b. The controller shall provide timers for each switch input. Each switch input timer shall be capable of 0-999 minutes. Software shall enable or disable switch inputs based on Time Of Day scheduling.
   3. Relay Type
      a. The system shall utilize control relays which are rated to 20 amps at 277 VAC. The relays shall be magnetically held and are provided in groups of eight. Relays that are latched or mechanically held are not acceptable. The relays shall be rated for 10

million mechanical operations. A limited 10 year warranty shall be provided on the individual relays.

4. Photocell Control
   a. The controller shall accept user adjustable ambient light sensors. The controller shall provide power for the sensor thereby eliminating any external power supply. Sensors shall provide for both outdoor and indoor applications and provide a dry contact to the controller once the threshold is reached. The sensor shall provide user adjustable dead band control.
5. Modular Design
   a. The control system shall employ all modular connectors to avoid repeat wiring in case of component failure. The system CPU board shall be mounted on quick release hinge pins that shall permit an entire change out of the processor and input board in less than 1 minute.
   b. All connections for the switch inputs shall incorporate modular connectors. The relay board shall be modular and designed for rapid field replacement or upgrading. Systems that do not employ modular connectors shall not be acceptable.
6. Hardware Output Options
   a. Modular Relay Card (MRC)
      1) The controller shall provide an option for modular relay control. The Modular Relay Card (MRC) shall offer the feature of controlling two pole voltages such as 208, 240, and 480VAC in a Normally Open or Normally Closed configuration. Single pole is offered for 120 and 277VAC in a Normally Open and Absolute Zero Configuration. This relay card shall also provide visual indication of relay status. Relays shall be individually exchangeable with plug in low voltage connectors. Combinations of relays shall be permitted since relay modules shall snap into and lock in location. Two pole modules require two relay locations for a maximum of four two pole relays per card. All other relay modules use 1 relay location for a maximum of eight per card. All Modular Relay Card components shall be warranted for 10 years.
7. Diagnostic Aids
   a. Each control panel shall incorporate diagnostic aids for confirmation of proper operation, or in case of failure these aids shall guide the individual in rapid troubleshooting of the system.
   b. The control panels shall employ both a backlit supertwist LCD and LED=s that indicates:
      1) POWER (LED)
      2) SYSTEM OK (LED)
      3) NETWORK COMMUNICATIONS (LED)
      4) ON/OFF STATUS of EACH RELAY (LED & LCD)
      5) SYSTEM CLOCK and DATE (LCD)
      6) PROGRAMMING CONFIRMATION (LCD) (TOD, HOLIDAY,ON/OFF, & PRESET)
   c. Control systems that do not provide visual self help diagnostics shall not be acceptable.
8. Memory Back-up
   a. The system shall utilize a memory back-up device that is system integrated and shall be non-serviceable. The data in RAM shall be protected against power interruptions lasting as long as 7 days. The power interrupt protection circuit shall be entirely maintenance-free.
9. Multi-tapped Transformer
   a. The control panel shall incorporate the use of a multi-tapped transformer. The panel shall not require specification of voltage for each control location. The voltages of 120 & 277 VAC shall be available with each control panel.
10. Status Indication of Relays

a. The system shall provide visible status indication of all relays through the window of each control panel. The visual indication shall disclose On/Off status and relay number.

11. Service Override & Priority Override
    a. The control panel shall provide a three position master-service override for the control unit. The service override shall not be accessible from the exterior.
    b. The master service override provides a single three position switch with the option of All Off, Auto, and All On, respectively. This master switch shall operate all of the relays in the controller. This switch shall override and supersede all commands from the logic board when the switch is in the All On or All Off position. The master switch shall function to override all the relays should the logic board programming differ from the space function.
    c. The system shall remember the last command to the individual relays. Upon returning the master override switch to the Auto position, the relays shall return to the most recent command state. This will occur even if the last command happened during the master override condition.
    d. Additionally, the system shall provide external priority override for the entire panel. Through an externally maintained contact the override card shall place the panel in a priority state. This external contact will supersede any other programmed state and will command all the relays ON or OFF depending on operational choice. This priority state will continue until the external contact is removed. Once the external override is removed the control panel will return the relays to the appropriate programmed state.
12. Lockable Enclosure
    a. Each control panel shall be enclosed in a lockable NEMA class 1 enclosure. The enclosure shall be manufactured out of 1/16" steel and shall provide pre-punched knockouts for efficient installation.
13. Panels
    a. The low voltage controller shall exist in two sizes of relay enclosures. The enclosure maximum sizes shall be either 16 or 32 relays per cabinet. The 16 size will employ two relays cards and the 32 will utilize 4 relay cards. Relays shall be provided in groups of eight relays per card.
14. High Voltage Barriers
    a. The low voltage controller shall provide as an option the ability to provide a barrier for either voltage separation or emergency circuit separation. The 16-size enclosure shall permit one barrier and the 32-size enclosure shall permit up to three locations where the barrier(s) may be installed. The barrier shall be painted red to denote the difference.
15. PC Interface (RS-232 port)
    a. The controller shall permit PC programming through optional software. The controller shall provide a RJ-12 connection for RS-232 programming. Programming shall be permitted through either a local connection or remotely through a modem. PC software shall permit multiple file storage for data archival and for seasonal facility requirements. Operator commands may be issued directly from the PC keyboard.

2.3 REMOTE SWITCHES

A. Wall Switch: Pushbutton type with separate on and off buttons.
   1. Description: Momentary contact, three wire switches, ivory color, rated 3 amperes at 25 VAC.

2.4 POWER LIMITED WIRE AND CABLE

A. Remote Control Cable: Copper conductor, 300 volt insulation rated 60 degrees C, individual conductors twisted together and covered with PVC jacket.

PART 3 EXECUTION

3.1 EQUIPMENT INSTALLATION AND DOCUMENTATION

A. Installation
   1. The control system shall be installed and fully wired as shown on the plans by the installing contractor. The contractor shall complete all electrical connections to all control circuits, and override wiring.

B. Documentation
   1. The contractor shall provide accurate "as built" drawings to the owner for correct programming and proper maintenance of the control system. The "as builts" shall indicate the load controlled by each relay and the relay panel number.

C. Operation and Service Manuals
   1. The factory shall supply all operation and service manuals.

D. Install all wiring in conduit in accordance with Section 16131.

3.2 CLOSEOUT ACTIVITIES

A. Demonstrate proper operation of system.
   1. All system equipment shall operate in accordance with specification and industrial standard procedures.
   2. An operational user program shall exist in the control system. The program shall execute and perform all functions required to effectively operate the site according to the requirements.
   3. Demonstration of program integrity during normal operation and pursuant to a power outage.
   4. Contractor shall provide a minimum of one training hour on the operation and use of the control system. Additional support services shall be negotiated between the contractor and the building owner or manager.

END OF SECTION

SECTION 16423 - ENCLOSED MOTOR CONTROLLERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manual motor controllers.

B. Magnetic motor controllers.

C. Combination magnetic motor controllers and disconnects.

1.2 RELATED REQUIREMENTS

A. Section 16070 - Hangers and Supports.

B. Section 16075 - Electrical Identification: Engraved nameplates.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

B. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC; National Electrical Manufacturers Association; 2000 (R2005).

C. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices; National Electrical Manufacturers Association; 2000.

D. NEMA ICS 6 - Industrial Control and Systems: Enclosures; National Electrical Manufacturers Association; 1993 (R2006).

E. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association; 2001 (R2006).

F. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2007.

G. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.4 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Same as panelboard manufacturer.

2.2 MANUAL CONTROLLERS

A. Manual Motor Controllers: NEMA ICS 2, AC general-purpose, Class A, manually operated, full-voltage controller with overload element, and toggle operator.

2.3 AUTOMATIC CONTROLLERS

A. Magnetic Motor Controllers: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower.

B. Two-Speed Controllers: Include integral time delay transition between FAST and SLOW speeds.

C. Coil Operating Voltage: 120 volts, 60 Hertz.

D. Enclosures: NEMA ICS 6, Type 1.

2.4 ACCESSORIES

A. Auxiliary Contacts: NEMA ICS 2, 2 normally open contacts in addition to seal-in contact.

B. Cover Mounted Pilot Devices: NEMA ICS 5, standard duty oiltight type.

C. Pushbuttons: Unguarded type.

D. Indicating Lights: Transformer, incandescent type.

E. Selector Switches: Rotary type.

F. Control Power Transformers: 120 volt secondary, as scheduled. Provide fused primary, secondary, and bond unfused leg of secondary to enclosure.

2.5 DISCONNECTS

A. Combination Controllers: Combine motor controllers with disconnects in common enclosure. Obtain IEC Class 2 coordinated component protection.

B. Thermal Magnetic Circuit Breakers: Integral thermal and instantaneous magnetic trip in each pole; UL listed.

C. Motor Circuit Protector: Circuit breakers with integral instantaneous magnetic trip in each pole; UL listed.

D. Nonfusible Switch Assemblies: NEMA KS 1, enclosed knife switch with externally operable handle.

E. Fusible Switch Assemblies: NEMA KS 1, enclosed knife switch with externally operable handle. Fuse clips: Designed to accommodate Class R fuses.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install enclosed controllers where indicated, in accordance with manufacturer's instructions.

B. Install securely, in a neat and workmanlike manner, as specified in NECA 1.

C. Provide supports in accordance with Section 16070.

D. Height: 5 ft to operating handle.

E. Provide fuses for fusible switches; refer to Section 16491 for product requirements.

F. Select and install overload heater elements in motor controllers to match installed motor characteristics.

G. Provide engraved plastic nameplates; refer to Section 16075 for product requirements and location.

H. Neatly type label inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating. Place label in clear plastic holder.

3.2 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01400.

B. Inspect and test in accordance with NETA STD ATS, except Section 4.

C. Perform inspections and tests listed in NETA STD ATS, Section 7.16.2.

END OF SECTION

SECTION 16426 - ENCLOSED CONTACTORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General purpose contactors.

1.2 REFERENCE STANDARDS

A. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC; National Electrical Manufacturers Association; 2000 (R2005).

B. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2007.

C. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.3 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 GENERAL PURPOSE CONTACTORS

A. Description: NEMA ICS 2, AC general purpose magnetic contactor.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install enclosed contactors where indicated, in accordance with manufacturer's instructions.

B. Install enclosed contactors plumb. Provide supports in accordance with Section 16070.

C. Provide engraved plastic nameplates; refer to Section 16075 for product requirements and location.

3.2 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01400.

B. Inspect and test in accordance with NETA STD ATS, except Section 4.

C. Perform applicable inspections and tests listed in NETA STD ATS, Section 7.16.1.

END OF SECTION

SECTION 16443 - PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Lighting and appliance panelboards.

1.2 RELATED REQUIREMENTS

A. Section 16060 - Grounding and Bonding.

B. Section 16075 - Electrical Identification.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

B. NEMA PB 1 - Panelboards; National Electrical Manufacturers Association; 2006.

C. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; National Electrical Manufacturers Association; 2007.

D. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2007.

E. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.4 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Electrical/Cutler-Hammer: www.eatonelectrical.com.

B. GE Industrial: www.geindustrial.com.

C. Square D: www.squared.com.

D. Siemens: www.siemens.com

E. Substitutions: See Section 01600 - Product Requirements.

2.2 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

B. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard; provide insulated ground bus where scheduled.

C. Minimum fully-rated Integrated Short Circuit Rating:
   1. 240 Volt Panelboards: 22,000 amperes rms symmetrical.

D. Molded Case Circuit Breakers: Thermal magnetic trip circuit breakers, bolt-on type, with common trip handle for all poles; UL listed.
   1. Type SWD for lighting circuits.
   2. Type HACR for air conditioning equipment circuits.
   3. Class A ground fault interrupter circuit breakers where scheduled.
   4. Do not use tandem circuit breakers.

E. Enclosure: NEMA PB 1, Type 1.

F. Cabinet Box: 6 inches deep, 20 inches wide for 240 volt and less panelboards, 20 inches wide for 480 volt panelboards.

G. Covers: Hinged trim - trim has piano hinge down one side. Door opens by single latch; Entire trim opens by removing screws.

H. Provide a minimum of six spare 20 amp, 1-pole breakers in each branch panel.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install panelboards in accordance with NEMA PB 1.1 and NECA 1.

B. Install panelboards plumb. Install recessed panelboards flush with wall finishes.

C. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.

D. Provide filler plates for unused spaces in panelboards.

E. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

F. Provide protection for installed breakers during construction to prevent physical damage, paint splatters, etc.

G. Provide 4" high concrete curb under floor standing distribution panelboards.

H. Arrange conductors neatly within enclosure, and secure with suitable nylon ties.

I. All panelboards shall be keyed alike.

J. Provide engraved plastic nameplates under the provisions of Section 16075.

K. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling. Identify each as SPARE.
   1. Minimum spare conduits: 5 empty 1 inch.

L. Ground and bond panelboard enclosure according to Section 16060.

3.2 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01400.

B. Inspect and test in accordance with NETA STD ATS, except Section 4.

C. Perform inspections and tests listed in NETA STD ATS, Section 7.5 for switches, Section 7.6 for circuit breakers.

3.3 ADJUSTING

A. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION

SECTION 16510 - INTERIOR LUMINAIRES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires and accessories.

B. Emergency lighting units.

C. Ballasts.

D. Fluorescent lamp emergency power supply.

E. Lamps.

F. Luminaire accessories.

1.2 REFERENCE STANDARDS

A. ANSI C82.4 - American National Standard for Ballasts for High-Intensity-Discharge and Low Pressure Sodium Lamps (Multiple-Supply Type); 2002.

B. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; National Electrical Contractors Association; 2006.

C. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

D. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association; 2006.

1.3 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70 and NFPA 101.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.4 EXTRA MATERIALS

A. See Section 01600 - Product Requirements, for additional provisions.

B. Furnish 10% of the total of each plastic lens type used on the project, minimum two of each type. Deliver to owner in protected, factory packaging.

C. Furnish 10% replacement lamps of the total of each lamp type, minimum two of each type. Deliver to owner in protected, factory packaging.

D. Furnish two of each ballast type.

PART 2 PRODUCTS

2.1 LUMINAIRES

A. Furnish products as indicated in Schedule included on the Drawings.

B. Emergency Lighting Units: Self-contained fluorescent emergency lighting unit.
   1. Battery: 6 volt, nickel-cadmium type, with 1.5 hour capacity.
   2. Battery Charger: Dual-rate type, with sufficient capacity to recharge discharged battery to full charge within twelve hours.
   3. Indicators: Lamps to indicate AC ON and RECHARGING.
   4. TEST switch: Transfers unit from external power supply to integral battery supply.

2.2 BALLASTS AND CONTROL UNITS

A. Fluorescent Ballasts: electronic solid state, suitable for lamps specified.
   1. UL listed and labeled
   2. Minimum power factor of 90 percent.
   3. Maximum total harmonic distortion of 10 percent.
   4. Audible noise level lower than quietest CBM certified ballast for same application.
   5. Transient protection in accordance with ANSI 62.41-1984.
   6. Comply with FCC Rules Part 18, 15J.
   7. Maximum crest factor of 1.7.
   8. One year full replacement warranty including labor allowance for replacement.
   9. Voltage: Match luminaire voltage.
   10. Certify fluorescent ballast design and construction by Certified Ballast Manufacturers, Inc.
   11. Substitutions: See Section 01600 - Product Requirements.

B. High Intensity Discharge (HID) Ballasts: ANSI C82.4, metal halide lamp ballast, suitable for lamp specified.
   1. UL listed and labeled.
   2. Pulse Start.
   3. ANSI type M-144.
   4. Maximum crest factor 1.6.
   5. One year full replacement warranty including labor allowance for replacement.

C. Fluorescent Lamp Emergency Power Supply: Emergency battery power supply suitable for installation in ballast compartment of fluorescent luminaire.
   1. Lamp Ratings: One F32/T8.
   2. Battery: Sealed lead calcium type, rated for 10 year life.
   3. Include TEST switch and AC ON indicator light, installed to be operable and visible from the outside of an assembled luminaire.
   4. Shall operate one lamp at approximately 1400 lumens initially and not less than 1000 lumens after 90 minutes.

D. Provide zero degree rated ballasts on all exterior fixtures without additional cost to owner.

2.3 LAMPS

A. Manufacturers:
   1. GE Lighting: www.gelighting.com.
   2. Philips Lighting Co of NA: www.lighting.philips.com.

B. Lamp Types: As specified for each luminaire.

C. Provide 130-volt incandescent lamps.

PART 3 EXECUTION

3.1 INSTALLATION

A. Mount fixtures as called for on drawings. Determine type of ceiling being installed in each space and furnish fixtures suitable for exact type, including roof/floor or ceiling/floor fire rated design with fire tenting required by Architect. All coordination and materials to be provided without additional cost to owner.

B. Review lighting drawings and confirm ballast voltages for each fixture, or need for two ballasts to accommodate dual-level switching, or need for dimming ballasts to interface with dimming control, before ordering. Contractor shall not be eligible for additional compensation if fixtures are delivered with incorrect voltage ratings or too few ballasts, or non-dimming ballasts, as a result of inaccurate catalog numbers on drawings.

C. Provide all necessary supports, brackets, adapters and miscellaneous equipment for mounting and installation of fixtures.

D. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting).

E. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.

F. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.

G. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.

H. Exposed Grid Ceilings: Support surface mounted luminaires in grid ceiling directly from building structure.

I. Install recessed luminaires to permit removal from below.

J. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

K. Install clips to secure recessed grid-supported luminaires in place.

L. Install wall mounted luminaires, emergency lighting units, and exit signs at height as indicated on Drawings.

M. Install accessories furnished with each luminaire.

N. Connect luminaires and exit signs to branch circuit outlets provided under Section 16138 using flexible conduit.

O. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

P. Bond products and metal accessories to branch circuit equipment grounding conductor.

Q. Install specified lamps in each emergency lighting unit, exit sign, and luminaire.

3.2 FIELD QUALITY CONTROL

A. Perform field inspection in accordance with Section 01400.

B. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.3 ADJUSTING

A. Aim and adjust luminaires as directed.

B. Position exit sign directional arrows as indicated.

3.4 CLEANING

A. Clean electrical parts to remove conductive and deleterious materials.

B. Remove dirt and debris from enclosures.

C. Clean finishes and touch up damage.

3.5 CLOSEOUT ACTIVITIES

A. Demonstrate luminaire operation for minimum of 8 hours.

3.6 PROTECTION

A. Relamp luminaires that have failed lamps at Substantial Completion.

3.7 SCHEDULE - See Drawings

END OF SECTION

SECTION 16710 - STRUCTURED TELECOMMUNICATIONS CABLING AND ENCLOSURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Telecommunications service entrance to building(s).

B. Cabling and pathways inside building(s).

C. Distribution frames, cross-connection equipment, enclosures, racks, and outlets.

D. Modular jacks and device plates.

E. Grounding and bonding the telecommunications distribution system.

1.2 RELATED REQUIREMENTS

A. Section 16060 - Grounding and Bonding: Electrical system grounding and bonding.

B. Section 16131 - Conduit.

C. Section 16134 - Cable Trays.

1.3 REFERENCE STANDARDS

A. CEA-310 - Cabinets, Racks, Panels, and Associated Equipment; Consumer Electronics Association; Revision E, 2005.

B. NFPA 70 - National Electrical Code; 2008.

C. TIA/EIA-568-B.1 - Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements; Rev B, 2001; Addenda 1-7.

D. TIA/EIA-568-B.2 - Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted Pair Cabling Components; Rev B, 2001; Addenda 1-11.

E. TIA-569 - Commercial Building Standard for Telecommunications Pathways and Spaces; Rev B, 2004.

F. TIA/EIA-606 - Administration Standard for the Telecommunications Infrastructure; Rev A, 2002.

G. ANSI/J-STD-607 - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications; Rev A, 2002.

H. UL 444 - Communications Cables; 2002.

I. UL 1863 - Standard for Communications-Circuit Accessories; 2004.

1.4 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Storage and handling requirements and recommendations.
   2. Installation methods.

C. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).

D. Manufacturer Qualifications.

E. Installer Qualifications.

F. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least 60 days prior to intended test date.

G. Field Test Reports.

H. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
   1. Record actual locations of outlet boxes and distribution frames.
   2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
   3. Identify distribution frames and equipment rooms by room number on contract drawings.

I. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.

B. Installer Qualifications: A company having at least 5 Years experience in the installation and testing of the type of system specified, and:
   1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
   2. Supervisors and installers factory certified by manufacturers of products to be installed.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep stored products clean and dry.

1.7 WARRANTY

A. A Lifetime Performance Warranty covering all components, equipment and workmanship shall be submitted in writing with system documentation. The warranty period shall begin on the system's first use by the owner.

B. The project must be pre-registered with Manufacturer before installation has begun.

C. See Section 01780 - Closeout Submittals, for additional warranty requirements.

D. Correct defective Work within a 2 year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Approved Cabling and Equipment Solutions:
   1. Nextlan
   2. Commscope Uniprise
   3. Equal as approved by Architect - All solutions must be end-to-end and be able to show shared engineering resources.

2.2 SYSTEM DESIGN

A. Provide a complete, warrentied, end-to-end, permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, patch panels, enclosures, racks and cabinets, and outlets.
   1. Comply with TIA/EIA-568 and TIA/EIA-569, latest editions.
   2. Provide fixed cables and pathways that comply with NFPA 70 and ANSI/J-STD-607 and are UL listed or third party independent testing laboratory certified.
   3. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F at relative humidity of 0 to 95 percent, noncondensing.

4. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

B. Capacity:
1. Building Entrance: By others.
2. Horizontal Cabling: Copper.
3. Offices and Work Areas: Provide one voice outlet and two data outlets in each work area.
4. Provide additional outlets where indicated on drawings.

C. Main Distribution Frame (MDF): Centrally located support structure for terminating cables that extend to telecommunications outlets, functioning as point of presence to external service provider.
1. Locate main distribution frame as indicated on the drawings.
2. Capacity: As required to terminate all cables required by design criteria plus minimum 25 percent spare space.

D. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.3 PATHWAYS

A. Conduit: As specified in Section 16131; provide pull cords in all conduit; minimum size 3/4".

B. Cable Trays: As specified in Section 16134.

C. Underground Service Entrance: PVC, Type EPC-40 conduit.

2.4 COPPER CABLE AND TERMINATIONS

A. Copper Horizontal Cable: TIA/EIA-568 Category 6 solid conductor unshielded twisted pair (UTP), 23 AWG, 100 ohm; 4 individually twisted pairs; covered with blue jacket and complying with all relevant parts of and addenda to latest edition of TIA/EIA-568 and UL 444.
1. In plenums, provide NFPA 70 type CMP plenum-rated cable.

B. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

C. Jacks and Connectors: RJ-45, non-keyed, terminated with 110-style insulation displacement connectors; high impact thermoplastic housing; complying with same standard as specified horizontal cable and UL 1863.
1. Performance: 500 mating cycles.
2. Voice and Data Jacks: 4-pair, pre-wired to T568A configuration, with color-coded indications for T568B configuration.

2.5 CROSS-CONNECTION EQUIPMENT

A. Connector Blocks for Category 5e and Up Cabling: Type 110 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.

B. Patch Panels for Copper Cabling: Sized to fit EIA standard 19 inch wide equipment racks; 0.09 inch thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
1. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
2. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare plus mounting space for all active componenets/equipment required to cross-connect to tany/all modular jack ports on the patch panels.
3. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA/EIA-606 using encoded identifiers.
4. Provide incoming cable strain relief and routing guides on back of panel.

5. Patch Cords: Provide one patch cord for each pair of patch panel ports.

C. Cable Management
1. Equip each rack or cabinet with vertical cable section.
2. Equip each rack or cabinet with horizontal cable managers above and below each patch section.
   a. 7 rings
   b. 6 pass-through holes
   c. Hinged front cover
3. Use velcro cable wraps on all cable - tie wraps are not acceptable.

2.6 ENCLOSURES

A. Backboards: Interior grade plywood without voids, 3/4 inch thick; UL-labeled fire-retardant.
1. Size: 48 inches wide by 96 inches high.
2. Do not paint over UL label.
3. Provide one 48" multi-outlet power strip with integral surge protection and outlets at 6" o.c. (minimum 7 outlets) mounted at center of terminal board.

B. Equipment Racks and Cabinets: CEA-310 standard 19 inch wide component racks.
1. Floor Mounted Racks: 16 gage steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.

C. Outlet Boxes: For flush mounting in walls; depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
1. Size, Unless Otherwise Indicated: 4 inches square by 2-1/8 inches deep.
2. Faceplates: High impact thermoplastic, complying with system design standards and UL 514C.
3. Labels: Comply with TIA/EIA-606 using encoded identifiers; label each jack on the face plate as to its function with a unique numerical identifier.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA/EIA-568, TIA/EIA-569, ANSI/J-STD-607, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

3.2 PATHWAYS

A. Underground Service Entrance: Install conduit at least 24 inches below finish grade; encase in at least 3 inches thick concrete for at least 60 inches out from the building line.

B. Install with the following minimum clearances:
1. 48 inches from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
2. 12 inches from power conduits and cables and panelboards.
3. 5 inches from fluorescent and high frequency lighting fixtures.
4. 6 inches from flues, hot water pipes, and steam pipes.

C. Conduit:
1. Run 3/4" conduit to terminal board from each telephone/computer network outlet box.
2. Install two UTP cables from each telephone/data outlet to terminal board unless indicated otherwise on Drawings. Route conductors in bundled, tied groups.
3. Do not install more than 2 (two) 90 degree bends in a single horizontal cable run.
4. Install insulated bushings on all stubbed conduit ends.
5. Leave pull cords in place where cables are not initially installed.

6. Conceal conduit under floor slabs and within finished walls, ceilings, and floors except where specifically indicated to be exposed.
   a. Conduit may remain exposed to view in mechanical rooms, electrical rooms, and telecommunications rooms.
   b. Treat conduit in crawl spaces and under floor slabs as if exposed to view.
   c. Where exposed to view, install parallel with or at right angles to ceilings, walls, and structural members.
   d. Under floor slabs, locate conduit at 12 inches, minimum, below vapor retarder; seal penetrations of vapor retarder around conduit.

D. Grounding and Bonding: Perform in accordance with ANSI/J-STD-607 and NFPA 70.

3.3 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:
1. Terminate cables at each outlet with specified modular jack assembly.
2. Patch appropriate computer outlet locations to network switches as directed by the owner.
3. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
4. Do not over-cinch or crush cables.
5. Do not exceed manufacturer's recommended cable pull tension.
6. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
1. At Distribution Frames: 120 inches.
2. At Outlets - Copper: 12 inches.

C. Copper Cabling:
1. Category 5e/6: Maintain cable geometry; do not untwist more than 1/2 inch from point of termination.
2. For 4-pair cables in conduit, do not exceed 25 pounds pull tension.
3. Copper Cabling Not in Conduit: Use only type CMP plenum-rated cable as specified.

D. Cable Tray: Install cable tray securely above racks and terminal boards the entire length of the room.

E. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations. Provide seismic bracing as directed by structural engineer.

F. Field-Installed Labels: Comply with TIA/EIA-606 using encoded identifiers.
1. Cables: Install color coded labels on both ends.
2. Outlets: Label each jack on its face plate as to its type and function, with a unique numerical identifier.
3. Patch Panels: Label each jack as to its type and function, with a unique numerical identifier.
4. Patch Cords: Label with jack identifier corresponding to initial installation.

3.4 FIELD QUALITY CONTROL

A. Comply with inspection and testing requirements of specified installation standards.

B. Visual Inspection:
1. Inspect cable jackets for certification markings.
2. Inspect cable terminations for color coded labels of proper type.
3. Inspect outlet plates and patch panels for complete labels.
4. Inspect patch cords for complete labels.

C. Testing - Copper Cabling and Associated Equipment:
   1. Test operation of shorting bars in connection blocks.
   2. Category 5e/6 Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.

D. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION