

COFFMAN PARK EXPANSION

Phase 2A

6565 Commerce Parkway
Dublin, Ohio 43017

PROJECT MANUAL

For

The City of Dublin – Parks & Open Space

OWNER:

The City of Dublin – Parks & Open Space
6555 Shier-Rings Road
Dublin, Ohio 43016
Phone: (614) 410-4700

LANDSCAPE ARCHITECT:

MKSK
462 South Ludlow Alley
Columbus, Ohio 43215
Phone: (614) 621-2796

ARCHITECT:

Ford & Associates Architects, Inc.
1500 West First Avenue
Columbus, Ohio 43212
Phone: (614) 488-6252

STRUCTURAL ENGINEER:

Shirk & O'Donovan Consulting Engineers, Inc.
370 East Wilson Bridge Rd
Worthington, Ohio 43085
Phone: (614) 436-6465

**MECHANICAL/PLUMBING/
ELECTRICAL ENGINEER**

McMullen Engineering Company, Inc.
100 South State Street
Westerville, Ohio 43081
Phone: (614) 895-9408

CIVIL ENGINEER:

EcoDesign & Engineering
7200 Wells Road
Plain City, Ohio 43064
Phone: (614) 733-0049

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FAA Project No. 14051.00

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General Requirements

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SECTION 01 1010 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 Related Documents

- A. AIA Document A201, General Conditions of the Contract for Construction - 2007 Edition are incorporated in full to this document by reference. Rights and responsibilities of the Owner, Architect and General Contractor shall be as defined in the before referenced document.
- B. Contract Documents for the **COFFMAN PARK EXPANSION, PHASE 2A** as prepared by Ford & Associates Architects, Inc. dated March 13, 2015.
- C. Contract Documents for the **COFFMAN PARK EXPANSION, PHASE 2A** with site earthwork and site utilities as issued by EcoDesign & Engineering, latest issue.
- D. Landscape drawings for the **COFFMAN PARK EXPANSION, PHASE 2A** as issued MKSK, latest issue.

1.2 Summary

- A. Project Description: The construction consists of a one story 821 square foot shelter and toilet building as described in the documentation issued by Ford & Associates Architects, Inc. dated March 13, 2015.

1.3 Contractor Use of Premises

- A. General: During the construction period the contractor shall have full use of the premises for construction operations, including use of the site.
 - 1. Contractor shall 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. Contractors will not interfere with surrounding adjacent properties that will remain open during construction. The General Contractor shall coordinate work schedules, site access, site pavement, utility extensions and adjacent site grades with existing conditions.
 - 2. Contractor shall keep driveways and entrances serving the premises clear at all times. Do not use these areas for parking or storage of material. Schedule deliveries to minimum space and time requirements for storage of materials and equipment on site.
 - 3. Prior to substantial completion, contractor shall remove all temporary utilities, equipment, facilities, and materials from the site. Clean and repair damage caused by temporary work and restore permanent facilities to specified condition.

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1.4 Owner Occupancy

- A. The Owner 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. A Certificate of Substantial Completion will be executed for each specific portion of the Work to be occupied prior to Owner occupancy. Obtain a Certificate of Occupancy from local building officials prior to Owner occupancy. Prior to partial Owner occupancy, mechanical and electrical systems shall be operational. Required inspections and tests shall have been successfully completed. Upon occupancy the Owner will provide operation and maintenance of mechanical and electrical systems that shall be fully operational.

1.5 Site Utilities

- A. General Contractor shall be responsible for connection of new building services (water, gas, sanitary, electric and storm water) connections to the existing site utilities. Contractor shall familiarize himself with the proposed utilities and proposed service connections to ensure proper coordination of all service laterals.

END OF SECTION

SECTION 01 1040 - PROJECT COORDINATION

PART 1 - GENERAL

1.1 Section Includes

- A. This Section specifies administrative and supervisory requirements provided by the General Contractor, necessary for Project Coordination including, but not necessarily limited to:
 - 1. Coordination.
 - 2. Layout of work.
 - 3. Administrative & supervisory personnel.
 - 4. General installation provisions.
 - 5. Cleaning and protection.

1.2 Related Requirements

- A. General Contractor's Construction Schedule.

1.3 Coordination

- A. General Contractor: 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, contractor shall prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
 - 1. Prepare similar memoranda for the Owner and separate Subcontractors where coordination of their Work is required.
- C. Administrative Procedures: General Contractor shall 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. Preparation of schedules.
 - 2. Installation and removal of temporary facilities.
 - 3. Delivery and processing of submittals.
 - 4. Progress meetings.
 - 5. Project Close-Out activities.

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- D. Progress Schedule: The progress schedule will be developed by the General Contractor. Each subcontractor will provide input into the schedule. He will be requested to furnish information regarding allowances required for producing submittals, fabrication, delivery and pertinent dates for the completion of his work. The General Contractor may, from time to time, adjust the schedule to a longer or shorter duration as he deems necessary.
- E. Project Meetings: The General Contractor will conduct regular Job site Progress Meetings on a schedule to be determined after award of Subcontracts. Each meeting is to be attended by the Subcontractor's on-site superintendent or foreman. A representative of the subcontractor who is authorized to obligate the company to issues of schedule, manpower and problem solving decisions for the subcontractor will also attend each meeting.

1.4 Layout of Work

- A. General Contractor: Coordinate work with other trades and schedule partition layout to expedite the work. Other trades shall be responsible for locating and coordinating their work.
 - 1. Locate site work items, including curbs, walks, and other items to facilitate proper placement of exterior light fixtures, catch basins, manholes, and similar construction which is located by the appropriate subcontractor.

1.5 Submittals

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Staff Names: Subcontractor shall within 15 days of Notice to Proceed, submit a list of the Subcontractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify key individuals, their duties and responsibilities; list their addresses and telephone numbers.
 - 1. General Contractor shall post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 General Installation Provisions

- A. Inspection of Conditions: Require 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.

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- B. **Manufacturer's Instructions:** Subcontractor shall 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. Subcontractor shall inspect materials or equipment immediately upon delivery and again before installation. Reject damaged and defective items.
- D. Subcontractor shall 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:** Subcontractor shall provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Contractor for final decision by the Architect.
- F. Subcontractor shall recheck measurements and dimensions, before starting each installation.
- G. Subcontractor shall install each component during weather conditions and Project status to ensure best possible results. Isolate each part of completed construction from incompatible material as necessary to prevent deterioration.
- H. Subcontractor shall coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

3.2 Cleaning and Protection

- A. During handling and installation, subcontractor shall 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. **General Contractor:** Repair damages to new and existing work caused by work operations and back charge to responsible trade. Damages which cannot be assigned to a particular trade or are due to vandalism shall be the responsibility of the trade whose work is damaged and his sureties.

END OF SECTION

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SECTION 01 1045 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 Section Includes

- A. This Section specifies general requirements for cutting, fitting, and patching of the Work required to:
 - 1. Make the several parts fit properly.
 - 2. Uncover work to provide for installing, inspecting, or both, of ill-timed work.
 - 3. Remove and replace work not conforming to requirements of the Contract Documents.
 - 4. Remove and replace defective work.
 - 5. Remove samples of work for testing.
 - 6. Provide openings in elements of work for penetrations such as piping, conduit, and duct work.
 - 7. Repair damage.

1.2 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 exterior or in occupied spaces, in a manner that would, in Architect's opinion, reduce 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 (Not Used)

PART 3 - EXECUTION

3.1 Inspection

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

3.2 Cutting and Patching

- A. Each Subcontractor shall perform all cutting and patching as required to complete his work, unless specifically noted otherwise.

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- B. General: Subcontractor shall employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
- C. Cutting, when necessary, shall be done with tools and methods to prevent unnecessary damage to surrounding areas or equipment. No cutting shall be done which will, in any way reduce the structural strength. If such cutting is necessary, consult General Contractor and do not proceed with cutting operations unless written approval is given.
- D. Patching: Subcontractor shall patch with durable seams that are as invisible as possible. Comply with specified tolerances.
 - 1. 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.
- E. The final appearance and integrity of the patched and refinished areas must meet the approval of the Architect and General Contractor. Refinishing must extend to logical termination lines if an acceptable appearance cannot be attained by finishing a partial area.
 - 1. When, in the Architect's or General Contractor's opinion, satisfactory results cannot or have not been achieved, defective surfaces shall be covered with approved finish materials adequately fastened and aligned.

3.3 Cleaning

- A. Subcontractor shall thoroughly clean areas and spaces where cutting and patching is performed or used as access.

END OF SECTION

SECTION 01 1070 - ABBREVIATIONS**Part 1 - GENERAL****1.1 Section Includes**

- A. This Section describes abbreviations used throughout these Specifications.

1.2 Abbreviations

- A. Throughout these Specifications reference to a technical society, organization or body is by abbreviations and shall refer as follows:

AA	Aluminum Association
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
ABPA	Acoustical and Board Products Association
ACI	American Concrete Association
AGA	American Gas Association
AGC	American General Contractors
AHC	Architectural Hardware Consultant
AI	Asphalt Institute
AIA	American Institute of Architects
AIA	American Insurance Association
AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
APA	American Plywood Association
ARI	Air Conditioning and Refrigeration Institute
ARMA	Asphalt Roofing Manufacturers Association
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWPB	American Wood Preservers Bureau
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWSC	American Welding Society Code
AWI	Architectural Woodwork Institute
AWWA	American Water Works Association
BIA	Brick Institute of America
BOCA	Building Officials Conference of America

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CLFMI	Chain Link Fence Manufacturer's Institute
CRA	California Redwood Association
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standards
CSI	Construction Specifications Institute
CTI	Cooling Tower Institute
FGMA	Flat Glass Marketing Association
FIA	Factory Insurance Association
FM	Factory Mutual
FS	Federal Specifications
FTI	Facing Tile Institute
GA	Gypsum Association
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
LEED	Leadership in Energy and Environmental Design
LIA	Lead Industries Association
MAG	Maricopa Association of Governments
MIA	Marble Institute of America
MIA	Masonry Institute of America
MLMA	Metal Lath Manufacturers Association
MS	Military Specifications
NAAMM	National Association of Architectural Metal Manufacturers
NBC	National Building Code
NBHA	National Builders Hardware Association
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NCMA	National Concrete Masonry Association
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association/ National Forest Products Association
NGA	National Glass Association
NKCA	National Kitchen Cabinet Association
NMWIA	National Mineral Wool Insulation Association
NTMA	National Terrazzo and Mosaic Association
NWMA	National Woodwork Manufacturer's Association
PCI	Precast Concrete Institute
PCA	Portland Cement Association
PDI	Plumbing Drainage Institute
PEI	Porcelain Enamel Institute
PS	Product Standards

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SDI	Steel Door Institute; Steel Deck Institute
SIGMA	Sealed Consulting Glass Manufacturer's Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSBC	Southern Standard Building Code
SSPC	Steel Structures Painting Council
TCA	Tile Council of America
TIMA	Thermal Insulation Manufacturers Association
TPI	Truss Plate Institute
UBC	Uniform Building Code
UL	Underwriters Laboratories, Inc.
USDA	United States Department of Agriculture
USGBC	United States Green Building Council
USPS	United States Postal Service
VI	Vermiculite Institute
WCLA	West Coast Lumberman's Association
WCLB	West Coast Lumber Bureau
WIA	Woodwork Institute of Arizona
WPOA	Western Plumbing Officials Association
WWPA	Western Wood Products Association

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SECTION 01 3000 – ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 Section Includes

- A. Preconstruction meeting.
- B. Progress meetings.
- C. Pre-Roof meeting.
- D. Pre-Masonry install meeting.
- E. Project Photos
- F. Submittals for review, information, and project closeout.
- G. Number of copies of submittals.
- H. Submittal procedures.
- I. 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. Performance and payment bonds.
 - 4. Release of Liens.
 - 5. Insurance certificates.

1.2 Related Requirements

- A. Inspection and test reports for Quality Control - Ref: See Individual Sections.
- B. Project Close-out – Ref: Section 01 7000:
 - 1. Record Drawings.
 - 2. Operating and Maintenance Manuals.
 - 3. Guaranty/Warranty Documents.

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 Preconstruction Meeting

- A. Contractor will schedule a meeting within 15 days of date established in Notice to Proceed.
- B. Attendance Required:
 - 1. Owner.

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2. Owner's Representative.
 3. Architect.
 4. Contractors Project Manager and Superintendent.
 5. Major Subcontractors.
 6. Testing Agency.
 7. Others as appropriate.
- C. Agenda:
1. Project Coordination: Designation of responsible personnel.
 2. Distribution of Contract Documents.
 3. Submission of list of Subcontractors, schedule of values, and progress schedule.
 4. Major equipment deliveries and priorities.
 5. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 6. Procedures for testing and inspection.
 7. Use of premises:
 - a. Jobsite trailers, work and storage areas.
 - b. Owner's requirements.
 8. Temporary utilities.
 9. Safety and first-aid procedures.
 10. Security procedures.
 11. Housekeeping procedures.
 12. Scheduling.
 13. Scheduling activities of Testing Agency.
- D. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.2 Progress Meetings

- A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.
- C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.
- D. Agenda
 1. Review minutes of previous meetings.
 2. Review of Work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Review of off-site fabrication and delivery schedules.
 7. Maintenance of progress schedule.

8. Corrective measures to regain projected schedules.
 9. Planned progress during succeeding work period.
 10. Maintenance of quality and work standards.
 11. Effect of proposed changes on progress schedule and coordination.
 12. Other business relating to Work.
- E. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.3 Pre-Roofing Meeting

- A. Schedule and administer pre-roof meeting 14 days prior to commencing installation of roofing.
- B. Attendance Required:
1. Owner's Representative.
 2. Architect.
 3. Contractor's Project Manager and Superintendent.
 4. Roofing sub-contractor.
 5. Roofing manufacturer.
 6. Others as appropriate.
- C. Suggested Agenda
1. Discuss representative areas of roofing substrates; inspect and discuss condition of substrate, scupper preparations, curbs, penetrations, and other preparatory work performed by other trades.
 2. Review structural loading limitations of deck and inspect deck for flatness and for required mechanical fastening.
 3. Review roofing system requirements: Drawings, Specifications, and other Contract Documents.
 4. Review required submittals, both complete and incomplete.
 5. Review preliminary roof inspection reports verifying locations and heights of roof drains, overflow scuppers, sloping of roof deck, and other roof components.
 6. Review and finalize construction schedule related to roofing work and verify availability of materials. Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 7. Review required inspection, testing, certifying, and material use accounting procedures.
 8. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing, and provision of watertight cut-offs.

3.4 Masonry Pre-installation Conference

- A. Prior to the start of any masonry installation, the General Contractor and masonry contractor shall meet with the Architect to review all masonry installation practices and detail installation requirements for the project. General

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Contractor shall provide Architect notice of this meeting a minimum of ten (10) days before the meeting.

3.5 Progress Photographs

- A. Photography Type: Digital; electronic files.
- B. Take photographs that apply to work under construction and submit promptly to Owner.
 - 1. Completion of site clearing.
 - 2. Excavations in progress.
 - 3. Foundations in progress and upon completion.
 - 4. Site utilities, particularly underground fire line and thrust blocks.
 - 5. Slab placements in progress.
 - 6. Structural framing in progress and upon completion.
 - 7. Enclosure of building, upon completion.
- C. Digital Photographs: 24 bit color, minimum resolution of 1600 by 1200 ("2 megapixel"), in JPG format; provide files unaltered by photo editing software.
 - 1. Delivery Medium: Via email.
 - 2. File Naming: Include project identification, date and time of view, and view identification.
 - 3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 4 photos per page, each photo labeled with file name; one PDF file per submittal.

3.6 Submittals for Review

- A. Contractor shall submit newly prepared information, drawn to accurate scale and are to be prepared by a qualified detailer. 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. When the following are specified in individual sections, submit them for review:
 - 1. Product data.
 - 2. Shop drawings.
 - 3. Samples for selection.
 - 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed only for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7010 – PROJECT STATUS CLOSEOUT FORM.

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- E. Job delays occasioned by requirement of resubmission of samples, shop drawings and product data not in accord with contract Documents are Contractor's responsibility and will not be considered valid justification for extension of contract time.
- F. Commence no portion of work requiring submittals until submittal has been reviewed by Architect.

3.7 Submittal Schedule

- A. Subcontractors shall prepare and submit to General Contractor before first Application for Payment a proposed Schedule of Submittals including shop and setting drawings. Schedule of submittals shall indicate anticipated dates submittals will be submitted for review and be coordinated with the Construction Schedule so as to permit a **minimum of two weeks** for review and approval of each submittal by Architect and Project Engineers while allowing sufficient time for fabrication and shipment to maintain the Construction Schedule.
 - 1. Prepare the schedule in chronological order; include submittals required during the first 90 days of construction. Provide the following information:
 - a. Scheduled dated for the first submittal.
 - b. Related Section number.
 - c. Submittal category.
 - d. Name of Subcontractor.
 - e. Description of the part of the Work covered.
 - f. Scheduled date for resubmittal, if anticipated.
 - g. Scheduled date of Architect's final release or approval.
- B. Schedule Updating: Revise schedule where revisions have been recognized or made. Issue the updated schedule information to General Contractor.
- C. Large sets of shop drawings requiring more than two weeks for review must be specifically provided for in schedule. Simultaneous submittals of multiple sets of shop drawings and other voluminous submittals shall be avoided. The schedule is subject to review and approval of General Contractor and Architect.

3.8 Product Data

- A. **Four (4)** copies of product data shall be submitted as required in various specification sections.
- B. 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, rough-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 the 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 dimension verified by field measurement.
 - f. Notation of coordination requirements.
 - g. Show wiring and controls.
2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
 3. Submittals: Submit one (1) reproducible copy and three (3) sets of prints of each required submittal to General Contractor. Submit two (2) extra copies where required for maintenance manuals. Copies will be retained as indicated for shop drawings.

3.9 Samples

- A. Samples shall be submitted as required in various specification sections and include physical examples to illustrate materials, equipment or workmanship, and to establish standards by which completed work is judged.
- B. Office Samples: Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.
 1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to match the Architect's Sample. Include the following:
 - a. Generic description of the Sample.
 - b. Sample source.
 - c. Product name or name of manufacturer.
 - d. Compliance with recognized standards.
 - e. Availability and delivery time.
 - f. Where variation in color, pattern, texture, or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3), that show approximate limits of the variations.
 - g. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details or assembly, connections, operation and similar construction characteristics.
- C. Field samples and Mock-ups: Field Samples are full-size examples erected on site to illustrate finishes, coatings, or finish materials and to establish the standard by which the Work will be judged.
 1. Erect at Project site at location acceptable to Architect and Owner.
 2. Construct each sample or mock-up complete, including Work of all trades required in finished Work.

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3. Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.
- D. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit 3 physical samples; two will be returned marked with the action taken.
 1. Maintain record of Samples, as returned, at the Project site, for quality comparisons throughout the course of construction.

3.10 Submittals for Project Closeout

- A. When the following are specified in individual sections, submit them at project closeout:
 1. Operation and maintenance data.
 2. Warranties.
 3. Other types as indicated.
- B. Submit for Owner's benefit during and after project completion.

3.11 Number of Copies of Submittals

- A. Documents for Review:
 1. ***It is preferable to submit one electronic copy in PDF format in lieu of hard copies. An electronically-market up file will be returned. Create PDFs at native size and right-side up. Illegible files will be rejected.***
 2. If hard copies are submitted, submit the number of copies that Contractor requires, plus two copies that will be retained by Architect.
- B. 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. Identify by reference to the sheet and detail numbers shown on Contract Drawings.
 5. Notation of coordination requirements.
 6. Notation of dimensions established by field measurement.
 7. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8½ "x 11" but no larger than 24" x 36".
 8. Submittal: **Four (4) sets** of prints for all shop drawings direct to General Contractor who shall review shop drawings and make further distribution to Architect.
- B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 1. After review, produce duplicates.
 2. Retained samples will not be returned to Contractor unless specifically so stated.

- C. Documents for Project Closeout: Provide an electronic copy in PDF format of all reviewed submittals. See Section 01 7800 – Project Closeout.

3.12 Contractor's Responsibilities

- A. Review Submittals, prior to submission, for compliance with Construction Documents. The Contractors review of each Submittal shall be indicated by stamp, date and signature of a responsible person.
- B. Verify:
 - 1. Field measurements.
 - 2. Field construction criteria.
 - 3. Catalog numbers and similar data.
- C. Coordinate each submittal with requirements of Work and Contract Documents.
- D. Contractor's responsibility for errors and omissions in submittals is not relieved by Architect's review of submittals.
- E. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by Architect's review of submittals, unless Architect gives written acceptance of specific deviations.
- F. Notify Architect in writing at time of submission, of deviations in submittals from requirements of Contract Documents.
- G. Begin no work which requires submittals until return of submittals with Architect's stamp and initials or signature indicating review.
- H. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities.
 - 1. Do not proceed with installation until an applicable copy of Product Data is in the installer's possession.
 - 2. Do not permit use of unmarked copies of Product Data in connection with construction.

3.13 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.

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- 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 resubmittals.
 - a. Allow **two weeks** by the Architect 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. No extension of Contract Time will be authorized because of failure to transmit submittals to the General Contractor sufficiently in advance of the Work to permit processing as specified.
- B. Large sets of shop drawings requiring more than two weeks for review must be specifically provided for in schedule. Simultaneous submittals of multiple sets of shop drawings and other voluminous submittals shall be avoided. The schedule is subject to review and approval of General Contractor and Architect.
- C. 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. 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.
- D. 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.
 1. An imprint of the stamp, signed and dated by the Contractor, shall be made above the title block of the submitted shop drawings, on product data in a location which will not obscure the information, or on a tag used to identify samples and similar submittals.
 2. Shop drawings which do not bear the imprint of the stamp, signed and dated by the Contractor, or which do not reasonably comply with the Contract Documents shall be returned to the Contractor, shipping charges collect, and without the Architects review.
- E. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from subcontractor to General Contractor using a transmittal form. Submittals received from sources other than the subcontractor will be returned without action.

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1. 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.

3.14 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 subcontractor's responsibility as indicated in Agreement Form.
- B. Action Stamp: Architect will stamp each submittal with a uniform, self-explanatory action stamp. Stamp will be appropriately marked, as follows, to indicate the action taken:
 1. Final Unrestricted Release: Where submittals are marked "**Reviewed**", 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 "**Furnish as Corrected**", 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.
 3. Returned for Resubmittal: When submittal is marked "**Revise and Resubmit**", 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 to obtain a different action mark.
 - a. Do not permit submittals marked "Resubmit" to be used at the Project site or elsewhere where Work is in progress.
 4. Return for Resubmittal: When submittal is marked "**Rejected**", do not proceed with that part of the work covered by the submittal. Submittal has failed to comply with specification. Prepare a new submittal to comply with construction documents and resubmit without delay.
 5. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "**For Information Only**".
- C. Review of separate items does not constitute review of an assembly.
- D. Architect's review is solely for compliance with the design intent of the project and information given in the contract Documents.

END OF SECTION

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Shop Drawing/Data/Sample Submittal Schedule

Owner: **City of Dublin, OH**
 Architect: Ford & Associates Architects
 Structural: Shirk & O'Donovan Engineers
 MPE: McMullen Engineering Co., Inc.

Spec Section	Description	Schedule Submittal Date	Date Rec'd by Contractor	Date Sent to Architect	Date Returned by Architect	Date Returned to Sub	Approval Status	Contractor/Subcontractor
A201	Construction Schedule							
A201	Schedule of Values							
01 3000	Completed Submittal Schedule							
01 6310	Product Substitutions							
02 5100	Portland Cement Concrete							
03 3000	Concrete Design Mixes Concrete Curing & Mixes							
03 3000	Reinforcing Steel & Imbeds							
04 2000	Standard CMU Manufactured Stone Mortar Color Selections Masonry Accessories							
06 1000	Rough Carpentry							
06 4013	Exterior Woodwork							
07 1300	Roofing Underlayment							
07 2616	Vapor Retarder							
07 2100	Batt Insulation Rigid Exterior Wall Insulation Semi-Rigid Insulation							

Spec Section	Description	Schedule Submittal Date	Date Rec'd by Contractor	Date Sent to Architect	Date Returned by Architect	Date Returned to Sub	Approval Status	Contractor/ Subcontractor
07 2200	Roof Insulation							
07 2616	Vapor Retarders							
07 2760	Fluid Applied Weather Barrier							
07 5300	Single Ply Membrane Roofing Roof Plan and Referenced Roof Warranty and Details							
07 6100	Metal Roofing							
07 6200	Flashing and Sheet Metal Color Selections							
07 8400	Fire Stopping							
07 9005	Joint Sealers - Technical Data & Details - Color Selections							
08 1113	Exterior - Standard Steel Doors and Frames							
08 4113	Aluminum Entrances and Storefronts							
08 7100	Finish Hardware							
08 8000	Glass and Glazing							
09 2116	Gypsum Drywall							
09 9000	Paint Materials							
09 9860	Fiberglass Wall Panels							
10 1400	Identifying Devices							
10 1650	Toilet Partitions							
10 2005	Louvers							
10 2813	Toilet Accessories							

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SECTION 01 4100 - TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 Section Includes

- A. An Independent Testing Laboratory, selected and paid for by the Contractor and approved by the Owner, shall perform the professional testing and laboratory services. Contractor shall coordinate all work with appropriate inspections and tests.
- B. Materials and workmanship not meeting the required standards or performance obligations are to be removed and replaced at the Contractor's expense, including all subsequent testing.
- C. Where the terms "Inspector" and "Testing Laboratory" are used, they mean and refer respectively to an officially designated and accredited inspector of the testing laboratory and the testing laboratory engaged by the Contractor.
- D. Related Requirements Specified Elsewhere:
 - 1. Refer to paragraphs 3.3.3, 4.2.6, 12.2.1.1 and 13.5 of the General Conditions.
 - 2. In the event of conflict between requirements of the General Conditions and this Section concerning testing laboratory services, for the specific items of construction listed in Section 01 4100, the requirements of Section 01 4100 shall govern.

1.2 Work Included

- A. Inspection and testing of soil compaction and soil density.
- B. Inspection and testing of concrete work including design mixes, placement and reinforcing steel.
- C. Keeping inspection and test logs of all inspections and tests.
- D. Submitting to Architect, Engineer, Contractor and Owner certifications, records and reports of all inspections and tests.
- E. Inspection and testing of mortar, grout and concrete masonry units, including design mixes and placement of reinforcing.

1.3 Submittals (Certification)

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Submit one copy each to Architect, Consulting Engineer, Contractor and Owner of certification of each inspection and test required.

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- C. In each certificate state details of each inspection and test to indicate satisfactory compliance with requirements of the specifications and/or drawings or unsatisfactory conditions or failure to comply with requirements.

1.4 Responsibilities of Contractor Regarding Testing Laboratory

- A. Selection of the laboratory in no way relieves the Contractor of his responsibility to furnish materials and construction in full compliance with the Contract Documents.
- B. Notify the laboratory of material sources and furnish without cost, necessary quantities of representative samples to laboratory of materials proposed for use which are required to be tested.
- C. Give timely notice to the laboratory when the various construction operations requiring testing or inspection are to be performed.
- D. Advise laboratory to complete any required check-tests and assign personnel for field inspection and testing as specified.
- E. Provide adequate facilities for safe storage of test samples on project site.
- F. Furnish such nominal labor as is required to assist laboratory personnel in obtaining and handling samples at site.

1.5 Authority and Duties of Laboratory Personnel

- A. Laboratory personnel shall inspect and/or test materials, assemblies, specimens and work performed including design mixes, methods and techniques as specified and report results to Architect, Structural Engineer, Owner and Contractor.
- B. Should it appear that the material furnished or work performed fails to meet requirements of Contract Documents, laboratory shall direct the attention of the Contractor and the Owner's Representative to such failure or infringement.
- C. The laboratories are not authorized to revoke, alter, relax, enlarge or release any requirements of the Contract Documents, or to approve or accept any portion of the work. The duty of the laboratories is to test and/or sample and report on a time basis.

PART 2 - PRODUCTS

2.1 Materials

- A. Materials in conjunction with the work of this Section shall be as required for the various tests.

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PART 3 - EXECUTION

3.1 Testing of Concrete

- A. Refer to Section 03 3000 for specific requirements. These apply to all concrete placed for Section 03 3000.

3.2 Subgrade Density Test

- A. Establish moisture density relationships of subgrade and select fill in accordance with ASTM D-698.
- B. Perform in place density test of completed select fill subgrade beneath building slabs-on-grade and stabilized sub-grade beneath paving in accordance with ASTM D-2167 as follows:
 - 1. Building Subgrade: One test per lift for each 5,000 SF area.
 - 2. Paving Subgrade: One test for each 8,000 SF area.

END OF SECTION

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SECTION 01 5000 - TEMPORARY FACILITIES

PART 1 – GENERAL

1.1 Section Includes

- A. This Section specified requirements for temporary services and facilities, including temporary utilities, temporary construction and support facilities, and temporary security and protection.
- B. Temporary utilities required include but are not limited to:
 - 1. Temporary electric service for power and light.
 - 2. Temporary lighting.
 - 3. Temporary water.
 - 4. Storm and Sanitary Services.
- C. Temporary construction and support facilities required include but are not limited to:
 - 1. Temporary heat.
 - 2. Field offices and storage sheds.
 - 3. Temporary sanitary facilities, including drinking water.
 - 4. Temporary construction barriers.
 - 5. Waste disposal services.
 - 6. Temporary roads, site access, and parking.
 - 7. Rodent and Pest Control.
- D. Security and protection facilities required include but are not limited to:
 - 1. Temporary fire protection.
 - 2. Barricades, warning signs, lights.
- E. Related Sections:
 - 1. Protection for public, employees, and occupants - Ref: AIA Document A201.
 - 2. Cutting and patching - Ref: Section 01 1045.
- F. General Requirements Relating to Temporary Facilities:
 - 1. Any Subcontractor requiring temporary service facilities before it can be provided as specified, or whose requirements with respect to a particular service differ from the service specified shall provide service as required to meet his needs, at his own expense and in a manner satisfactory to General Contractor and Architect.
 - 2. Each Subcontractor shall be responsible for his own necessary temporary drainage for his work and shall use trenches, drains, sumps, or other necessary elements as required to afford satisfactory working conditions for execution and completion of the work of all Subcontractors and to protect all work.
 - a. Pumping of water from excavations (including site utilities) shall be done by each Subcontractor as required for their work.

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3. Subcontractor shall maintain temporary facilities and keep in good operating condition of the entire construction period. Provide maintenance men necessary to perform this work. Maintenance time will include normal working hours for all trades and start up and shut down overtime as required.
4. Permanent building equipment and devices used for provisions of temporary hoisting, heating, power, light, water and sanitation shall be put in new condition immediately before final acceptance by Owner. Unless stated otherwise, the warranty for all equipment and devices listed above shall be for a period of one year following date of Substantial Completion.

1.2 Quality Assurance

- A. Regulations: Comply with all U.S. Department of Labor OSHA requirements, industry standards and applicable laws and regulations of 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. Inspections: If required by local code officials, arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.3 Project Conditions

- A. Conditions of Use: Subcontractor shall 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.
- B. Temporary work shall be installed in a manner to not interfere with permanent construction. If interferences do occur, it shall be the Subcontractor's responsibility to make required changes to overcome the interference.
- C. Subcontractors shall restore all damaged off-site and on-site paved areas used for storage and by construction vehicles to conditions equal to or better than original.
- D. Coordinate and cooperate with General Contractor in scheduling work and using spaces, including parking spaces and driveways.

PART 2 - PRODUCTS**2.1 Materials**

- A. General: Subcontractor shall provide new materials; if acceptable to Architect and General Contractor, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for use intended.
- B. Water: Provide potable water approved by local health authorities.

2.2 Equipment

- A. General: Provide new equipment; if acceptable to General Contractor and Architect, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.
- B. First Aid Supplies: Comply with governing regulations.
- C. Fire Extinguisher: Provide hand-carried, portable UL-rated, class "A" fire extinguisher for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguisher, or a combination of extinguisher of NFPA recommended classes for the exposures.
 - 1. Comply with NFPA 1- and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

2.3 Temporary Electric Service for Power and Lighting

- A. Electrical Contractor: Provide labor and material for installation and maintenance of temporary light and power for construction purposes for all trades including cost of running or extending temporary service from the utility supply.
 - 1. Arrange and pay for temporary pole line construction, if required, from the public utility.
- B. Service shall consist of weatherproof, grounded electric service and distribution systems of sufficient size, capacity, and power characteristic during construction period. Include panelboards, grounding, branch circuits, switches, transformers, overload protected disconnects, automatic ground-fault necessary to provide a complete operating system including any special power company fees.
 - 1. 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.
 - 2. 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.

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3. 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.
- C. Layout, balance, and size temporary wiring to produce a voltage drop of no more than 5 percent at the extreme end of the line when operating at full load.
- D. Electrical Contractor shall be responsible for a safe and satisfactory temporary wiring installation, shall maintain entire system at all times and remove temporary wiring when permanent wiring is installed.
- E. Each Subcontractor using temporary electrical service shall furnish their own extension cords, receptacle plugs, and adopters. (See also "Field Offices and Storage Sheds" in this Section for additional requirements.)
- F. Temporary services to heavy equipment, such as hoists and lifts, will be the responsibility of Subcontractors requiring the temporary service.
- G. No temporary wiring, fittings, receptacles, or other parts of the temporary system shall be used in the permanent electrical installation.
- H. Cost of electrical power consumed during construction period shall be paid by General Contractor until Substantial Completion.

2.4 Temporary Water

- A. Plumbing Contractor: Coordinate with local utility and connect to main at street. Provide temporary meters and extend service to central location on site.
- B. Plumbing Contractor: Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use. Furnish and install temporary risers, hose bibbs, and other items required for temporary service. Protect temporary water service from damage and freezing.
 1. Sterilization: Sterilize temporary water piping before use.
 2. Locate outlets so any part of building construction can be reached with 100 foot hose extension.
 3. Each subcontractor shall be responsible for transporting water from each new water service location to point of use and coordinating use with other trades.
 4. Provide permanent main water service throughout new facility as soon as practical to distribute water for sanitary and construction purposes.
- C. Cost of water reasonably used for construction purposes will be paid for by General Contractor.

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2.5 Storm and Sanitary Service

- A. Sewers and Drainage: The subcontractor responsible for providing storm and sanitary service shall filter out excessive amounts of soil, construction debris, chemicals, oils and similar contaminants that might clog sewers or pollute waterways before discharge.

2.6 Field Offices and Storage Sheds

- A. Each Subcontractor: At his option, may provide own job site construction trailer for field offices. Location determined on job site by the General Contractor.
 - 1. Electrical power for lights and power will be extended to each enclosure by Electrical Contractor at subcontractor's expense. Each Subcontractor shall provide wiring, fixtures, and outlets required within own enclosure and pay for power and fixture bulbs used in own facility.
 - 2. Provide insulated, prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows and serviceable finishes. Provide heated and air-conditioned units on foundations adequate for normal loading.
 - 3. Each Subcontractor: Provide required heating and cooling within own enclosure.
 - 4. Each Subcontractor: Provide telephone and telephone service and make telephone available to their subcontractors and suppliers.
- B. Each Subcontractor: Provide suitable watertight storage enclosure(s) of suitable size for all materials subject to weather damage.
 - 1. Provide secure locked storage for materials and equipment to be stored on project site. Enforce discipline in connection with installation and release of material to minimize theft or vandalism.
- C. Each Subcontractor: Maintain a copy of all permits, contract drawings, and project manual marked up-to-date with revisions, addenda, change orders, and as-built drawings on file at the field office, available for use at all times.

2.7 Temporary Sanitary Facilities, Including Drinking Water

- A. 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 service project needs.
- B. General Contractor: Provide temporary portable self-contained chemical type toilets, acceptable to public health authorities.
- C. Each Subcontractor shall provide his own drinking water.

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2.8 Temporary Construction Barriers and Fences

- A. Construction Fence: General Contractor shall construct and maintain a temporary construction fence where indicated with suitable access gates to remain until building can be secured.
- B. Provide and maintain temporary stairs, ladders, ramps, railings, guards, runways, and similar constructions required for proper execution of the work of all trades to protect and secure the site from the public, and to allow the public safe access around the site.

2.9 Waste Disposal Services

- A. General Contractor: Responsible to keep the entire project site in a clean and sanitary condition during the entire progress of the Work and shall post and take precautions to keep the site clean.
 - 1. Provide a dumpster or other trash container of adequate size for use by all Subcontractors. Rental and dump fees shall be paid by the General Contractor.
- B. Each Subcontractor: Maintain project site in a neat and orderly manner. Remove daily packaging material and other debris from his work and deposit in trash container or other location indicated by General Contractor. Areas shall be left broom clean at the end of each construction activity.
 - 1. Comply with NFPA 241 requirements 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 degrees F. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly.
- C. If Subcontractors do not clean up and dispose of their waste materials in a reasonable length of time, General Contractor will do the required work. Cost of the work will be charged to responsible Subcontractor.
- D. General Contractor shall remove any unidentifiable debris as it accumulates.

2.10 Site Access and Parking

- A. Parking:
 - 1. On-site parking by Subcontractors and workers will be provided as directed by the General Contractor and Owner.

2.11 Weather Protection

- A. Each Subcontractor is responsible for protecting his work and existing or adjacent property against weather and maintaining his work, materials, apparatus, and fixtures free from injury or damage during the construction

period. Cover or protect work at the end of each day's work. Remove work damaged by failure to provide protection and provide new work meeting project requirements at subcontractor's expense.

2.12 Project Identification Signs

- A. General Contractor to provide project identification sign.

2.13 Barricades, Warning Signs, and Lights

- A. Each Subcontractor shall provide, maintain, and remove all barricades, warning lights, and other safety devices required for the security, protection, and safety of his work and employees as well as the public.
- B. Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform Contractor's and Owner's personnel and the general public of hazards being protected against.
 - 1. Provide lighting, including flashing red or amber lights, when required at barricades, railings, obstructions in streets, drives, or sidewalks and at all trenches or pits adjacent to public walks or roadways.
- C. General Contractor: Maintain safety barricades through construction process and remove when directed.
- D. Each Subcontractor: Plan and conduct work operations so traffic is maintained at all times on adjacent streets and drives. Furnish lights, signs, barricades, and watchmen necessary for safe flow of traffic, 24 hours daily.

2.14 Watchman Services

- A. Watchman service is not required of the project. Job security is the responsibility of each Subcontractor. If any Subcontractor desires watchman service, they shall provide the service at their own cost.

PART 3 - EXECUTION**3.1 Installation**

- A. Subcontractor shall 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 Utilities Installation

- A. General: Employ appropriate local utility company to install temporary service or connect to existing service. Where company provides only part of the service, Subcontractor shall provide remaining work with matching, compatible materials and equipment complying 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. If required this work shall be performed after normal working hours with no additional cost to the General Contractor or Owner.
 2. Provide adequate capacity at each stage of construction. Before temporary utility availability, provide trucked-in services.
 3. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner, General Contractor, or Architect, and will not be accepted as a basis of claims for a Change Order.

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 before Substantial Completion, unless otherwise accepted by the General Contractor. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the General Contractor.
- B. 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.

3.4 Operation, Termination and Removal

- A. Supervision: Subcontractor shall 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: Subcontractor shall maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
1. Protection: Prevent water filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. General Contractor: Keep surrounding streets and properties clear of mud and construction debris. Subcontractors shall cooperate with General Contractor in keeping streets clean.

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- D. Termination and Removal: Unless General Contractor requests that it be maintained longer, Subcontractor shall 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 subcontractor.

END OF SECTION

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SECTION 01 6310 - PRODUCT SUBSTITUTIONS

PART 1 - GENERAL

1.1 Section Includes

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

1.2 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 Subcontractor after award of the Contract are considered requests for "substitutions." The following are not considered substitutions.
 - 1. Substitutions requested in writing by Bidders during the bidding period, and accepted before award of Contract, are considered as included in the Contract Documents and are not subject to requirement specified in this Section for substitutions.
 - 2. Specified options of products and construction methods included in Contract Documents.
 - 3. The Subcontractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.3 Submittals

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Substitution Request Submittal: Requests will be considered after start of the Work.
 - 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.

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- 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 Subcontractor'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 Subcontractor 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 Subcontractor'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 2 weeks of receipt of the request, or one week of receipt of the additional information or documentation, whichever is later, the Architect will notify the General Contractor of acceptance or rejection of the proposed substitution. If a decision on use of a propose substitute cannot be made or obtained within the time allocated, use the product specified by name.

PART 2 - PRODUCTS

2.1 Substitutions

- A. Conditions: The Subcontractor's substitution request will be received and considered by the Architect and General Contractor when one or more of the following conditions are satisfied, as determined by the Architect and General Contractor; 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.

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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 of the Owner may include additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or separate Subcontractors, 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 Subcontractor 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 subcontractor certifies that the proposed substitution can be coordinated.
 10. The specified product or method construction cannot provide a warranty required by the Contract Documents and where the Subcontractor certifies that the proposed substitution provide the required warranty.
 11. Where a proposed substitution involves more than one Subcontractor, each Subcontractor shall cooperate with the other Subcontractors involved to coordinate the Work, provide uniformity and consistency, and to assure compatibility of products.
- B. The subcontractor's submittal and Architect and General Contractor'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**

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SECTION 01 6320 – SUBSTITUTION REQUEST FORM

To: _____ Project: _____

We hereby submit for your consideration the following product instead of the specified item described as:

Specified Item: _____

Item specified in: Section _____ Section Title _____ Paragraph _____ Page _____

Proposed Substitution: _____

The reason for this substitution: _____

Attach complete product description, drawings, photographs, performance and test data, and other information necessary for evaluation. Identify specific model numbers, finishes, options, etc. Note: For substitutions of items in Divisions 1 through 14, send additional copy of request with attachments to the Architect.

Will changes be required to the building design in order to properly install proposed substitutions?

Yes _____ No _____ If Yes, explain: _____

Will the undersigned pay for changes to the building design, including engineering and drawings costs, caused by the requested substitution?

Yes _____ No _____

List differences between proposed substitution and specified item below:

<i>Specified Item:</i>	<i>Proposed Substitution:</i>
_____	_____
_____	_____

Does substitution affect drawing dimensions? Yes _____ No _____

If Yes, explain: _____

What effect does substitution have on other trades? _____

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Does manufacturer's warrant of proposed substitution differ from that specified? Yes No___

If Yes, explain:_____

Will substitution affect progress schedule: Yes ___ No ___

If Yes, explain:_____

Will substitution require more license fees or royalties than specified product? Yes_____ No___

If Yes, explain:_____

Will maintenance & service parts be locally available for substitution? Yes___ No ___

If Yes, explain:_____

Does the substitution contain asbestos in any form? Yes_ No___

Date Submitted:_____ **Firm:**_____

Submitted by:_____ **Address:**_____

Signature:_____ **Telephone:**_____

For Architect's Use Only:

Accepted:_____

Accepted as Noted:_____

Not Accepted:_____

Received Too Late:_____

Reviewed by:_____

Date: _____

Remarks:_____

SECTION 01 7000 - PROJECT CLOSE-OUT**PART 1 - GENERAL****1.1 Section Includes**

- A. This Section specifies administrative and procedural requirements for project close-out, including but not limited to:
 - 1. Inspection procedures for Substantial Completion and Final Completion.
 - 2. Project record document submittal.
 - 3. Operating and maintenance manual submittal.
 - 4. Submittal of warranties.
 - 5. Final cleaning.
 - 6. Close-out requirements for specific construction activities are included in the appropriate Sections in Division 3 through 26.

1.2 Substantial Completion

- A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, Subcontractor shall complete the following. List all 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 General Contractor 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, and similar final record information.
 - 6. Deliver tools, spare parts, extra stock, and similar items.
 - 7. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
 - 8. 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, Architect, General Contractor and Representatives from Owner will either proceed with inspection or advise Subcontractor of unfilled requirements. General Contractor will prepare the Certificate of Substantial Completion following inspection, or advise

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

1. When Subcontractor believes the Work is Substantially Complete, he shall notify the General Contractor in writing and accompany the letter with his Punch List of items to be completed and corrected before final completion. General Contractor will verify this list and then schedule with Architect and Subcontractor for inspection.
2. Architect and Consulting Engineers will observe Work, verify Substantial Completion has been reached, and verify Subcontractor's Punch List or amend it. Verified or amended Punch List will be attached to Certificate of Substantial Completion.
3. If, in Architect and General Contractor's judgment, project cannot be considered Substantially Complete, he shall notify subcontractor of items to be completed or corrected before Certificate of Substantial Completion can be issued.
4. If subcontractor's Punch List is inadequate and an excessive number of items remain to be completed or corrected, the Work will not be considered Substantially Complete and the review terminated.
 - a. Architect and Consulting Engineers will make only two inspections to determine Substantial Completion. If the Work is not Substantially Complete, successive inspections required will be back charged to subcontractor at the Architect's and Consulting Engineer's current billing rate, including mileage and travel time.
 - b. Payment to subcontractor may be withheld from subcontractor's remaining payment due to compensate for this cost.
5. Results of the completed inspection will form the basis of requirements for final acceptance.

1.3 Final Acceptance

- A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, Subcontractor shall complete the following. List all exceptions in the request.
 1. Submit 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 Architect's final inspection list of items to be completed or corrected, stating each item has been completed or otherwise resolved for acceptance, and list has been endorsed and dated by Architect and General Contractor.
- B. Re-inspection Procedure: Architect and General Contractor will re-inspect 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 Architect and General Contractor.

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1. Upon completion of re-inspection, Architect will prepare a certificate of final acceptance or advise Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
2. Architect and Consulting Engineers will make only one inspection to determine final completion. If Work is not finally complete, successive inspections required shall be back charged to subcontractor at Architect's and Consulting Engineer's Current billing rate, including mileage and travel time.
 - a. Payment to subcontractor may be withheld from subcontractor's remaining payment due to compensate for this cost.

1.4 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 and Owner's reference during normal working hours.
- B. Record Drawings: Subcontractor shall maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark set to show actual installation where 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: Subcontractor shall 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 specification text and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot 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 transmittal to the Owner's records.
- D. Maintenance Manuals: Subcontractor shall organize five (5) sets of operating and maintenance data into suitable sets of manageable size. Bind properly

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indexed data in an 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. 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.

E. Warranty Manual:

1. In a separate but similar binder to the Maintenance Manual, each Subcontractor shall include five (5) sets of all required guarantees, warranties, and maintenance contracts for items as they exist in a form that is transferable from Owner to Tenant. Statements of warranty shall be jointly signed by manufacturer, installer, and Contractor and shall identify the Project by name, commission number, and address. In addition, indicate duration and expiration of each warranty and guarantee. All warranties shall be assignable.

F. Other Items: Include updated list of Suppliers and Subcontractors.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 Close-out Procedures

A. Substantial Completion

1. When the Contractor considers the work substantially complete, he shall submit to the Architect/Owner's Representative:
 - a. A written notice that the work or designated portion thereof is substantially complete.
 - b. A list of items remaining to be completed or corrected.
2. Within a reasonable time after receipt of such notice, the Architect, Owner's Representative and the Contractor will make an inspection to determine the status of completion.
3. When the Architect, Owner's Representative and Contractor have concurred that the work is substantially complete, the following documents will be completed by the Contractor and submitted to the Owner's Representative and Architect simultaneously:
 - a. Certificate of Substantial Completion on AIA Form G-704.
 - b. Punch-list of items remaining to be completed or corrected.
 - c. Contractor shall complete all punch list items within 15 days.

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- B. Final Inspection
 - 1. When Contractor considers work to be complete, he will submit written certification to the Architect and Owner's Representative verifying that:
 - a. Work has been completed and inspected in accordance with the Contract Documents.
 - b. Equipment and systems have been tested in the presence of the Owner's Representative and are operational.
 - c. Contractor to arrange for a Final Inspection.
 - 2. After receipt of written Certification, the Architect and Owner's Representative will make an inspection to verify the status of completion of the punch list items.
 - 3. Should the Architect and Owner's Representative determine that the work is incomplete or defective:
 - a. Architect and Owner's Representative will promptly notify Contractor, in writing, listing the incomplete or defective work.
 - b. Contractor shall take immediate steps to remedy the stated deficiencies, and send a second Certification to the Architect and Owner's Representative that the Work is complete.
 - c. The Architect and Owner's Representative will re-inspect the Work.
 - 4. When the Architect and Owner's Representative find that the work is acceptable under the Contract Documents, he shall request the Contractor to make Close-out Submittals.
- C. Contractor's Close-out Submittals to Architect and Owner's Representative
 - 1. Contractor must submit to Architect and Owner's Representative evidence of compliance with requirements of governing authorities.
 - a. Certificate of Occupancy
 - b. Certificate of Inspections
 - 1. Mechanical
 - 2. Plumbing
 - 3. Electrical
 - 4. Fire Marshall
 - 5. Building
 - 2. Contractor must submit to Architect and Owner's Representative all Project Record Documents to the requirements of each respective section in this Project Manual, i.e.: Schedules, Operating and Maintenance Data, Warranties and Bonds, Keys and Keying Schedule, Evidence of Payment and Release of Liens, Certificates of Insurance, etc.
- D. Final Application for Payment
 - 1. Before final payment can be released to the Contractor and subsequently to the Subcontractors, the Contractor shall submit to the Owner's Representative all items as listed on the attached "Project Close-out Checklist". Subcontractor shall submit same to the Contractor in the quantity identified.

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2. Contractor shall submit to Owner's Representative, along with items as listed on "Project Close-out Checklist", the Final Statement of Accounting on AIA Form G702.

3.2 Final Cleaning

- A. General: General cleaning during construction is required by the General Conditions and included in Section 01500, 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.
 2. General Contractor:
 - a. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Leave concrete floors broom clean.
 - b. Clean the site of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are not paved or 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

PROJECT CLOSEOUT STATUS

Project Name: Coffman Park Expansion, 2A
 Location: 6565 Commerce Parkway
 Dublin, Ohio 43017
 FAA Project No: 14051.00

Owner: The City of Dublin
 Architect: Ford & Associates Architects
 Structural: Shirk & O'Donovan Engineers
 MPE: McMullen Engineering Co.
 Landscape Architect: MKSK

PROJECT MANUAL	NOT COMPLETED	NOT APPROVED	COMPLETED
4 BOUND MANUALS			
CERTIFICATE OF OCCUPANCY			
1 YR. WARRANTY BY GENERAL CONTRACTOR			
SUBCONTRACTOR LIST W/ PHONE NO.			
SUBCONTRACTOR LIEN WAIVERS			
SUBCONTRACTOR 1 YR. WARRANTY (or as specified)			
SUBCONTRACTOR 5 YR. WARRANTY at SEALANTS			
SUBCONTRACTOR 15 YR. WARRANTY at ROOFING			
SUBCONTRACTOR PRODUCT LITERATURE			
MECHANICAL SYSTEMS SECTION			
PLUMBING SYSTEMS SECTION			
ELECTRICAL SYSTEMS SECTION			
SPARE PARTS & MAINT MATL CHECKLIST SIGNED			
PUNCH LIST ITEMS COMPLETED			
HEALTH DEPT. APPROVAL (where applicable)			
CERTIFICATE OF INSURANCE			
FINAL METER READINGS @ DATE OF SUBSTANTIAL COMPLETION			
SIGNED COPY OF SUBST. COMPLETION FORM			

PROJECT CLOSEOUT STATUS

RECORD DRAWINGS	NOT COMPLETED	NOT APPROVED	COMPLETED
TWO SETS (AS BUILT) BLUE LINES			
ALL ADENDA AND PROJECT BULLETINS INCORPORATED			
ALL FIELD CHANGES INCORPORATED			
INDICATE ALL SEWER INVERT ELEVATIONS			
LOCATE CONCEALED DUCTWORK OFF GRID			
LOCATE CONCEALED ELEC. CONDUIT OFF GRID			
LOCATE CONCEALED WATER LINES OFF GRID			
LOCATE CONCEALED WASTE LINES OFF GRID			
LOCATE STORM DRAIN LINE INVERTS (if applicable)			
ADD NAMES, ADDRESSES & PHONE #'s OF SUBCONTRACTORS TO DRAWINGS - front cover			
SIGNED BY G.C. & DATED - front cover			
SIGNED BY G.C. & DATED - front cover			

Division 2

Sitework

Coffman Park Expansion
Phase 2A
6565 Commerce Parkway
Dublin, Ohio 43017

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SECTION 02 2000 - SITE GRADING AND EXCAVATION

PART 1 - GENERAL

1.1 Section Includes

- A. Includes labor, materials, equipment, and accessories specified, shown, or reasonably implied, for Earthwork.
- B. The following operations are included in this section:
 - 1. Verification / preparation of existing subgrade +/- inch.
 - 2. Compacted fill under and around structures shall be per on-site Soils Engineer recommendations.
 - 3. Excavation and backfilling including the footings and miscellaneous items, per on-site Soils Engineer recommendations.
 - 4. Trenching and backfilling for utility lines.

1.2 Related Requirements

- A. Coordinate all clearing and site utilities with Site Development Plans and Site Electrical Drawings.
- B. Coordinate all earthwork with on-site Soils Engineer.
- C. Civil Engineering documents prepare by **EcoDesign & Engineering**, latest issue.

1.3 Inspection of the Site

- A. Prior to bidding the Work, the Contractor shall examine, investigate and inspect the construction site as to the nature and location of the Work, and the general and local conditions at the construction site, including without limitation, the character of surface or subsurface conditions and obstacles to be encountered on and around the construction site; and shall make such additional investigation as he may deem necessary for the planning and proper execution of the Work.
- B. Refer to the Drawings for data pertaining to levels of the site and scope of earth moving, if required.

1.4 Job Conditions

- A. Existing Utilities: Soils Reports as provided throughout project. Other sections of these specifications which apply.
 - 1. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Architect immediately for directions as to procedure. Cooperate with public utility companies in keeping services and facilities in operation. Repair any damaged utilities.
- B. Protection of Persons and Property: Barricade open excavations. Protect structures, utilities, sidewalks, pavements, and other facilities immediately

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adjacent to excavations from damages caused by settlement, lateral movement, undermining, washout, and other hazards.

- C. Provide bracing and shoring to guard against movement or settlement of existing improvements or new construction. Contractor is entirely responsible for strength and adequacy of bracing and shoring, and for safety and support of construction from damage or injury caused by the lack thereof or by movement or settlement.

1.5 Quality Assurances

- A. Testing: Testing shall be the responsibility of the Contractor. Testing shall be performed by an approved commercial testing laboratory or tests may be made by the Contractor subject to approval. The testing firm will immediately report any failing tests to the site superintendent. If the situation cannot be resolved that day, the Owner and Architect will be contacted to resolve any problems. Copies of all test results will be sent to the Owner copied to the Architect on a monthly schedule.
- B. Density Test: As required by Soils Engineer.

PART 2 - PRODUCTS

2.1 Materials

- A. Transported engineered fill from off-site must be clean granular material free from organic contamination and conform to minimum dry weight requirements and approved by the Soils Engineer.
 - 1. All material used for fill shall be free of organic matter, frozen material, or rocks larger than 6", and compactable.
 - 2. In areas accessible to rollers, the fill material shall be bank run sand and gravel or soil with some clay or silt. In areas inaccessible to rollers, use hand operated tamping equipment and granular material only, passing a #3 sieve.
 - 3. Base course material - 3/4 inch course, crushed limestone or gravel.
 - 4. Concrete base material - 3/4 inch course, crushed limestone or gravel.
 - 5. Bank run gravel shall meet ODOT Specifications Item 310.02, Type B or as approved.

PART 3 - EXECUTION

3.1 General Excavation

- A. Excavation shall be unclassified. Excavate to the dimensions and elevations indicated. Excavations below indicated depths shall not be permitted except to remove unsatisfactory material.
- B. Unsatisfactory material encountered below the grades shown shall be removed as directed by the Soils Engineer and replaced with satisfactory material. Place

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satisfactory excavated materials in required fill or embankment areas. Dispose of surplus excavated materials, if any, on site as directed by Owner.

C. Excavation for Structures:

1. Conform to elevations and dimensions shown within a tolerance of plus or minus 1 inch, extend sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, for other construction required, and for inspection.
2. Bottoms for footings shall be level, clean, and clear of loose materials.
3. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete is placed. Trim bottoms to required lines and grades to leave solid base to receive concrete.
4. Excavations for footing below the elevations indicated on the drawings shall be filled with specified footing-type concrete at Contractor's expense.
5. Keep earth under footings dry. Should bearing surfaces be softened by water, re-excavate to solid bearing and fill with concrete of required strength at Contractor's expense.

D. Excavations for Trenches:

1. Excavating shall be performed to remove whatever substances are encountered to grades shown. Excavate unsatisfactory soil materials encountered that extend below the required elevations. Excavations shall be made by open cut.
2. Sides of trenches shall be kept as nearly vertical as practical for safety requirements.
3. Stability of Sides: Slope sides of excavations over 5' deep to angle of repose of material excavated; otherwise shore and brace where sloping is not possible either because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in a safe condition until completion of backfilling by scaling, benching, shelving, or bracing. Take precautions to prevent slides or cave-ins when excavations are made in locations adjacent to backfilled excavations and when sides of excavations are subjected to vibrations.
4. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross-bracers. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.
5. Provide minimum requirements for trench shoring and bracing to comply with ANSI A10.1 "Safety Code for Building Construction".
6. The bottom of trenches shall be accurately graded to provide uniform bearing and support for each section of pipe or conduit on undisturbed soil for the entire length of pipe or conduit.

E. Excavation for Sidewalks and Pavements: Cut the ground under pavements to comply with the cross sections, elevations and grades shown.

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3.2 Dewatering

- A. Perform earthwork and site grading in a manner to prevent water from flowing into excavations and to prevent flooding the project site and the surrounding area.
- B. Do not allow water to accumulate in excavations. Remove water from excavations using dewatering methods which will prevent softening of foundations bottoms, undercutting footings, and soil changes detrimental to the stability of subgrades and foundations. Provide and maintain pumps, sumps, suction and discharge lines, and other dewatering system components necessary to convey the water from the site.
- C. Convey water removed from the excavations and rain water to collecting or fun-off areas. Provide and maintain temporary drainage ditches and other diversions. Do not use trench excavations for site utilities as temporary drainage ditches.

3.3 Material Storage

- A. Stockpile excavated materials classified as satisfactory where directed until required for fill, place, grade, and shape stockpiles for proper storage.

3.4 Fill and Backfill

- A. Do not begin filling until construction below finish grade has been completed, underground utilities systems have been inspected, and tested, forms removed, and the excavation area cleaned of trash and debris. Do not place in wet areas.
- B. The area to receive fill shall be cleared of existing vegetation and the top nine inches scarified and recompacted to the percent of maximum density required for the overlaying fill. Plow, step, bench, or break up sloped surfaces steeper than 1" vertical to 4" horizontal, so that the fill material will bond with the existing material.
- C. All filled areas shall be proof-rolled and inspected by the Soils Engineer. All unstable material, as directed by the Soils Engineer, shall be removed, or stabilized, and the area to be recompacted as directed.
 - 1. Remove all unsatisfactory materials of their full depth and replace with engineered fill. Low strength, high moisture content, natural clay soils beneath the silt, if unstable shall be removed or stabilized. After completing over excavations, the subgrade shall be scarified to a minimum depth of 9 inches, moisture conditioned to 0% to 2% above optimum moisture content and compacted. The top 8 inches of subgrade under the pavement shall be modified as recommended in the soil report and detailed on the plans. Refer to the soil report and the Foundation Plan for preparation of the soil beneath the building.

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- D. Do not place backfill against foundation walls prior to seven days after completion of the walls. As far as practicable, bring backfill evenly on each side of the wall and slope to drain away from the wall.
- E. Do not operate heavy equipment closer to the foundation or retaining walls than a distance equal to the height of the backfill above the top of the footing; compact the area remaining with power driven hand tampers.
- F. The moisture content at the time of compaction shall be at or slightly above the optimum.
- G. For purposes of acceptance the in-place density of the fill shall be defined as that determined by the sand cone method (ASTM D1556) or by nuclear methods (ASTM D2922).
- H. Weather Limitations: Fill shall not be constructed when the atmospheric temperature is below 35 degrees F. When the temperature falls below 35 degrees, it shall be the responsibility of the Contractor to protect areas of completed surface against detrimental effects by methods recommended by the Soils Engineer. Areas damaged by freezing shall be reconditioned, reshaped, and recompacted by the Contractor in conformance with the requirements of this specification at the Contractor's expense.
- I. Slope Protection and Drainage: Slope steeper than one vertical to five horizontal shall be protected as shown.
- J. Backfill excavations as promptly as the work permits, but not until completion of inspection, testing, approval, and recording location of underground utilities.
- K. Trenches: The trenches shall not be backfilled until the utility systems, as installed, conform to the requirements specified and required tests are performed.
 - 1. Approved fill material, free from large clods of earth or stone, shall be placed in 6" layers until the utility line has a cover of not less than one foot. Each layer shall be thoroughly and carefully rammed.
 - 2. Where pipe is coated or wrapped, use backfill material free from stones larger than one inch in dimension up to an elevation of 2 feet above the sewer lines and one foot above other utility lines.
 - 3. Open trenches under driveways, sidewalks, and streets shall be backfilled as specified above, except that additional care shall be taken to tamp the fill to a density equal to that of the surrounding earth; and the top one foot of fill shall be placed in two six inch layers and compacted to 95% of the maximum density using compaction equipment designed for that purpose. If settlement occurs within the guarantee period of this contract, the Contractor shall return, remove all materials to the bottom of the excavation and recompact it to meet the above specification. Avoid damage to coatings, wrappings or tanks.
 - 4. Exposed earth on trenches shall be left in a uniform and neatly shaped condition.

3.5 Gradings and Drainage

- A. General: Uniformly grade areas within the limits of site grading shown including adjacent transition areas. Smooth the finished surface within the specified tolerances; compact with uniform levels or slopes between points and existing grades. Where finish contour lines are not shown, ground surfaces shall be finished to drain away from buildings and minor surfaces shall be finished.
1. The degree of finish required for areas other than lawns and pavement subgrade will be that ordinarily obtainable from either blade-grader or scraper operations.
- B. Walks and Driveways: Shape the surface of areas under walks and drives to line, grade, and cross-section, with the finish surface not more than 0.00' above or 0.10' below the required subgrade elevation, graded to prevent ponding of water after rains.
- C. Drainage: Areas shall be shaped to drain away from structures and building. Provide positive drainage for ten (10) feet away from all structures with a minimum fall not less than six (6) inches measured between the dirt and grassed level at the foundation or edge of structure and the level of the ten (10) foot offset. Collective swales shall be established around the structures as required to carry the drainage to the nearest street or real lot drainage.
- D. Contractor to pursue a sequence of earthwork to ensure proper drainage of the site during the construction phase. If it is not feasible to schedule work in this manner, then contractor shall provide all necessary temporary drainage trenches, swales and devices during the course of construction to keep the site properly drained of surface water.

3.6 Erosion Control

- A. Site contractor to initiate and maintain all erosion control methods as indicated on the drawings.

3.7 Maintenance

- A. Protection of Grade Areas:
1. Protect newly graded areas from traffic and erosion, and keep free of trash and debris.
 2. Repair and re-establish grades in settled, eroded, and rutted areas to the specified tolerances.
- B. Reconditioning Compacted Areas: Where completed areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction. Use hand tamping for re-compaction over underground utilities.

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3.8 Certification of Completed Grading: Upon completion of grading, the Soils Engineer shall:

- A. Certify that the site was graded and filled with acceptable material in accordance with these specifications.
- B. Give his professional opinion regarding remaining shrinkage or settlement, expansive characteristics, slope stability, load bearing qualities, saline or alkaline conditions and of any other conditions pertinent to construction upon the completed cut or fill.

3.9 Finishing

- A. The finished surface shall be constructed so that the average surface elevation of the earth shall not be higher or lower than 0.10 feet of required elevation.
- B. Certification of completed grade elevations shall be submitted by a registered Civil Engineer or licensed Land Surveyor.
- C. All cost for certification shall be borne by the Contractor.

END OF SECTION

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SECTION 02 5100 - PORTLAND CEMENT CONCRETE PAVING

PART 1 - GENERAL

1.1 Section Includes

- A. Work includes all new exterior cast-in place concrete outside the building lines, but not limited to:
 - 1. Furnishing and installing concrete walks, curbs and paving as indicated on drawings.
 - 2. Concrete curb ramps.
 - 3. Forms, reinforcing steel and mesh, shoring, placing, curing and finishing of concrete work noted above as well as all labor, equipment and related items necessary for the Work.
 - 4. Furnishing and installing expansion joint sealers and fillers in pavement against adjoining materials.

1.2 Related Requirements

- A. Concrete Testing and Laboratory Control - Ref: Section 03 3000.
- B. Prepared Sub Base and Aggregate Base - Ref: Section 03 3000.
- C. Concrete and Related Materials - Ref: Section 03 3000.
- D. Joint Sealers - Ref: 07 9005.
- E. Civil Engineering Documents prepared by **EcoDesign & Engineering**, latest issue.

1.3 References

- A. ACI 301 - Specifications for Structural Concrete for Buildings.
- B. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
- C. ANSI/ASTM D1751 - Pre-formed Expansion Joint Fillers for Concrete Paving and Structural Concrete.
- D. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.
- E. ASTM C33 - Concrete Aggregates.
- F. ASTM C150 - Portland Cement.
- G. ASTM C260 - Air-Entraining Admixtures for Concrete.
- H. ASTM C494 - Chemical Admixtures for Concrete.
 - 1. No calcium chloride admixture is permitted.

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1.4 Quality Assurance

- A. Perform work to ACI 301.
- B. Obtain concrete materials from same source throughout.
- C. Contractor is responsible for establishing all elevation reference points.

1.5 Regulatory Requirements

- A. Conform to applicable requirements for paving work on public property.

1.6 Job Conditions

- A. Maintain Owner's access to existing building and access for vehicular and pedestrian traffic as required for construction activities.
- B. Provide flag men, barricades, warning signs and warning lights as necessary to protect persons and property during progress of the Work of this Section.

PART 2 - PRODUCTS

2.1 Materials

- A. Portland Cement: ASTM C-150, Type I or III.
- B. Fine Aggregate: Natural Sand, ASTM C-33.
- C. Course Aggregate: Crushed limestone meeting requirements of ASTM C-33. Maximum size and gradation is accordance with Size No. 67 or 467 in Table II of ASTM C-33.
- D. Water: Potable.
- E. Admixture: Cement-dispersing, water reducing compound such as Pozzolith 100 series, as made by Master Builders. Air entraining agent meeting requirements of ASTM C260.
- F. Reinforcing Bars and Dowels: Deformed steel bars, ASTM A 615, Grade 60, except Grade 40 permitted for No. 3 and No. 2 sizes.
- G. Expansion Joint Materials: Non-extruding, pre-molded filler strips to comply with ASTM D-1782, non-asphaltic.
 - 1. W.R. Meadows: Sealtight, Fibre Expansion Joint Filler.
- H. Joint Dowel Bars and sleeves: 1/2 inch plain round bars, with sleeves at one end, allowing for one inch of movement. Cut bars true to length with ends square and free of burrs.

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- I. Wire Mesh: ASTM A185, minimum 6 x 6 x 1.4 x 1.4 WWF.
- J. Curing Compound: Clear Bond by Guardian Chemical, Kure-N-Seal by Sonneborne or Dress and Seal. ASTM C309, 30 percent solids.
- K. Forms: Nominal 2 inch thickness dimension fir or steel paving forms.

2.2 Concrete Mix, Design and Testing

- A. Comply with applicable requirements of Section 03300 for concrete mix design, sampling and testing, and quality control and as herein specified.
- B. Mixing: Ready mixed concrete in accordance with ASTM C 94.
- C. Slump: Shall not exceed 4 inches per ASTM C-143.
- D. Mix shall be designed by Contractor's testing laboratory to produce standard-weight concrete consisting of Portland cement aggregate, air-entraining admixture and water to produce the following properties:
 - 1. Compressive Strength: 4000 psi, minimum at 28 days.
 - 2. Cement: Gray Portland
 - 3. Slump Range: 2 inches to 4 inches.
 - 4. Air Content: 6% (+/- 1 1/2%).
 - 5. Maximum Aggregate Size: 3/4 inch.

PART 3 - EXECUTION

3.1 Forms and Screeds

- A. Set forms and screeds to the required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of the work so that forms can remain in place at least 24 hours after concrete placement.
- B. Check completed work for grade and alignment to the following tolerances:
 - 1. Top of Form or Screed Units: Not more than 1/8 inch deviation in 10 feet.
 - 2. Vertical Face: Longitudinal axis, not more than 1/4 inch in 10 feet.

3.2 Reinforcement

- A. Place reinforcing steel as detailed and in accordance with ACI 318. Place wire mesh to provide one full mesh lap at sides, minimum 8 inches at ends. Lap bars 36 diameters. Place dowels and sleeves at expansion joints at 24 inches on center maximum. Refer to drawings.

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3.3 Concrete

- A. Convey and place concrete so there is no separation of ingredients in accordance with applicable requirements of Chapter 10 ACI Standard Specifications for Concrete Pavements and Concrete Bases (ACI 617).
 - 1. Do not place concrete when the temperature is below 40 degrees F., or exceeds 90 degrees F.
- B. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hour, place a construction joint. Sections less than 15 feet in length between transverse joints will not be permitted.

3.4 Joints

- A. Construction Joints: Place construction joints at the end of pours, at location where placement operations are stopped for more than 1/2 hour, except where such pours terminate in expansion joints. Construct joints using standard metal sections. Wire mesh, reinforcements must be continuous across all construction joints or provide 36 inch long #6 tie bars at 36 inches on center.
 - 1. Stop all pours at expansion joints and at locations where placement will terminate at vertical elements (curbs, etc.).
 - 2. Construct bulkheads to permit continuation of reinforcing steel.
 - 3. Where load transfer-slip dowel devices are used, install perpendicular to joint so that one end of each dowel bar is free to move.
- B. Expansion Joints: Locate expansion joints at all locations where concrete slabs, walks, aprons, etc. abut vertical elements and other locations as indicated on Drawings.
 - 1. Sawcut joints to provide a recess for joint sealing compound. Seal joints with sealants as indicated in Section 07900.
 - 2. Provide expansion joints every 20 feet in curbs at walks.
 - 3. Provide joint fillers in one-piece lengths for the full length being placed, wherever possible.
- C. Saw-Cut Contraction Joints: Saw-cut joints when concrete is hard enough not to be torn, raveled, or damaged by saw cutting equipment and no later than 24 hours after concrete placement. Use power drive concrete saw.
 - 1. Saw blades shall make a clean, smooth cut, producing a groove 1/4 inch to 3/16 inch wide to depth required (1/5 slab depth).
 - 2. Locate contraction joints in sidewalks at 5 feet on center unless otherwise indicated on the drawings.
 - 3. Seal joint with sealant as indicated in Section 07900.

3.5 Concrete Finishing

- A. After striking-off and consolidating concrete, smooth the surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust the floating to compact the surface and produce a uniform texture.

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- B. After floating, test surface for trueness with a 10 feet straight-edge. Distribute concrete as necessary to remove surface irregularities, and refloat repaired areas to provide a continuous, smooth finish.
- C. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to $\frac{1}{2}$ inch radius, unless otherwise shown. Eliminate tool marks on concrete surface.
- D. After completion of floating and when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:
 - 1. General: Broom finish, by drawing a hair broom across concrete surface, perpendicular to line of traffic. Trowel all joints and edges.
 - 2. On inclined slab surfaces, provide a coarse, non-slip finish by scoring surface with a stiff-bristled broom perpendicular to direction of traffic.
- E. Concrete shall be cured by use of curing compound applied after surfaces take set after finishing per ACI 308-71, Recommended Practice for Curing Concrete.

3.6 Curbs and Gutters

- A. Contraction joints shall be constructed as indicated. Exposed edges of joints shall be rounded with an edging tool to a radius of $\frac{1}{4}$ inch.
- B. Expansion joints shall be formed by means of an acceptable pre-formed filler material cut and shaped to the cross section of the curb and gutter. Expansion joints shall be provided at indicated locations.
- C. Finishing: Trowel curbs and gutters to accurate line and level. Following trowelling, exposed surfaces shall be brushed with a soft-bristle brush with strokes parallel to the line of the curb.

3.7 Protection

- A. Protect concrete from damage until acceptance of Work. Exclude traffic from area for at least 14 days after placement. Where construction traffic is permitted, maintain surface as clean as possible by removing surface stains and spillage of materials as they occur.
- B. Sweep concrete and wash free of stains, discoloration, dirt and other foreign material just prior to final inspection.

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Division 3

Concrete

Coffman Park Expansion

Phase 2A

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Ford & Associates Architects, Inc.

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SECTION 03 3000 - CAST-IN-PLACE CONCRETE**PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Basic Specification: All work of this Section shall conform to the requirements of ACI 301, "Specifications for Structural Concrete," except as specifically modified herein. Numbers in parentheses (0.00) indicate a related paragraph of ACI 301.
- B. Work Included: All cast-in-place concrete work shown on the Drawings and required by these Specifications, including formwork, reinforcement, concrete materials, mix design, placement procedures and finishes. Allow for the installation of cast-in-place items furnished under other Sections. Install anchor rods for structural steel. Provide and install grout under base plates.
- C. Provide concrete pads, piers, curbs, and bases required for equipment of all trades. Coordinate dimensions and details with requirements of equipment being supplied, prior to placing concrete.
- D. Coordinate the work of other trades who are to provide and install items (sleeves, piping, conduit, inserts, etc.) to be cast in the concrete. Place no concrete until all such items are in place.
- E. Inspection and testing services required to establish mix designs are to be performed by an agency retained by the Contractor (1.6.3). Other services required by this Section are to be performed by an agency retained by the Owner (1.6.4). Provide facilities for storage and curing of specimens molded by the Owner's agency (1.6.3.2.d).
- F. Related Work Specified Elsewhere: The general provisions of the Contract apply to the work of this Section as though reproduced herein. Carefully examine all other Sections and all Drawings for related work; which includes but is not limited to:
 - 1. Quality Requirements: Section 01 4000

1.2 QUALITY ASSURANCE

- A. All cast-in-place concrete construction shall conform with the governing codes including the latest adopted editions of the standards and material specifications referenced herein.
- B. Reference Standards:
 - 1. ACI 301, "Specifications For Structural Concrete."
 - 2. ACI 318, "Building Code Requirements for Structural Concrete."
 - 3. ACI Detailing Manual, (SP-66).
 - 4. ACI 347, "Guide to Formwork for Concrete."
 - 5. CRSI "Placing Reinforcing Bars," and "Manual of Standard Practice."
 - 6. ACI 305, "Hot Weather Concreting."
 - 7. ACI 306, "Cold Weather Concreting."

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- C. Materials and installed work may require testing and retesting at any time during the progress of work. Tests, including retesting of non-conforming or deficient materials or installed work, shall be performed at Contractor's expense.

1.3 SUBMITTALS

- A. Submit for approval the name of the agency proposed for the required inspection and testing services. All of the required testing is to be performed by personnel employed by the proposed agency (1.6.2).
- B. Submit a mix design for each class of concrete required (1.6.3). Submittals to comply with appropriate methods listed in ACI 301 (4.1 and 4.2). Indicate whether mixes have been designed for pumping.
- C. Submit shop drawings for all reinforcing. Indicate strength, size, and details for all bar reinforcing, and style and specification of all welded wire fabric (3.1.1).
- D. Submit, on request only, product literature for admixtures, curing compounds and patching mortar proposed for use.
- E. Submit reports of all required testing and inspection (1.6.3.2.f).

1.4 FIELD REFERENCE MANUALS

- A. Provide at least one copy of the ACI Field Reference Manual, SP-15, and one copy of CRSI's "Placing Reinforcing Bars" and "Manual of Standard Practice," in the field office at all times (1.3.3).

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Smooth-Formed Finished Concrete: Plywood, metal or other approved panel materials that provide continuous, true and smooth concrete surfaces.
- B. Rough Formed Finished Concrete: Plywood, lumber, metal or other approved material.
- C. Chamfer Strips: Wood, metal, PVC or rubber strips, 3/4 inch x 3/4 inch, minimum.
- D. Formwork Release Agent: Commercially manufactured form release agents that will prevent formwork absorption of moisture, prevent bond with concrete, not stain concrete surfaces and will not impair subsequent treatment of concrete surfaces.
- E. Form Ties: Factory fabricated, adjustable length, removable or snap off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal. Provide ties that will leave no metal closer than 1-1/2 inches from exposed surfaces and that will leave holes not larger than 1 inch diameter in concrete surfaces.

2.2 REINFORCING (3.2.1)

- A. Deformed Bars: ASTM A615 (including Supplementary Requirements) or A617. Minimum yield strength to be 60 ksi. Bars to be welded are to be per A706.
- B. Welded Wire Fabric: ASTM A185. Provide in sheet form (not rolls).
- C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete.
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.

2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150, Type I, II, or III (4.2.1.1).
- B. Water: Potable.
- C. Aggregates: ASTM C33. Use size No. 57 coarse aggregate, unless otherwise indicated (4.2.1.2).

2.4 ADMIXTURES

- A. All admixtures shall be certified by the manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and shall be compatible with other admixtures and cementitious materials.
- B. Water-Reducing: ASTM C494, Type A or D.
- C. Superplasticizer: ASTM C494, Type F or G.
- D. Air-Entraining: ASTM C260.
- E. Accelerating: ASTM C494, Type C or E, containing no more chlorides than are present in municipal drinking water.
- F. Calcium chloride is not permitted (4.2.2.6).

2.5 RELATED MATERIALS

- A. Premolded Expansion Joint Filler: ASTM D1751 (2.2.1.4).
- B. Curing Compound: Comply with ASTM C309, Type 1, Class B (clear), except moisture loss not to exceed 0.39 kg/sq. m. in 72 hours. Compound shall comply with EPA's VOC requirements. Apply at the manufacturer's written recommended

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application rate. Must be compatible with adhesive specified for floor finishes or be removed by the Contractor prior to applying floor finish.

- C. Grout for Masonry Core Fill: ASTM C476, coarse type or fine type, placed per ACI 530.1, Paragraph 3.5.
- D. Non-Shrink, Non-Metallic Grout Under Bearing Elements: Conform to ASTM C1107.
- E. Dovetail Slots: Galvanized steel, 24 gage, minimum.
- F. Bonding Agent: Conform to ASTM C1059, Type II. No thinner than 75 square feet per gallon.
- G. Sealer: Clear membrane-forming compound which will not yellow. Must be formulated for the intended application, either interior or exterior and applied per the manufacturer's written recommendations. Must comply with EPA VOC requirements and be compatible with the curing compound used.
- H. Joint Sealant: Use 1-component polyurethane conforming to ASTM C920, Type S, Grade NS, Class 25, with backer rod as required.

2.6 CONCRETE MIXES

- A. The following classes of concrete are required (4.2.2.8):
 - 1. Class I – footings and piers: Minimum $f'_c = 3,000$ psi.
 - 2. Class II - interior slabs on grade and all interior concrete not otherwise identified. Minimum $f'_c = 3,500$ psi; water-reducer required. Minimum cement content 517 lbs. per cubic yard.
 - 3. Class III - exterior slabs on grade and all exterior concrete not otherwise identified. Minimum $f'_c = 4,000$ psi; air-entraining admixture and water-reducer required. Maximum water-cement ratio: 0.48, air content: $5 \pm 1.5\%$ (4.2.2.4).
 - 4. Class IV - backfill below footings. Minimum $f'_c = 1,500$ psi (lean mix).
- B. Flyash is permitted in all Classes, but if used, shall be a minimum of 15% and a maximum of 25% of the total weight of cementitious materials.
- C. Class IV concrete may be site mixed, all other concrete is to be ready-mixed (4.3.1.1 and 4.3.1.2). All admixtures are to be added at the batch plant, except that superplasticizer, if used, is to be added at the site.
- D. Slump (4.2.2.2):
 - 1. Design concrete mixes for a maximum slump of 4 inches, unless a superplasticizer is to be used.
 - 2. If a superplasticizer is to be used, design mixes for a slump of 2 inches - 3 inches before its addition; maximum slump permitted after its addition is 8 inches.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Verify that excavations are free of water and ice, are of the required dimensions and have been approved by the Soils Engineer prior to placing concrete (5.3.1).
- B. Determine field conditions by actual measurement.
- C. Notify the Architect not less than 24 hours in advance of placing concrete. Place concrete only when the Architect is present, unless this requirement is specifically waived.

3.2 FORMWORK

- A. Footings may be cast against earth cuts when soil conditions permit (2.2.2.3).
- B. Design, erect, support, brace, and maintain formwork to support vertical and lateral, static and dynamic loads that might be applied until such loads can be supported by the concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACI 347.
- C. Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.
- D. 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, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste. Chamfer all exposed corners and edges.
- E. 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.
- F. Provide temporary openings where interior area of formwork is inaccessible for clean out, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

3.3 REINFORCING

- A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as herein 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 by formwork, construction or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Architect.

3.4 EMBEDDED ITEMS

- A. Install embedded conduit, pipes and sleeves subject to the following limitations:
1. Do not embed aluminum without prior approval of coating material.
 2. Do not displace reinforcing steel.
 3. In slabs, limit outside dimension of conduits and pipes to 1/3 slab thickness. Where conduits cross, maintain same minimum concrete cover as required for reinforcing bars. For slabs over metal decks, thickness is measured from the top of the metal deck.
 4. Maintain a center-to-center spacing of at least three diameters of conduit or pipe.
- B. Plates and Anchors: Set and build into work anchorage devices and other embedded items required for other work attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.

3.5 DELIVERY AND PLACEMENT

- A. Preparation Before Placement:
1. Remove all debris from forms and deck. Clean steel deck of grease, oil, and other substances which would reduce bond to concrete.
 2. Do not use additives or salts to remove ice.
 3. In cold weather, maintain temperature of forms and reinforcing such that concrete temperature can be kept within the specified range.
- B. Delivery:
1. Conform to ASTM C94.
 2. ASTM C94 requires discharge within 1-1/2 hours or 300 revolutions, whichever occurs first, after the introduction of water to cement and aggregates, or the introduction of cement to the aggregates. The Architect may require an earlier discharge during hot weather or when high-early strength cement is being used (4.3.2.2).
 3. Place concrete at the maximum slump for which the mix was designed with a tolerance of up to 1 inch above the maximum.
- C. Placement:
1. Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete" and as specified herein.
 2. Place within 6 feet of final position. Spreading with vibrators is prohibited.
 3. In walls, deposit concrete in uniform horizontal layers with a maximum depth of 2 feet.
 4. Maximum free fall without chutes or elephant trunks to be 5 feet.

3.6 JOINTING

- A. Interior Slabs on Grade:
1. Locate control and construction joints as shown on the Drawings. In the absence of information on Drawings, locate at openings, walls, columns, grid lines, inside corners and at 12 feet on center generally. Schedule slab placements and sawcutting operations such that sawing is completed prior to onset of shrinkage cracking (5.3.5).
 2. Provide isolation joints at columns (1/2 inch thick) and at walls (1/4 inch thick). Where isolation joint will be exposed to view, set top of joint filler below top of slab a distance equal to the filler thickness, to receive sealant. Where not exposed to view, set top of filler flush with top of slab.
 3. Where joints are exposed to view in the finished building, provide joint sealant.
- B. Exterior Slabs on Grade: Locate joints as shown on the Drawings. In the absence of information on the Drawings, provide the following:
1. Expansion Joints: Full depth, with 1/2 inch joint filler, where slabs abut vertical surfaces, at intersections of sidewalks, at abrupt changes in width and at a spacing not exceeding 30 feet.
 2. Control Joints: Tooled, 7/8 inch deep, 4'-0" to 6'-0" on center between expansion joints.
- C. Construction Joints: Construct joints true to line with formed keyways perpendicular to surface plane of concrete. Construction joints are shown on the drawings. The Contractor shall submit all joint locations and joint details with the reinforcing steel shop drawings for all construction joints, including additional joints not shown on the drawings.
1. Reinforcement shall be continuous across construction joints.
 2. Place joints perpendicular to main reinforcement.
 3. All construction joints shall be roughened and fully bonded. Use a bonding agent at all construction joints.

3.7 FINISHES

- A. Schedule of finishes on flatwork is as follows:
1. Typical interior floor areas to receive adhesive-applied finish, or carpet, or to remain exposed: troweled finish (5.3.4.2.c).
 2. Interior floor areas to receive finish in cementitious setting bed: floated finish (5.3.4.2.b).
 3. Exterior slabs: broom finish (5.3.4.2.d).
- B. Schedule of finishes on formed surfaces is as follows:
1. Rough formed finished concrete: walls, slabs, and other surfaces not otherwise specified: (5.3.3.3.a).
 2. Smooth formed finished concrete: walls, slabs, and other surfaces exposed to view or scheduled to receive waterproofing: (5.3.3.3.b). Repair and patch defective areas.

3.8 FINISHING TOLERANCES

- A. Conform to F-number requirements noted below and as described in ASTM E1155 for all interior slabs (5.3.4.3):
 - 1. Interior slabs-on-grade with resilient flooring: F_F -32/ F_L -25 for any individual floor section.
 - 2. All other interior slabs-on-grade: F_F -25/ F_L -20 minimum overall for composite of all measured values; F_F -18/ F_L -15 minimum for any individual floor section.
 - 3. All other interior slabs: F_F -25 minimum overall for composite of all measured values; F_F -18 minimum for any individual section.
- B. Take remedial measures if flatness and levelness testing indicates either of the following conditions exists:
 - 1. The entire floor composite value, when installation is complete, measures less than either of the specified overall F-numbers.
 - 2. Any individual floor section measures less than either of the specified minimum section F-numbers.
- C. Individual floor sections for floor tolerance testing purposes shall be bound by the following that provide the smallest sections: construction joints, control joints, column lines and half-column lines. Any bay not conforming to the above flatness and levelness requirements is subject to repair or removal and replacement and retesting at no additional expense to the Owner (1.7.1).
- D. Obtain written approval of the Architect and Engineer for remedial measures proposed before implementing measures.
- E. Finish all exterior slabs with a floated finish that will meet conventional straightedge tolerance requirements of ACI 117, then refloat the slab immediately to a uniform texture. Immediately after, give the concrete surface a coarse transverse scored texture by drawing a broom across the surface (5.3.4.2.b and 5.3.4.2.d).

3.9 CURING AND PROTECTION

- A. Temperature:
 - 1. When the average air temperature is expected to be less than 40 degrees for more than three consecutive days, temperature of concrete as placed is to be between 50 and 90 degrees F (55 and 90 degrees F for sections less than 12 inches thick). Maintain concrete temperature within these limits for the full curing period of seven days. (4.2.2.7, 5.3.1.6, 5.3.2.1.b and 5.3.6.1).
- B. Curing:
 - 1. Interior slab areas which will receive finish in cementitious setting bed are to be moist-cured, without the use of a curing compound (5.3.6.4.a through 5.3.6.4.d).
 - 2. Surfaces which are to receive a sealer are to be moist-cured, without the use of a curing compound (5.3.6.4.a through 5.3.6.4.d).
 - 3. All other slab areas may be either moist-cured or receive an application of curing compound (5.3.6.4.a through 5.3.6.4.f).
 - 4. Whichever curing method is used, it is to commence immediately after

disappearance of water sheen, and continue for at least seven days (5.3.6.1). Do not allow curing to be delayed overnight.

5. Prevent excessive moisture loss from formed surfaces (5.3.6.3). If forms are removed before seven days have elapsed, cure the formed surfaces by moist-curing or application of curing compound for the remainder of the curing period.
6. All exterior slabs are to receive an application of sealer prior to the completion of construction.
7. Interior slabs which remain exposed are to receive an application of sealer prior to the completion of construction.

3.10 GROUTING

- A. Install grout below bearing plates, setting plates and column base plates only after the steel is plumbed. The use of leveling plates at column bases is prohibited.
- B. Install grout per the recommendations of the manufacturer.

3.11 CONCRETE SURFACE REPAIRS

- A. Repair any slabs which do not meet the finish requirements. The Architect will determine whether grinding, filling cracks, patching and leveling, or removal and replacement procedures are required.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement, so that, when dry, patching mortar will match surrounding color. Patch a test area 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.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by the Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

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1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, grazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement 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 and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to the Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to the Architect's approval.

3.12 FIELD QUALITY CONTROL

- A. Obtain concrete for required tests at point of placement (1.6.4.3).
- B. For each concrete Class, perform one strength test for each 50 yards or fraction thereof, for one day placements up to 300 yards. Perform one strength test for each 100 yards or fraction thereof for one day placements greater than 300 yards (1.6.4.2.d).
- C. Determine slump for each strength test (1.6.4.2.f).

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- D. Determine air content for each strength test of air-entrained concrete (1.6.4.2.h).
- E. Determine concrete temperature for each strength test (1.6.4.2.g).
- F. Do not place concrete when slump, air content or temperature vary from allowable (1.6.8).
- G. Interior floor slab finished surfaces shall be tested for flatness and levelness in accordance with ASTM E1155.
- H. Individual floor sections for floor tolerance testing purposes shall be bound by the following that provide the smallest sections: construction joints, control joints, column lines and half-column lines.
- I. Floor tolerance tests shall be performed (and all defective areas identified) within 24 hours after slab placement and reported to all parties as soon as possible, but not later than 72 hours after installation. Shored elevated slabs shall be tested prior to removal of shoring.
- J. Maintain records of all tests, indicating date and time of placement and exact location of the structure represented by each test. Test results will be reported in writing to Architect/Engineer, the Owner, and Contractor within 24 hours after tests. Reports of compressive strength test 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 strength, breaking load and type of break for both 7-day tests and 28-day tests.
- K. 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.
- L. Additional Tests: The testing service will make additional test 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/Engineer. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

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Division 4

Masonry

Coffman Park Expansion

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SECTION 04 2000 – UNIT MASONRY**PART 1 - GENERAL****1.1 Section Includes**

- A. Provide unit masonry work as indicated. Work includes:
 - 1. Standard concrete masonry units and accessories.
 - 2. Manufactured stone units.
 - 3. Flashings, termination bars, sealants and associated adhesives.
 - 4. Weeps and vents.
 - 5. Masonry anchors.
 - 6. Setting and "building-in" collars, sleeves, thimbles, inserts, anchors, ties, sockets, bolts, blocking, plugs, miscellaneous metal work, bearing plates, and similar items in contact with, supported on, or enclosed by masonry and furnished by others together with information for setting.

- B. Pre-installation conference requirements.***

1.2 Related Requirements

- A. Wood Framing – Ref: Section 06 1000.
- B. Building Insulation – Ref: Section 07 2100.
- C. Joint Sealants – Ref: Section 07 9005.
- D. Fluid Applied Weather Resistive Barrier – Ref: Section 07 2760.
- E. Gypsum Wall Board Sheathing – Ref: Section 09 2500.

1.3 Reference Standards

- A. ACI 530/ASCE 5/TMS 402 – Building Code Requirements for Masonry Structures; American concrete Institute International; 2008.
- B. ACI 530.1/ASCE 6/TMS 602 – Specification for Masonry Structures; American Concrete Institute International; 2008.
- C. ASTM A 82/A 82M – Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2007.
- D. ASTM A 153/A 153M – Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware; 2009.
- E. ASTM C 90 – Standard Specification for Loadbearing Concrete Masonry Units; 2009.
- F. ASTM C 129 – Standard Specification for Nonloadbearing Concrete Masonry Units; 2006.
- G. ASTM C 144 – Standard Specification for Aggregate for Masonry Mortar; 2004.

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- H. ASTM C 150 – Standard Specification for Portland Cement; 2007.
- I. ASTM C 207 – Standard Specification for Hydrated Lime for Masonry Purposes; 2006.
- J. ASTM C 270 – Standard Specification for Mortar for Unit Masonry; 2008a.
- K. ASTM C 404 – Standard Specification for Aggregates for Masonry Grout; 2007.
- L. ASTM C 476 – Standard Specification for Grout for Masonry; 2009.
- M. ASTM C 780 – Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2009.

1.4 Submittals

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, and mortar.
- C. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- D. Where fire resistance rated concrete masonry units are required, submit certificate indicating unit width, height, and length, shell and web thickness, minimum equivalent thickness, compressive strength and aggregate type.
 - 1. Submit UL or Warnock-Hersey approval certificate indicating compliance with the requirements indicated, instead of above material specifications.
- E. A minimum of ten days prior to order of materials, Contractor shall provide, on site, a 4 foot x 4 foot sample section of typical brick wall for the purpose of masonry and grout style and color approval which shall set the standard of acceptance of further work.
 - 1. Contractor shall construct the sample section to determine coursing pattern and grout color to be used.
 - 2. Sample to be placed on site in a location as directed by the owner representative and shall be secured in a manner to prevent injury to persons or property.

1.5 Quality Assurance

- A. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents.

1.6 Delivery, Storage, and Handling

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

1.7 Project Conditions

- A. Concrete Unit Masonry: Comply with hot- and cold-weather construction and protection requirements contained in NCMA TEK 3-1B.
1. Cold Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freeing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS602.
 2. Hot Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530 503.1/ASCE 6/TMS 02.
- B. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of day's work. Cover partially completed masonry when construction is not in progress.
1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
 2. Do not apply uniform loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls of columns.
 3. Stain prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Remove immediately any grout, mortar, and soil that comes in contact with such masonry.
 - a. Protect sills, ledges, and projections from mortar droppings.
 - b. Protect surfaces of door frames and similar products with painted and integral finishes from mortar droppings.

1.8 Pre-installation Conference

- A. *Prior to the start of any masonry installation, the General Contractor and masonry contractor shall meet with the Architect to review all masonry installation practices and detail installation requirements for the project. General Contractor shall provide Architect notice of this meeting a minimum of ten (10) days before the meeting.***

PART 2 – PRODUCTS**2.1 Standard Concrete Masonry Units**

- A. Provide concrete masonry units with the following characteristics as indicated on the drawings or as otherwise required for construction to comply with applicable codes.
1. Hollow Load-Bearing Concrete Block: ASTM C90, Grade N, Type I, normal weight units. Provide units with minimum average net area compressive strength of 2,000 psi.
 2. Solid Load-Bearing Concrete Block: ASTM C145, Grade N, Type I, normal weight units. Provide units with minimum average net area compressive strength of 1,800 psi.
 3. Provide special shapes where required, including:
 - a. Corner masonry units (90 deg. & other angles).
 - b. Jamb blocks.

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4. Moisture content of concrete block delivered to the job site shall not exceed 10 lbs. per cubic foot.
5. See drawings for sizes and locations of CMU.

2.2 Manufactured Stone Units

- A. Manufactured Stone units listed below and on drawings from the following manufacturers.
 1. Eldorado Stone.
 - a. See Drawings for Schedule of Materials.
 2. Provide sizes and special shapes (water tables, mitered corner units, solid units, chamfered units) as required to complete the work as described in the drawings.
- B. Testing: Manufactured Stone Units: ASTM C 90, machine cast, smooth face and split face finish (as indicated) on exposed faces and ends
 1. Compressive Strength, ASTM C 140: 4000 – 6,000 psi at 28 days.
 2. Absorption, ASTM C 140: Less than .065 percent at 28 days.
 3. Linear Shrinkage, ASTM C 426: Maximum .065 percent.
 4. Density, ASTM C 140: Greater than 120 pounds per cubic foot.
 5. Freeze- Thaw, ASTM C 666: Less than 5 percent cumulative mass loss after 300 cycles.
 6. Size and finish as indicated on architectural drawings.
- C. Curing:
 1. Cure in enclosed chamber at 95 percent relative humidity and 95 to 120 degrees F for 12 to 18 hours or yard cure for 350 degree-days.
- D. Manufactured Stone Materials
 1. Portland Cement: ASTM C 150, Type I or III, white or gray as required to match specified color.
 2. Coarse Aggregates: ASTM C 33 except for gradation, granite, quartz or limestone.
 3. Fine Aggregates: ASTM C 33 except for gradation, manufactured or natural sands.
 4. Pigments: ASTM C 979, except do not use carbon black pigments, inorganic iron oxide.
 5. Water Reducing, Retarding and Accelerating Admixtures: ASTM C 494.
 6. Water: drinkable.
 7. Reinforcing Bars: ASTM A 615, deformed steel bars, galvanized when less than 1 1/2" of material.
 - a. Galvanized Coating: ASTM A 767.
- E. Tolerances:
 1. General – Manufacture cast stone units within tolerances in accordance with Cast Stone Institute Technical Manual.
 2. Cross Section Dimensions: Do not deviate by more than +/- 1/8 inch from approved dimensions.

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3. Length of Units: Do not deviate by more than length/360 or +/- 1/8 inch, whichever is greater.
 4. Warp, Bow or Twist: do not exceed length/360 or +/- 1/8 inch, whichever is greater.
- F. Water repellant: Apply Prosoco Saltguard® Weather Seal Siloxane WB.
- a. Water repellant over stone units: Obtain in writing from Cast Stone manufacturer indicating water repellant product is an acceptable product application to Stone units.
- G. Dryblock:
1. Units composed of Dryblock admixture providing a water repellant characteristic as part of manufacturing process enabling installation possible at grade conditions.
- H. Damp-proofing Units:
1. Where units are to be used at or below grade, damp-proofing must be applied to backs and at the beds of each cast stone unit. Extend damp-proofing a minimum of 12" above finished grade for the evaporation of moisture on surfaces above finished grade.
- I. Limestone units (Bid Alternate in lieu of manufactured stone) listed below and on the drawings from following supplier.
1. Wysong Stone thin stone veneer.
 - a. See Drawings for Schedule of Materials.
 2. Provide sizes and special shapes (water tables, mitered corner units, solid units, chamfered units) as required to complete the work as described in the drawings.

2.3 Mortar and Grout Materials

- A. Portland Cement: ASTM C 150, Type I.
1. Hydrated Lime: ASTM C 207, Type S.
 2. Mortar Aggregate: ASTM C 144.
 3. Grout Aggregate: ASTM C 404.
- B. Water: Clean and potable.
- C. Mortar for Unit Masonry: ASTM C 270, using the Proportion Specification.
1. Type M Mortar: 2500 psi minimum compressive strength at 28 days. Use for masonry foundation walls below grade.
 2. Type N Mortar: 750 psi minimum average compressive strength at 28 days. Use for above grade masonry veneer.
 3. Type S Mortar: 1800 psi minimum average compressive strength at 28 days. Use for load-bearing masonry and at locations not noted otherwise.
 4. Provide colored mortar for decorative concrete masonry unit masonry work.
- D. Grout for Unit Masonry: Comply with ASTM C 476.

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1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 - a. Use fine grout in grout spaces less than 2" in horizontal dimension, unless otherwise indicated.
 - b. Use coarse grout in grout spaces 2" or greater in least horizontal dimension, unless otherwise indicated.
2. Compressive Strength: 2,500 psi minimum. 3,000 psi pea gravel concrete for concrete masonry bond beams.
3. Slump: Provide grout with a slump of 8" to 11" as measured according to ASTM C 143.

2.4 Admixtures

- A. Admixtures: Materials must be acceptable to mortar material manufacturer.
 1. Cold-Weather Admixture: Non-chloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by the manufacturer for use in masonry mortar of composition indicated. Products by the following are unacceptable:
 - a. Euclid Chemical Co. "Accelguard 80".
 - b. W.R. Grace & Co. "Morseled."
 - c. Sonneborn "Trimix-NCA".
- B. Admixture: Comply with ASTM C-270. Anti-freeze compounds or those containing chlorides are prohibited.

2.5 Reinforcement and Anchors

- A. Reinforcing Bars: Uncoated steel, ASTM A 615/ A 615M or ASTM A 996/ A 996M, Grade 60.
- B. Masonry Joint Reinforcement, Attachments and Accessories: Products by Dur-O-Wall Inc. form the basis of design. Products with comparable materials, performance characteristics and finishes by AA Wire Products Co., Ty-Wal Masonry Products, Dur-O-Wal, National Wire Products Corp Heckman, and Hohmann & Barnard are also acceptable.
 1. Materials: ASTM A 951/ A 951M, Class 3 mill galvanized at interior walls, and ASTM A 153, Class B-2, hot-dip galvanized at exterior walls.
 2. Single Wythe Horizontal Joint Reinforcement:
 - a. Non-Reinforced Walls: "Truss DA 3100", prefabricated galvanized #9 gauge, parallel, deformed steel rods and a continuous, diagonally oriented, #9 gauge, smooth steel cross rod forming a truss design.
 - b. Vertically Reinforced Walls: "DA 3200 Ladur Design", prefabricated, galvanized, #9 gauge, parallel, deformed steel rods.
 - c. Assemblies 1-5/8" to 2" less than the wall thickness in which it is used.
 - d. Provide matching prefabricated corner and tee units.

3. Multiple Wythe Adjustable Horizontal Joint Reinforcement
 - a. Non-Reinforced Walls: "DA 3700 Dur-O-Eye", prefabricated galvanized #9 gauge, parallel, deformed steel rods with #9 gauge smooth steel cross rod forming a truss design and adjustable 3/16 wire pintle sections at 16" o.c.
 - b. Vertically Reinforced Walls: "DA 3600 Ladur Eye Design", prefabricated galvanized #9 gauge, parallel, deformed steel rods with adjustable 3/16 wire pintle sections at 16" o.c.
 - c. Assemblies 1-5/8" to 2" less than the wall thickness in which it is used.
 - d. Provide prefabricated corner and tee units.
- C. CMU Construction
 1. Concrete block back-up construction: Adjustable veneer anchor with two (2) cadmium coated screws, 14 gage anchor and 3/16 inch diameter steel ties. Provide one anchor for each 1.77 square feet of wall area. Neither the vertical nor the horizontal spacing of the adjustable wall ties shall exceed 16 inches. Ties shall be sized to extend within 3/4 inch of face masonry. Anchors must be fastened directly to metal studs - see wall sections for locations.
 2. Cavity walls with insulation: Provide units with adjustable double wire/eye or clips to hold insulation tight against block back up.
- D. Concrete Block Lateral Support Anchors: 1/8 inch thick x 1 -1/4 inch wide x 16 inch long, mill galvanized with down-turned end bends.
- E. Wire mesh wall ties shall be 16 gage hot-dipped galvanized wire mesh with 1/2 inch openings.

2.6 Flashing Materials

- A. Flashing may not be exposed or extend out past the front edge of the brick masonry.
- B. Prefabricated Metal Flashing and Accessories: Products by Dur-O-Wall Inc. form the basis-of-design. Products with comparable materials, performance characteristics, and finishes by Heckman and Hohmann & Barnard are also acceptable.
 1. Drip Edge Flashing: "DA 1525-Drip Edge Stainless Steel Flashing", 1 1/2" wide, 26 gage Type 304 stainless steel with 3/8" closed hemmed edge and 2B-2D finish.
- C. Fabricated Metal Flashing and Accessories: Comply with material and method requirements specified in Division 07 "Sheet Metal Flashing and Trim".
 1. Cavity Wall Base Flashing: Similar to SMACNA Fig. 4-2. Width equal to full depth of shelf (veneer + air cavity).
 - a. Material: 24 gauge, G90 galvanized steel.
 - b. Material: 26 gauge Type 304 stainless steel with 3/8" closed hemmed edge and 2B-2D finish.

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2. Wall Coping Flashing: Similar to SMACNA Fig. 4-3A, 3D and 3E.
 - a. Material: 24 gauge, G90 galvanized steel with deformed pattern.

- D. Contractor's Option for Concealed Flashing: For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:
 1. Copper-Laminated Flashing: 5-oz./sq. ft. copper sheet bonded with asphalt between 2 layers of glass-fiber cloth. Products by the following manufacturers are acceptable.
 - a. Advanced Building Products Inc.; Copper Fabric Flashing.
 - b. Dayton Superior Corporation, Duro-O-Wal Division; Copper Fabric Thru-Wall Flashing.
 - c. Hohmann & Barnard, Inc.; H & B C-Fab Flashing.
 - d. Phoenix Building Products; Type FCC-Fabric Covered Copper.
 - e. Polytite Manufacturing Corp.; Copper Fabric Flashing.
 - f. Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
 - g. York Manufacturing, Inc.; Multi-Flash 500 Flashing.
 2. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040". Products by the following manufacturers are acceptable.
 - a. Advanced Building Products Inc.; Peel-N-Seal.
 - b. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
 - c. Dayton Superior Corporation, Duro-O-Wal Division; Dur-O-Barrier Thru-Wall Flashing.
 - d. Fiberweb, Clark Hammerbeam Corp.; Aquaflash 500.
 - e. Grace Construction Products, W.R. Grace & Co. – Conn.; Perm-A-Barrier Wall Flashing.
 - f. Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
 - g. Hohmann & Barnard, Inc.; Textroflash.
 - h. W. R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.
 - i. Polyguard Products, Inc.; Polyguard 300.
 - j. Sandell Manufacturing Co., Inc.; Sando-Seal.
 - k. Williams Products, Inc.; Everlastic MF-40.
 3. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637, 0.040" thick.
 - a. Carlisle Coatings & Waterproofing; Pre-Kleened EPDM Thru-Wall Flashing.
 - b. Firestone Building Products; FlashGuard.
 - c. Heckmann Building Products Inc.; No. 81 EPDM Thru-Wall Flashing.
 - d. Hohmann & Barnard, Inc.; Epra-Max EPDM Thru-Wall Flashing.
 - e. Sandell Manufacturing Co., Inc.; EPDM Flashing.

- F. Solder and Sealants for Sheet Metal Flashings: As specified in Division 07 Section "Sheet Metal Flashing and Trim."

- G. Adhesives, Primers and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.7 Miscellaneous Masonry Accessories

- A. Miscellaneous masonry accessories by Dur-O-Wall Inc. form the basis-of-design. Products with comparable materials and performance characteristics by noted manufacturers are also acceptable.
1. Acceptable Manufacturers:
 - a. Hohmann & Barnard, Inc.
 - b. Sandell Manufacturing Co., Inc.
 2. Vertical Movement Control Joints:
 - a. Concrete Block: "DA 2001, 2002, 2003, 2005 Series Rubber Control Joint" with shear keys designed to fit sash block grooves or Sandell Manufacturing Company, PVC #2011.
 - b. Masonry Veneer Control Joints: Rubber Compound of PVC equal in design to:
 1. Dur-O-Wall, Soft Joint "DA 2015 Expansion Joint", closed cell neoprene rubber, 3/8" thickness.
 2. Sandell Manufacturing Company, Closed Cell Neoprene #3300.
 3. Dur-o-Wall, Rapid Control Joint No. 6.
 4. Dimex, #2011.
 5. Sizes: Provide style and size required by each installation condition.
 3. Horizontal Movement Control Joints: "DA 2010 Rapid Soft Joint", closed cell neoprene rubber with adhesive on one side. Thickness: 1/4".
 4. Grout Stop: "DA 1015 Dur-O-Stop" fabricated from monofilament screen nylon with 1/2" mesh designed for controlling grout while maintaining positive bond in mortar joint.
- B. Wicking Materials: Cotton or polyester rope, 1/4" to 3/8" in diameter, in length required to produce 2" exposure on exterior and 18" in cavity between wythes.
- C. Weather resistant barrier over "Dens-Glass Gold" sheathing or exterior grade structural panel sheathing.
1. All flashings and seams of substrate sheathing in composite metal stud wall construction conditions to be taped & sealed at all openings and penetrations per weather resistant barrier specifications and tape/sealant.

2.8 Through-Wall Flashing

- A. Copper/Paper Flashing: 5 oz. copper sheet laminated between 2 sheets of bituminous impregnated crepe Kraft paper or saturated fabric.
- B. Products: Subject to compliance with requirements specified, provide one of the following:
1. W.R. Grace & Co., "Perma-A-Barrier"
 2. Afco Products, Inc., "Cop-A-Bond Duplex".

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3. Phoenix Building Products, Inc.; "Duplex Cop-R Flash".
 4. York Manufacturing, Inc.; "Cop-R-Tex Duplex".
- C. Adhesive for Flashings; of type recommended by manufacturer of flashing material for use indicated.

2.9 Cleaner

- A. Cleaner: Prosoco Sure Klean® "600 Detergent" or "VanaTrol".

PART 3 - EXECUTION

3.1 Preparation

- A. Erect a four-foot by four-foot sample panel at the job trailer for Owner & Architect review of the manufactured cast stone and decorative pier cap units, mortars, special shapes, and feature detail coursing.

3.2 General Masonry Practice

- A. Cut masonry units using motor-driven wet saws to provide clean, sharp, un-chipped edges.
Cut units as required to provide continuous pattern and to fit adjoining work. Use full-size units without cutting where possible.
1. Prior to cutting pre-soak calcium silicate units using clean water. Allow units to dry prior to placement
- B. Vertical Reinforcement; Provide inspection ports at all locations where vertical reinforcing is to be fully grouted within the unit core to allow confirmation that cores have been fully grouted. Following inspection, close all inspection ports and make flush with surrounding masonry.
- C. Increase quantity of wall ties around perimeter of openings, at wall terminations and corners. Place wall ties within 8" of openings and edges of masonry.
- D. Stack masonry materials on wood dunnage and protect with tarpaulin or shed.
- E. Consult other trades in advance of masonry work and make provision for installation of their work to avoid later cutting and patching. Perform masonry cutting and patching required accommodating the work of other trades.
- F. Unfinished work shall be racked back. Toothed masonry will not be permitted.
- G. Build solid masonry 4 inches above and below expansion bolts and built-in anchors.
- H. Install three courses of solid concrete masonry under beam and lintel bearings. Where anchor bolts are specified, use hollow concrete block and grout solid around bolt.

- I. When a wall of hollow masonry units is to be decreased in thickness over its height, place a continuous course of solid masonry to cap the thicker section and provide solid bearing for starting the thinner section above.
- J. As work progresses, clean mortar daubs and smears from masonry work by wiping with burlap before mortar sets up. Turn back first scaffold plank adjacent to wall at end of each day's work to prevent unnecessary soiling.
- K. Where face of masonry is exposed as the finish cut neatly around electrical boxes so faceplates for switches, receptacles and other electrical devices will cover the cutout. Where necessary, point between cut out and electrical box with mortar.
- L. Chases, risers and conduits in bearing walls shall be approved by Architect before constructed or installed.
- M. Terminate non-bearing walls 3/8 inch below concrete structural deck above and fill void with compressible filler. Joint will be sealed under Section 07900.
- N. Point and fill all holes and cracks in exposed joints using fresh mortar. If mortar has hardened, defects shall be chiseled out, wetted, and refilled solidly with fresh mortar and tooled as specified.

3.3 Horizontal Joint Reinforcement

- A. Install horizontal joint reinforcement in all masonry walls.
- B. Bed into mortar joints of alternate block courses, 16 inches on center vertically, starting 8 inches above the floor. Lap side rods of reinforcement a minimum of 6" or as per the manufacturer's installation instructions direct if there is greater requirement.
- C. Reinforcement shall be continuous around corners and spliced as required. Use prefabricated "Tee" sections at wall intersections.
- D. Install one course of additional reinforcement above and below masonry openings extending 2 feet beyond each side of opening.

3.4 Masonry Control Joints

- A. Maintain lateral support of continuous wall at joint by using control joint block (tongue and groove type) or mortar-filled vertically stacked end cores with feltbond breaker one side.
- B. Make control joint width minimum 3/8 inch unless otherwise indicated. For control joints in interior walls and at intersections of walls on interior, non-filler strip is required, but rake out all mortar and caulk.
- C. Provide control joints where shown on drawings. Provide additional joints located so the maximum distance between joints does not exceed three times the height of the wall or 40 feet maximum. Location of control joints shall be approved by the Architect.

- D. Do not carry horizontal joint reinforcement through control joints.
- E. Maintain lateral support of intersecting masonry non-load bearing walls with wire mesh ties placed across joint between walls and spaced 16 inches on center vertically.
 - 1. Maintain lateral support of intersecting load bearing walls with specified concrete block lateral support anchors placed across joint between walls and spaced 16 inches on center vertically.

3.5 Construction Tolerances

- A. Variation from Plumb: Vertical lines, surfaces or columns, walls do not exceed 1/4" in 10' nor 1/2" up to 40'. For external corners, expansion joints, control joints and other conspicuous lines, do not exceed 1/4" in any story of 20' maximum. Vertical alignment of head joints not to exceed 1/4" in 10'.
- B. Variation from Level: For bed joints, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4" in any bay or 20' maximum.
- C. Variation of Linear Building Line: Do not exceed 1/2" in any bay or 20' maximum, nor 3/4" in 40' or more.
- D. Variation in Mortar Joint Thickness: Do not exceed joint thickness indicated by more than plus or minus 1/8".

3.6 Through-Wall Flashing

- A. Install through-wall flashing at the base of cavity walls; heads of doors, windows and other openings; window sills, spandrels, shelf angles, wall recesses and projections, copings and at similar locations.
 - 1. Place flashing 2 courses above grade. Where grade slopes, step flashing.
 - 2. ***Extend flashing 1/4 inch beyond the exterior face of the wall so it is not concealed from view.***
 - 3. Lay flashing in a slurry of fresh mortar and top with a full bed of fresh mortar.
 - 1. Extend flashing vertically a minimum of 8 inches above the base of the flashing.
- B. Flashing, which is not continuous such as that in heads and sills of openings in exterior walls shall extend 8 inches beyond the jamb lines on each side of the opening and turned up brick height to form a dam. Corners at the dams shall be folded and not cut.
- C. Lap discontinuous flashing at least 6 inches and seal contact surfaces with fiberated asphalt mastic. Flashings shall be one piece where possible and be continuous around corners and at physical interruptions. Cut, fold, lap, and seal pieces of flashing with mastic as required to maintain continuity.

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3.7 Cleaning

- A. Clean brick using bucket and brush method; comply with BIA Tech Note 20. Keep wall surface clean during construction. Prevent smearing mortar on face of block. Remove mortar droppings when almost dry using a trowel. Remove burrs from tooled joints. Brush clean with fiber brush at end of each day's work and after finally painting.
- B. Use care to avoid damage to adjacent surfaces when cleaning masonry. Any repairs required due to inadequate protection shall be charged to the Masonry Contractor.
- C. After mortar is thoroughly set and cured, clean masonry completely using the "bucket and brush hand cleaning" method. Use only cleaning solutions approved by manufacturer of masonry units being cleaned. Apply cleaning solution in strict accordance with solution manufacturers written instructions. Do not use metallic tools to remove large mortar particles. Do not use muriatic acid. Do not sandblast.
- D. Test cleaning method on small inconspicuous area of each type of masonry to be cleaned, before full cleaning, to confirm masonry will not be damaged or discolored.
- E. Apply water repellent to Hollow Clay Masonry Units and Cast Stone Units after installation, cleaning and acceptance.

3.8 Cold Weather Practice

- A. Do not install masonry at temperatures below 32 degrees F. on a rising thermometer or below 40 degrees F. on a falling thermometer unless adequate precaution against freezing is provided. No masonry shall be installed using frozen materials.
- B. In cold weather, protect masonry against freezing for at least 48 hours after installation with the temperature on both sides of the wall maintained above 40 degrees F. The use of anti-freeze or quickset compounds will not be permitted.
- C. **Cold weather masonry construction shall conform to the following:**

Temperature Requirements	Construction Requirements	Protection
Above 40 degrees F.	Normal masonry procedures.	Cover walls with plastic or canvas at end of day to prevent water from entering masonry materials.
40 to 32 degrees F.	Heating mixing water to produce mortar temperature between 40 and 120 degrees F.	Cover walls and materials with plastic or canvas to prevent wetting and freezing.

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32 to 25 degrees F.	Heat mixing water and sand to produce mortar temperatures between 40 and 120 degrees F.	With wind velocities over 15 mph, provide wind-breaks during the work day and cover walls and materials at the end of the work day to prevent wetting and freezing.
25 to 20 degrees F.	Mortar on boards should be maintained above 40 degrees F.	Maintain masonry above freezing for 16 hours using auxiliary heat or insulated blankets.
20 to 0 degrees F.	Heat mixing water and sand to produce mortar temperatures between 40 and 120 degrees F.	Provide enclosures and supply sufficient heat to maintain masonry above 32 degrees F. for 24 hours.

3.13 Field Quality Control

- A. The General Contractor shall engage an independent testing and inspection agency to perform this field quality control testing and inspection indicated below.
1. Prior to construction, verify this compressing strength of masonry (fm) and the compressive strength of grout.
 2. As masonry construction begins, the following shall be verified and periodically monitored to ensure compliance.
 - a. Proportions and strength of mortar and grout
 - b. Construction of mortar joints.
 - c. Location of reinforcement and anchors
 3. The following shall be periodically inspected throughout the full extent of the work:
 - a. Size and location of structural elements
 - b. Type size and location of anchors, including anchorage of masonry to structural members, frames or other construction
 - c. Size, spacing grade and type of reinforcement including proper positioning within walls and lap splices in reinforcement.
 - d. Protection of masonry during cold weather (temperature below 40 degrees F) or hot weather (temperature above 90 degrees F).
 4. Prior to grouting, the following shall be verified to ensure compliance:
 - a. Grout spaces are clean
 - b. Proper placement of reinforcement, connectors and anchors
 - c. Construction of mortar joints
 5. Grout placement shall be verified to ensure compliance.
 6. Observe preparation of grout specimens, mortar specimens and/or prisms.
 7. Verify compliance with required inspection provisions of the contract documents and the approved submittals.
- B. The frequency and extent of the inspection shall be as required by the owner's agency to report that the masonry work has been accomplished in accordance with the Contract Documents.

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- C. Prior to the start of masonry work, the owner's agency shall meet with the contractor and masonry sub contractor to review the project requirements and the methods and procedures proposed by the contractor.
- D. The owner's agency shall submit written reports during the course of the work to the owner, architect, structural engineer, contractor and masonry sub contractor. One written report is required for each 5,000 SF (or fraction thereof) of masonry construction.
- E. If non-conforming items are not corrected within 24 hours of discovery, the owner's agency shall contact the architect to resolve the non-conformance.
- F. Retesting of materials failing to meet the specified requirements shall be done at the contractor's expense.
- G. Mortar Tests: Test each type of mortar in accordance with ASTM C 780, testing with same frequency as masonry samples.

END OF SECTION

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Division 6

Wood, Plastics and Composites

**Coffman Park Expansion
Phase 2A**

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SECTION 06 1100 - WOOD FRAMING**PART 1 - GENERAL****1.1 Description**

- A. Work Included: All labor and materials for structural lumber and sheathing shown on the Drawings for walls, roof framing, including all connections and accessory materials shown on the Drawings and required by this Section, or necessary for a complete installation.
- B. Related Work Specified Elsewhere: The general provisions of the Contract apply to the work of this Section, as though reproduced herein. Carefully examine all other Sections and all Drawings for related work, which includes but is not limited to:
 - 1. Quality Requirements: Section 01 4000
 - 2. Cast-In-Place Concrete: Section 03 3000
 - 3. Masonry: Division 4

1.2 Quality Assurance

- A. All wood framing construction shall conform with the governing codes including the latest adopted editions of the standards and material specifications referenced herein.
- B. Reference Standards:
 - 1. The structural design is based on the National Design Specification for Wood Construction (N.D.S.), by the American Forest and Paper Association.
 - 2. Lumber shall comply with US DOC PS 20, American Softwood Lumber Standard with applicable grading rules of inspection agencies certified by American Lumber Standard Committee's (ALSC) Board of Review.
 - 3. All Wood Structural Panels shall comply with US DOC PS 1 and US DOC PS 2 and the Standards of The American Plywood Association.

PART 2 - PRODUCTS**2.1 Materials**

- A. Lumber: Spruce-Pine-Fir No. 2 or better, surfaced at 19% moisture content.
- B. Wood Structural Panels:
 - 1. Roof: 5/8 inch nominal, APA rated sheathing, 40/20, exposure 1.
 - 2. Walls: 1/2 inch nominal, APA rated sheathing, 24/16, exposure 1.
- C. Wood-Preservative-Treated Materials:
 - 1. Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPA Standard U1. Mark each treated item with the quality mark requirements of an inspection agency approved by ALSC's Board of Review.
 - a. Do not use chemicals containing chromium or arsenic.
 - 2. Pressure treat above-ground items with waterborne preservatives to a

minimum retention of 0.25 lb/cu. ft. (4.0 kg/cu. m). After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:

- a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - b. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 - c. Wood framing members less than 18 inches (460 mm) above grade.
 - d. Wood floor plates installed over concrete slabs directly in contact with earth.
3. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWWPA M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.
- E. Nails: Unless noted otherwise, all nails and spikes for fastening framing members together are to be common steel wire nails, conforming to ASTM F1667.
1. Where galvanized or zinc coated nails are indicated on the Drawings, provide coated nails conforming to ASTM A641.
- F. Screws: Flat head conforming to ANSI/ASME Standard B18.6.1. The minimum screw bending yield strength shall conform to the wood screw values listed below the lateral design load tables in Chapter 11 of N.D.S.
- G. Bolts: Conform to ASTM A307.
- H. Framing Anchors: Use the products of The Simpson Strong-Tie Company, Inc. or equivalent products of other approved manufacturer.

PART 3 - EXECUTION

3.1 Surface Conditions

- A. Prior to beginning work of this Section, verify that the installed work of other trades is complete and correct to the extent necessary for the proper execution of the work of this Section.
- B. In the event of discrepancies, immediately notify the Architect. Do not proceed with work affected by the discrepancies until they have been resolved.

3.2 Erection

- A. In stud walls, attach sill plates to supporting structure with the equivalent of a 1/2 inch anchor rods at 48 inches on center.
- B. Provide solid blocking at mid-height of stud walls.
- C. Provide solid or diagonal bridging at midspan of all joists and rafters.

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- D. Attach all wood structural panels to supporting members per the requirements indicated on the Drawings.

3.3 Acceptance

- A. Members with excessive knots, twists, checks, or shakes or other obvious imperfections, will be rejected.

END OF SECTION

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SECTION 06 4013– EXTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 Summary

- A. This Section includes the following exterior woodwork:
 - 1. Exterior wood siding and trim.

1.2 Related Requirements

- A. Rough Carpentry – Ref: Section 06 1000.
- B. Fluid Applied Weather Barrier – Ref: Section 07 2760.
- C. Wall Sheathing – Ref: Section 09 2116.
- D. Painting - Ref: Section 09 9000.

1.3 Quality Assurance

- A. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards", for Custom Grade.
- B. Framing Lumber: Comply with American Softwood Lumber Standard PS-20, current edition. Provide lumber grade-marked and conforming to grades as follows:
 - 1. Southern Pine: Grading Rules published by Southern Pine Inspection Bureau (SPIB), latest edition.
 - 2. Douglas Fir, Western Larch, and Hemlock: Western Lumber Grading Rules, published by Western Wood Products Association (WWPA), or Standard Grading Rules, No. 17, published by West Coast Lumber Inspection Bureau (WCLB), latest edition.
- C. Installation
 - 1. Installers: Finish carpenters, trained and experienced in skills required.
 - 2. Pre-manufactured Items: Comply with manufacturer's written recommendations.

1.4 Submittals

- A. Product Data: For wood-preservative materials and finish systems indicated. Include color selection fans with finish on real wood samples.
- B. Shop Drawings: Include location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
- C. Samples: Provide 12" (minimum) length sample for each type of exterior wood material selected showing proposed, grade, texture, and finish system. Provide samples with one-half surface finished and other half exposed.

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PART 2 - PRODUCTS**2.1 Exterior Wood Siding, Trim and Soffits**

- A. Exterior Finish Carpentry: Boards and worked lumber products complying with requirements indicated below including those of grading agency listed with species.
1. Western Red Cedar: WWPA or WCLIB.
 - a. Grade: A Clear to received clear sealer.
 - b. Texture: S4S, 2E.
 - c. Dimension as noted on the drawings.
- B. Vertical Wood Siding and Soffits: Lumber worked to pattern and size indicated, complying with requirements indicated below including those of grading agency listed with species.
1. Western Red Cedar: WWPA or WCLIB.
 - a. Grade: A Clear to receive clear sealer.
 - b. Texture: S4S 2E.
 - c. Size: 6 inch tongue and groove.
- C. Soffit Louvers:
1. Species: Cedar.
 - a. Style and size as indicated on the drawings.
- D. Miscellaneous Materials:
1. Fasteners and Anchorages: Provide nails, screws and other anchoring devices of type, size, material and finish suitable for intended use and required to provide secure attachment, concealed where possible.
 2. Hot-dip galvanized fasteners for work exposed to exterior and high humidity to comply with ASTM A 153.
 - a. Wood Framing Fasteners:
 - 1) Wood framing: 4d common corrosion resistant nails.
 - 2) Wood framing: 6d common corrosion resistant nails.
 - 3) Wood framing: 0.089 inch (2.2 mm) shank by 0.221 inch (5.6 mm) head by 2 inches (51 mm) corrosion resistant siding nails.
 - 4) Wood framing: 0.093 inch (2.4 mm) shank by 0.222 inch (5.6 mm) head by 2 inches (51 mm) corrosion resistant siding nails.
 - 5) Wood framing: 0.091 inch (2.3 mm) shank by 0.221 inch (5.6 mm) head by 1-1/2 inches (38 mm) corrosion resistant siding nails.
 - 6) Wood framing: 0.091 inch (2.3 mm) shank by 0.225 inch (5.7 mm) head by 1-1/2 inches (38 mm) corrosion resistant siding nails.
 - 7) Wood framing: 0.121 inch (3 mm) shank by 0.371 inch (9.4 mm) head by 1-1/4 inches (32 mm) corrosion resistant roofing nails.

- 8) Wood framing: 1-1/4 inches (32 mm) corrosion resistant roofing nails.
- 9) Wood framing: 1-1/2 inches (38 mm) corrosion resistant roofing nails.
- b. Metal Framing:
 - 1) Metal framing: 1-1/4 inches (32 mm) No. 8-18 by 0.375 inch (9.5 mm) head self-drilling, corrosion resistant S-12 ribbed buglehead screws.
 - 2) Metal framing: 1-5/8 inches (41 mm) No. 8-18 by 0.323 inch (8.2 mm) head self-drilling, corrosion resistant S-12 ribbed buglehead screws.
 - 3) Metal framing: 1 inch (25 mm) No. 8-18 by 0.323 inch (8.2 mm) head self-drilling, corrosion resistant ribbed buglehead screws.
 - 4) Metal framing: 1 inch (25 mm) No. 8-18 by 0.311 inch (7.9 mm) head self-drilling, corrosion resistant S-12 ribbed buglehead screws.
 - 5) Concrete Walls: Erica Stud Nail, ET&F ASM No.-144-125, 0.14 inch (3.6 mm) shank by 0.30 inch (7.6 mm) head by 2 inches (51 mm) corrosion resistant nail.

2.2 Special Project Note

- A. ***All cedar paneling and trim is to be sealed all four sides prior to installation. See Section 09900.***

PART 3 - EXECUTION

3.1 Installation, General

- A. Quality Standard: Install woodwork to comply with AWI Section 1700 or the same grade specified for type of woodwork involved.
 1. Install woodwork true and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8" in 96".
 2. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.
 3. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
 4. Do not over drive or set fasteners to counteract material bow or misalignment.
- B. Condition woodwork to average prevailing humidity conditions in installation areas before installation. 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. Discard units of material with defects that might impair quality of work, and units that are too small to use in fabricating work with minimum joints or optimum joint arrangement. Do not begin installation until substrates have been properly prepared.
- B. Install exterior wood trim shapes accurately to required levels and lines, with members plumb, true, and accurately cut and fit. Secure materials to sub-framing with weather-resistant fasteners of proper size and length.
 - 1. Back prime concealed surfaces and edges with one (1) coat of finish material prior to wood trim installation..
 - 2. Install trim with minimum number of splices. Provide scarf joints where solid fastening to sub-framing can be made. Provide butt joints at exterior and interior angles, except as otherwise indicated. Install flashing provided under Division 07 Section "Sheet Metal Flashing and Trim".
 - 3. Do not over set fasteners to counteract material bow or misalignment.
 - 4. Set fasteners flush with material surface unless noted otherwise.
- C. Securely attach carpentry work to substrate by anchoring and fastening as shown as required by recognized standards.
- D. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; pre-drill as required.
- E. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces form maximum length lumber available. Cope at returns, miter at corners to produce tight fitting joints. Use scarf joints for end-to-end joints.
- F. Sealants: Provide sealants at joints as necessary for weatherproof installation.
- G. Repair all damage to work, finish sand, clean and protect work.
- H. Starting: Install a minimum ¼ inch thick lath starter strip at the bottom course of the wall. Apply planks horizontally with minimum 1-1/4 inch wide laps at the top. The bottom edge of the first plank overlaps the starter strip.
- I. Allow minimum 1 inch vertical clearance between roofing and bottom edge of siding.
- J. Align vertical joints of the planks over framing members.
- K. Maintain clearance between siding and adjacent finished grade.
- L. Locate splices at least one stud cavity away from window and door openings.

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- M. Nominal 2 inch by 4 inch (51 mm by 102 mm) wood framing selected for minimal shrinkage and complying with local building codes, including the use of water-resistive barriers or vapor barriers where required. Minimum 1-1/2 inches (38 mm) face and straight, true, of uniform dimensions and properly aligned.
 - 1. Install water-resistive barriers and claddings to dry surfaces.
 - 2. Repair any punctures or tears in the water-resistive barrier prior to the installation of the siding.
 - 3. Protect siding from other trades.
- N. Complete finishing work specified to extent not completed at shop or before installation of woodwork. Fill nail and screw holes with matching filler where exposed.
- O. Clean woodwork on exposed and semi-exposed surfaces. Touch-up shop-applied finishes to restore damaged or soiled areas.
- P. Remove excess material and dispose of properly off site.

3.3 Finishing

- A. Refer to Division 09 Section "Painting" for final finishing of installed architectural woodwork.
- B. Place fasteners no closer than 3/8 inch (9.5 mm) from panel edges and 2 inches (51 mm) from panel corners.
- C. Allow minimum vertical clearance between the bottom edge of siding and any other material in strict accordance with the manufacturer's installation instructions.
- D. Maintain clearance between siding and adjacent finished grade.

END OF SECTION

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Division 7

Thermal and Moisture Protection

**Coffman Park Expansion
Phase 2A**

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SECTION 07 1300 - ROOFING UNDERLAYMENT

PART 1 - GENERAL

1.1 Summary

- A. Scope: Furnish and install sheet roofing underlayment at the following locations:
 - 1. Under all roof eaves\ thru-wall penetrations and metal roofing locations.
 - 2. Other locations as located on the drawings.

1.2 Related Requirements

- A. Fully Adhered Membrane Roofing - Ref: Section 07 5300.
- B. Metal Roofing – Ref: Section 07 6000.
- C. Flashing & Sheet Metal - Ref: Section 07 6200.

1.3 Quality Assurance

- A. Roofing Underlayment shall meet the following standards:
 - 1. ASTM D412-Test Methods for Rubber Properties in Tension.
 - 2. ASTM 1970 Specification for Self Adhering, Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - 3. ASTM E 96 Test Methods for Water Vapor Transmission of Materials.
 - 4. ASTM D903 Test Method for Peel or Stripping Strength of Adhesive Bonds.

1.4 Submittals

- A. Submit the following data:
 - 1. 12 inch x 12 inch material sample.
 - 2. Manufacturer's current test data and product literature.

PART 2 - PRODUCTS

2.1 Materials

- A. Membrane: Grace Ice & Water Shield as manufactured by W.R. Grace & Company. A composite of cross laminated, high density polyethylene film and self-adhesive rubberized asphalt. An embossed, slip resistant surface is provide on the polyethylene. The rubberized asphalt shall extend out past the polyethylene film on the sheet edges for at least 1/8 inch. Membrane is to have the following characteristics:
 - 1. Color: Grey Black.
 - 2. Thickness: 40 mils.
 - 3. Tensile Strength: 250.
 - 4. Elongation failure: 250.
 - 5. Adhesion to Plywood: 3.0

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6. Permeance: 0.05 Perms.

B. Primers:

1. Bituthene Primer P-3000 is a rubber-based primer in solvent.
2. Bituthene Water-Based Primer is a rubber-based primer in water.

PART 3 - EXECUTION

3.1 Preparation of Substrates:

- A. Grace Ice & Water Shield must be placed directly on the structural deck, never on insulation. Remove all dust, dirt, loose nails or other protrusions. Do not apply directly to fluted deck.
- B. Masonry or concrete surface must be primed with Bituthene Primer P-3000 at the rate of 250 to 350 square feet per gallon of Bituthene Water Based Primer at the rate of 500-600 square feet per gallon.
- C. For retrofit where the membrane is in place, apply a new layer of membrane directly over the old membrane.
- D. Metal drip edges or wood starter shingles shall be placed over the membrane.

3.2 Installation:

- A. Cut the membrane into 10 foot to 15 foot lengths and reroll. Peel back 1 to 2 feet of release paper, align the membrane on the lower edge of the roof and place the first 1 to 2 feet. Pull the release paper under the membrane and continue to peel it from the membrane. Press or roll the membrane in place to assure full adherence to the deck. For ice dam protection, the membrane must be applied over the area wide enough to reach a point above the highest expected level of ice dams. For wind driven rain protection, membrane should be applied to the entire roof. End laps must be at least 6 inches; side laps must be at least 3-1/2 inches. Membrane may be folded onto the fascia providing it will be covered by a gutter, metal edge or other material.
- B. For full roof coverage, membrane may be applied from full rolls if convenient. Always work from the low point to the high point on the roof. Following placement along the eaves, membrane may then be placed vertically up the roof.
- C. In areas where severe ice dams are anticipated, a double layer should be considered along the eaves or in valleys.
- D. If nailing is necessary on steep sloped during hot weather, backnail and cover nails by overlapping with the next sheet.
- E. Smooth shank, electroplated galvanized nails are recommended for fastening shingles. Hand nailing will provide a better seal than power-activated nailing.

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- F. For valley and ridge applications, peel back the release paper, center the sheet over the valley or ridge, drape and press it into place working from the center of the valley or ridge outward in each direction. For valleys, apply membrane starting at the low point and work upwards. End laps must be at least 6 inches; side laps must be at least 3-1/2 inches. Membrane in valleys should be applied before membrane is applied to the eaves.

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SECTION 07 2100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 Section Includes

- A. This section includes but is not limited to the following types and locations or insulation:
 - 1. Batt fiberglass building insulation with kraft paper facing at exterior walls and ceilings.
 - 2. Rigid extruded polystyrene insulation at foundations.
 - 3. Un-faced fiberglass batt insulation.
 - 4. Rigid insulation on the exterior side of the exterior wall sheathing.
 - 5. Expanding spray foam insulation within framing cavities at the perimeter of the roof and all roof penetrations.

1.2 Related Requirements

- A. Cast-in-place Concrete - Ref: Section 03 1000.
- B. Unit Masonry - Ref: Section 04 2000.
- C. Roof Insulation - Ref: Section 07 2200.
- D. Gypsum Board - Ref: Section 09 2116.

1.3 Reference Standards

- A. ASTM C 1289 – Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2008.
- B. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials; 2010.
- C. Provide only materials tested and certified to conform to specified requirements.

1.4 Submittals

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1.5 Product Delivery, Storage & Handling

- A. Delivery: Deliver products in original, unopened containers with contents, brand names, and manufacturer plainly marked.
- B. Storage: Store material in dry place. Protect from damage; protect foam and rigid insulation from excessive exposure to sunlight.

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PART 2 - PRODUCTS

2.1 Materials

- A. Rigid Perimeter Foundation Insulation:
 - 1. Extruded closed cell polystyrene, "Styrofoam SM" Dow Chemical Company, conforming to ASTM C-578 and Federal Specification HH-1-524c Type IV.
 - a. Approved equals by:
 - 1) Zonolite, W.R. Grace
 - 2) Formular 250, UC Industries.
 - 3) Thermco Plastic Foam, Thermco.
 - 2. Conductivity (K) value not to exceed 0.21 per inch, aged. Thickness and locations are as shown on drawings.
 - a. Provide minimum aged R-value of approximately 5.0 per inch of thickness.
 - 3. Slab on grade insulation for unheated slabs and slabs without air ducts in them shall conform to the values below. The R-value is for the insulation only. The insulation must insulate the slab by extending to the top of the slab. It shall be inline with the envelope insulation to provide continuity and no thermal breaks.
 - a. Provide insulation at the following values:

	<u>0-24 inches</u>	<u>0-36 inches</u>	<u>0-48 inches</u>
Horizontal	R-17	R-14	R-11
Vertical	R-8	R-6	R-4

- B. Un-faced Thermal Fiberglass Batt Insulation: Owens Corning "Thermal Batt Insulation" complying with ASTM C 665-84, Type 1, maximum flame spread and smoke developed values of 10 and 20, K-value 25, respectively; passing ASTM E 136.
- C. Kraft Faced Thermal Fiberglass Batt Insulation: Owens Corning glass fiber insulation complying with ASTM C 665, Type II, Class C with a Vapor Retarder Perm Rating of 1.00 max. perms when tested in accordance with ASTM E 96.
- D. Rigid Exterior Wall Insulation:
 - 1. Extruded polystyrene foam, "Styrofoam "SM" Dow Chemical Company, conforming to ASTM C-578 and Federal Specification HH-1-524c Type IV.
 - a. Maximum Flame Spread: 75.
 - b. Maximum Smoke Development: 450.
 - c. Thickness: 2 inches.
 - d. Minimum R-Value: 13.
 - e. Tongue and Groove Edges.
 - 2. Approved equals by:
 - a. Zonolite, W.R. Grace
 - b. Formular 250, UC Industries
 - c. Thermco Plastic Foam, Thermco.
 - 3. Furring: USG Z-Furring channels, depth as required or 1-5/8" metal studs; galvanized steel, 26-gauge minimum.

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- E. Provide expanding foam insulation/sealant within the wall framing cavities at the perimeter of the roof as indicated on the drawings.

PART 3 - EXECUTION

3.1 Preparation

- A. Inspect surfaces to receive insulation and verify that they are ready for the installation. Remove loose particles, dirt, and other foreign matter affecting bond of adhesives.

3.2 Installation

- A. Install insulation in strict accordance with manufacturer's directions.
- B. Unless otherwise recommended by manufacturer, install insulation as follows:
 - 1. Provide attachment/support as required and/or recommended by manufacturer to assure insulating materials are positioned in their proper location and perform their intended function.
 - a. Where shown on drawings on outside face of drywall or block, attached with adhesive and/or stickpins.
 - b. Install with tight joints using manufacturer's recommended joint adhesive.
- D. Rigid Insulation:
 - 1. Install rigid insulation to wall substrate with manufacturer's recommended adhesive.
 - 2. Lay out insulation neatly, Tongue and grooved together to moderate contact, six or support adequately and fit accurately around obstructions to provide as efficient as insulating blanket as possible, level and true with a straight edge in every direction.
 - 3. Install boards in as large sizes as practical.
 - 4. Reject **and replace** damaged boards.
- E. Foundation Insulation:
 - 1. Taper top of boards as indicated on drawings.
 - 2. Insulation to extend to top of finish floor. At door openings, lay insulation horizontal and extend two feet into building.
 - 3. Install boards in as large sizes as practical.
 - 4. Reject **and replace** damaged boards.
- F. Final Clean-up:
 - 1. At the completion of insulation work, remove all excess material and leave area free of debris.

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SECTION 07220 - ROOF INSULATION

PART 1 - GENERAL

1.1 Section Includes

- A. Roof insulation and associated materials on roof deck surfaces. Provide install and secure a smooth, uninterrupted and stable base for a membrane roofing system inclusive of tapered overlays. Roof system to be fully adhered EPDM.
 - 1. Tapered insulation at mechanical equipment curbs.
 - 2. Tapered insulation at corner crickets and saddles as indicated on drawings as well as the upslope of all equipment curbs over four feet in width.
 - 3. Provide expanded foam insulation at the edge of deck perimeter.

1.2 Related Requirements

- A. Rough Carpentry - Ref: Section 06 1000.
- B. Building Insulation - Ref: Section 07 2100.
- C. Roof Membrane - Ref: Section 07 5300.

1.3 Quality Control

- A. Factory Mutual Research:
 - 1. Products and assemblies described in this section shall meet FM Class I Classification Requirements.
 - a. UL listed as acceptable component for a Class 1 steel deck assembly.
 - b. UL listed for use under Class A, B, or C Roof Coverings.
 - c. Flute span capability suitable for use over metal deck if used.
 - d. Installation to withstand wind speed of **72 mph**.
- B. Regulatory Agencies:
 - 1. Underwriter's Laboratory Inc.: Products and assemblies used in the work of this section shall meet UL Class A Construction Requirements.
- C. Qualifications:
 - 1. Submit written statement of manufacturer stating that Contractor has been trained by the manufacturer in application of insulation system specified, and that the installer is approved for this work by manufacturer. Submit on letterhead of manufacturer, signed by an officer of the company.
- D. References:

Some products and execution are specified in this section by reference to published specifications or standards of the following:

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The American Society for Testing and Material (ASTM)
Federal Specifications (FS)
Factory Mutual Research (FM)
Underwriter's Laboratory Inc. (UL)

1.4 Submittals

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Submit with membrane roofing specified elsewhere, manufacturer's printed literature describing all materials and installations requirements.
- C. Shop Drawings:
 - 1. Submit shop drawings showing tapered insulation conditions, clearly outlining the configuration of each tapered insulation system. Submit specifications, installation instructions, and general recommendations from insulation manufacturer for type of roofing required. Include data substantiating that materials comply with requirements.
 - 2. Shop drawings shall be presented at 1/16 inch = 1 foot scale, depicting exact drain locations and roof penetrations. In addition, shop drawings shall indicate tapered insulation system slope and slope along drain line.
 - 3. All shop drawings should reflect on-site field measurements of the roof.
- D. Product Samples:
 - 1. Tapered Insulation:
 - a. Sample size 6" x 6".
 - 2. Insulation Fasteners:
 - a. Samples of screw and plate.
 - 3. Slip sheet if required by material manufacturer.
- E. Product Use Approval:
 - 1. Submit written approval of roof insulation and roof membrane manufacturers for use and performance of the products in the proposed system.

1.5 Product Delivery

- A. All products delivered to the site shall be in the original unopened containers or wrappings bearing brand name(s) of manufacturer(s) clearly marked with letter/number designations identifying contents.
- B. Handle all materials to prevent damage. Store materials elevated off the ground and fully protected from moisture. Material shall be covered with opaque tarps, secured to prevent displacement by wind forces.
- C. Store temperature susceptible materials in a dry and heated area between 60 degrees F and 80 degrees F. If exposed to lower temperatures, restore to proper temperature prior to use. If required, provide certification from the

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manufacturer indicating that freezing temperatures will not adversely affect the materials' use and performance.

- D. Materials determined by the Owner's Representative to be damaged or to have been subjected to adverse conditions shall be removed and replaced at contractor's expense.
- E. Average live loads on the roof during the work shall not exceed twenty (20) pounds per square foot at any time.

1.6 Job Conditions

- A. Insulation shall not be applied during precipitation or started in the event there is a probability of precipitation during the application.
- B. Do not expose tapered insulation to open flame or excessive heat. The material may smolder if ignited. Extinguish completely, remove from project site and replace with brand new material.
- C. Environmental Conditions: Install roofing only when satisfactory conditions prevail; **DO NOT APPLY** roofing when moisture in any form is present on the roof deck.

1.7 Protection

- A. Protect tapered insulation against concentrated loads and standing loads exerting a force in excess of 50% of the materials compressive strength.
- B. Any traffic shall be limited to the workmen installing the material.
- C. The contractor shall plan installation progress to prevent or minimize traffic access completed or partially completed sections. Where traffic across completed or partially completed sections is necessary, contractor shall provide protection adequate in (nature) and duration and consistent with requirements of the material manufacturer.
- D. All insulation shall be kept securely tarped with opaque tarps in addition to manufacturer's shipping wrap.

1.8 Warranty

- A. Warranty: Roofing system, including insulation, is subject to the terms of the warranty specified in Sections 07 5300.
 - 1. Insulation to be provided or approved in writing by roofing membrane manufacturer.
- B. The roofing contractor shall furnish to the Owner the insulation manufacturer's material performance and labor warranty. The warranty shall be for a period of

fifteen (15) years from Owner's acceptance of project and shall not be pro-rated and shall be without limit to the financial obligation.

- C. Certification:
1. Submit a written statement from roof insulation manufacturer that contractor has experience in the application of specified roof insulation, and the contractor is approved by insulation manufacturer.
 2. Submit a statement from roof insulation manufacturer certifying that roof system meets all identified costs, industry standards and insurance requirements.

PART 2 - PRODUCTS

2.1 Manufacturers

- A. Provide roofing insulation from one of the following manufacturers and otherwise confirming to these specifications are acceptable:
1. Carlisle Syntec Systems, Carlisle, PA
 2. Celotex, Tampa, FL
 3. R-max, Dallas, TX
 4. Firestone Building Products, Inc.
 5. Atlas Energy Products, Atlanta, GA
 6. Hunter Panels, Portland, ME
- B. Provide roofing insulation fasteners from one of the following manufacturers and otherwise confirming to these specifications are acceptable:
1. SFS/Stadler Inc., Reading, PA
 2. Construction Fasteners Inc., Wyomssing, PA
 3. ITW Buildex, Elmhurst, IL
 4. Olympic Fasteners, Agawam, MA
 5. Carlisle Syntec Systems

2.2 Insulation

- A. Insulation at all flat roof areas: Provide the following with a minimum installed indicated.
1. Flat board, rigid, cellular thermal insulation with polyisocyanurate closed-cell foam core and fibermat facers integrally laminated to both sides; complying with FS HH-I-1972/2, Class 1; R-values as designated shall comply with LTTR (Long-Term Thermal Resistance) 15-year time-weighted average:
 - a. Surface Burning Characteristics: Maximum flame spread of 25.
 - b. Compressive Strength: 20 psi.
 2. Provide the following insulation to comply with required aged R-values:
 - a. **R-24.0.**
 - b. Provide **Two (2) equal** layers of board with joints staggered 6 inches in each direction.
 3. Provide tapered insulation to facilitate roof slope of 1/4 inch per foot and a minimum valley slope equal to 1/8 inch per foot. Lay insulation sheets

so that tapered ends form a continuous smooth slope with no protruding edges.

- B. Provide expanding foam insulation/sealant at the perimeter edge of deck and curb opening locations and all gaps in the insulation greater than 1/4".

PART 3 - EXECUTION

3.1 Installation

- A. Inspection: Inspect surfaces to receive insulation and verify that condition is satisfactory for the installation; installation of materials is understood as acceptance of the substrate as satisfactory.
- B. General: Install all roof insulation in strict conformance to manufacturer's printed instructions and approved details, thickness or R values as indicated.
- C. Extend single layer of fastened laid insulation over entire surface to be insulated, cutting and fitting tightly around obstructions. Gaps greater than 1/4 inch must be filled with the same material. Form crickets, saddles, and other tapered areas with additional material as shown and as required for proper drainage of membrane.
 - 1. Stagger joints in one direction for each course. For multiple layers, stagger joints in both directions between courses with no gaps, to form a complete thermal envelope. Stagger joints 6 inches in each direction.
 - 2. Provide saddle/crickets at upside slope of all equipment curbs over 4 feet in width.
- D. Coordinate installation with single ply roof membrane. Install no more insulation per day than can be covered in the same day.

3.2 Workmanship

- A. Work that does not conform to specified requirements including tolerances and finishes, shall be corrected and/or replaced as directed by the Owner's Representative, at Contractor's expense, without extension of time. Therefore, Contractor shall also be responsible for cost of corrections to any Work affected by or resulting from the correction to Work of this Section.
- B. Ponded water conditions will not be acceptable under any circumstances when they occur at lap seams or near gutter edges.

3.3 Clean-Up

- A. General clean up and good housekeeping shall be maintained on a daily basis.
- B. After installation is completed, remove all materials, containers and equipment from job.
- C. Clean and remove spilled materials from building or adjacent surfaces.

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SECTION 07 2616 – VAPOR RETARDER

PART 1 - GENERAL

1.1 Section Includes

- A. Vapor retarders to be provided and installed at the following locations:
 - 1. Placed under interior concrete slabs on grade where indicated.

1.2 Related Requirements

- A. Cast-in-place Concrete - Ref: Section 03 3000.
- B. Building Thermal Insulation – Ref: Section 07 2100.

1.3 Reference Standards

- A. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials, 2005.
- B. ASTM E 1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2009.

1.4 Submittals

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's product literature and instructions for vapor barrier material and mastic.

1.4 Delivery, Storage and Handling

- A. Deliver materials to project site in manufacturer's original packaging or containers.
- B. Store to prevent damage, deterioration or contamination.

PART 2 – PRODUCTS

2.1 Vapor Retarder

- A. Water Vapor Retarder (slabs-on-grade):
 - 1. Decay resistant materials complying with ASTM E 96 not exceeding 0.03 perms, ASTM E 154 and ASTM E 1745 Class A. Provide polyethylene sheet not less than 15 mils thick, Raven Industries “VaporBlock 15”, Stego Industries 15 mil “Stego Wrap™”, or W.R. Meadows Sealtight 15 mil “Vapor Mat”.
 - 2. Approved equals by:
 - a. W.R. Meadows Premoulded Membrane with Plasmatic Core.
 - b. Zero-Perm by Alumiseal.

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2.2 Accessories

- A. Floors: all penetrations, blockouts and Vapor Barrier membrane overlaps (6" minimum) must be sealed with the following:
 - 1. Stego Wrap Red Polyethylene Seam Tape: polyethylene based, pressure sensitive adhesive providing permanent bonding with Water Vapor Transmission Rate ASTM E 96 0.3 perms or lower.
 - 2. Stego Mastic: Vapor proofing mastic with Water Vapor Transmission Rate ASTM E 96 0.3 perms or lower.
 - 3. Pipe boots: Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

PART 3 - EXECUTION

3.1 Installation

- A. Apply under slab vapor barrier over gravel sub-base prior to concrete pour. Ensure that subsoil is approved by Geotechnical Engineer. Level and tamp or roll aggregate, sand or granular base Gravel surface to be leveled before laying vapor barrier.
- B. Sheets to be applied in the widest practical width parallel to direction of pour with joints top lapped **6" minimum and taped**. Barrier is to be turned up and sealed at all walls, columns, and vertical surfaces. Extend film over exposed top edge of perimeter foundation insulation.
- C. Care shall be taken by workmen not to puncture or in any way damage the membrane.
- D. Any puncture or tears shall be repaired by a rectangular piece from the polyethylene roll material, place over damaged area, and tape around all edges. Patch shall be one foot larger than penetration in all directions and seal at overlapping edges.
- E. Install vapor retarder in accordance with manufacturer's instructions and ASTM E 1643-98 (2005).
 - 1. Unroll vapor retarder with the longest dimension parallel with the direction of the concrete pour.
 - 2. Lap vapor retarder over footings and/or seal to foundation walls.
 - 3. Overlap joints 6 inches and seal with manufacturer's tape.
 - 4. Seal all penetrations (including pipes) per manufacturer's instructions.
 - 5. No penetration of the vapor retarder is allowed except for reinforcing steel and permanent utilities.
 - 6. Repair damaged areas by cutting patches of vapor retarder, overlapping damaged area 6 inches and taping all four sides with tape.

END OF SECTION

SECTION 07 2760 – FLUID-APPLIED WEATHER BARRIERS

PART 1 - GENERAL

1.1 Section Includes

- A. Provide the weather resistant Barrier as shown and specified. Work includes:
 - 1. Fluid-applied, vapor permeable weather barrier membrane.
 - 2. Joint Treatment:
 - a. Joint Tape.
 - b. Joint Compound.
 - 3. Flashing:
 - a. Vapor Permeable Fluid-Applied Elastomeric Flashing.
 - b. Flexible Flashing.
 - c. Sheet Flashing.
 - 4. Primers for flexible flashing and sheet flashing.
 - 5. ***This product is to be used in conjunction with exterior sealants at the exterior sheathing joints as specified in Section 07 9005, Sealants.***

1.2 Related Requirements

- A. Masonry Veneer – Ref: Section 04 2000.
- B. Rough Carpentry – Ref: Section 06 1000.
- C. Thermal Insulation – Ref: Section 07 2100.
- D. Sealants – Ref: Section 07 9005.
- E. Exterior Sheathing – Ref: Section 09 2500.

1.3 References

- A. ASTM International
 - 1. ASTM C 1250 – Standard Test Method for Nonvolatile Content of Cold Liquid-Applied Elastomeric Waterproofing Membranes.
 - 2. ASTM D 412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
 - 3. ASTM D 2240 – Standard Test Method for Rubber Property – Durometer Hardness.
 - 4. ASTM D 4541 – Standard Test Method for Pull-off Strength of Coatings Using Portable Adhesion Testers.
 - 5. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 6. ASTM E 96 - Test Method for Water Vapor Transmission of Materials
 - 7. ASTM E 283 – Standard Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across the Specimen.

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8. ASTM E 331 – Standard Test Method for Water Penetration of Exterior Windows, Skylight, Doors and Curtain Walls by Uniform Static Air Pressure Differences.
 9. ASTM E 779 – Standard Test Method for Determining Air Leakage Rate by Fan Pressurization.
 10. ASTM E 783 – Standard Test Method for Field Measurement of Air Leakage through Installed Exterior Windows and Doors.
 11. ASTM E 1105 – Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
 12. ASTM E 1186 – Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems.
 13. ASTM E 1677 - Specification for Air Retarder Material or System for Framed Building Walls.
 14. ASTM E 2178 – Standard Test Method for Air Permeance of Building Materials
 15. ASTM E 2357 – Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.
 16. ASTM G155 – Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.
 17. ASTM C 1305 - Standard Test Method for Crack Bridging Ability of Liquid-Applied Waterproofing Membrane.
- B. AATCC – American Association of Textile Chemists & Colorists
1. Test Method 127 Water Resistance: Hydrostatic Pressure Test.
- C. TAPPI
1. Test Method T-460; Air Resistance of Paper (Gurley Hill Method).

1.4 Submittals

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's current technical literature for each component to be used, including:
1. Substrate preparation instructions and recommendations.
 2. Samples: Actual pieces of weather resistant barrier material, not less than 12 inches (300 mm) square.
 3. Test Results: Submit copies of test results showing weather resistant Barrier performance characteristics equaling or exceeding those specified.
- C. Quality Assurance Submittals:
1. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.
 2. Manufacturer Instructions: Provide manufacturer's written installation.

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3. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of weather barrier system installation.
- D. Closeout Submittals:
1. Refer to Section 01 1700.
 2. Weather Barrier Warranty: manufacturer's executed warranty form with authorized signatures and endorsements indicating date of Substantial Completion.

1.5 Quality Assurance

- A. Qualifications
1. Installer shall have experience with installation of commercial fluid-applied weather barrier assemblies under similar conditions.
 2. Installer shall be trained and certified for installation by manufacturer.
- B. Installation shall be in accordance with manufacturer's installation guidelines and recommendations.
- C. Source Limitations: Provide weather barrier and accessory materials produced by single manufacturer.
1. Provide manufacturer's written installation instructions.
 2. Inspection: During initial weather resistant Barrier installation, a qualified manufacturer's representative shall conduct a timely inspection of the installation to verify compliance with manufacturer's installation instructions and recommendations. Submit inspection reports to the Architect and Contractor upon completion of inspection.
 3. There shall be no deviation made from the manufacturer's installation instructions without prior written approval of the manufacturer.
- D. Pre-installation Meeting
1. Hold a pre-installation conference, two weeks prior to start of weather barrier installation. Attendees shall include Contractor, Architect, certified installer, Owner's Representative, and weather barrier manufacturer's designated field representative.
 2. Review all related project requirements and submittals, status of substrate work and preparation, areas of potential conflict and interface, availability of weather barrier system materials and components, installer's training requirements, equipment, facilities and scaffolding, and coordinate methods, procedures and sequencing requirements for full and proper installation, integration and protection.
- E. Mock-up:
1. Install mock-up using approved weather barrier system including membrane, flashing, joint and detailing compound and related weather barrier accessories according to weather barrier manufacturer's current printed instructions and recommendations.

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- a. Mock-up size: 10 feet by 10 feet.
 - b. Mock-up Substrate: Match wall assembly construction including window opening.
 - c. Mock-up may remain as part of the work.
2. Contact manufacturer's designated representative prior to weather barrier system installation, to perform required mock-up visual inspection and analysis as required for warranty.

1.6 Delivery, Storage and Handling

- A. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store weather barrier materials as recommended by manufacturer.

1.7 Sequencing and Scheduling

- A. Review requirements for sequencing of installation of the weather barrier system with installation of windows, doors, louvers and flashing to provide a weather-tight installation.
- B. Schedule installation of exterior cladding within nine months of weather barrier system installation.

1.8 Warranty

- A. Limited Warranty
 1. Manufacturer's warranty for weather barrier for a period often (10) years from date of Purchase.
 2. Pre-installation meeting and jobsite observations by weather barrier manufacturer for warranty are required.

PART 2 - PRODUCTS

2.1 Weather Barrier

- A. Manufacturer: DuPont Building Innovations; 4417 Lancaster Pike, Chestnut Run Plaza 728, Wilmington, DE 19805; 1.800.44TYVEK (8-9835); www.weatherization.tyvek.com.
 1. Description: A single-component, low VOC, 25 mil thick synthetic polymer fluid-applied product with superior elasticity and flexibility providing resistance to air flow, bulk water and wind driven rain yet allows moisture vapor to escape.
 2. Basis of Design: DuPont™ Tyvek® Fluid Applied WB System; including DuPont™ Tyvek® Fluid Applied WB, DuPont™ Tyvek® Fluid Applied Flashing and Joint Compound, DuPont™ Tyvek® Fluid Applied Flashing – Brush Grade and DuPont™ Sealant for Tyvek® Fluid Applied Systems.

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- B. Performance Characteristics:
1. Air Penetration Resistance (Material):
 - a. 0.0002 cfm/ft² at 75 Pa, when tested in accordance with ASTM E 2178.
 - b. Air infiltration greater than 10,000 seconds per 100cc, when tested in accordance with TAPPI Test Method T-460.
 2. Air Penetration Resistance (System / Assembly):
 - a. ≤ 0.01 cfm/ft² at 75 Pa, when tested in accordance with ASTM E 2357.
 - b. ≤ 0.01 cfm/ft² at 75 Pa, Type I Air Barrier, when tested in accordance with ASTM E 1677.
 3. Water Vapor Transmission: 25 perms, when tested in accordance with ASTM E 96, Method B at 25 mils DFT (Dry Film Thickness).
 4. Water Penetration Resistance: Greater than 1000 cm when tested in accordance with AATCC Test Method 127. No leakage at 15 psf when tested in accordance with ASTM E 331.
 5. Tensile Strength: Minimum 169 lbs/in², when tested in accordance with ASTM D 412.
 6. Estimated Elongation: 420% in accordance with ASTM D 412.
 7. Hardness: Passes at a Shore A hardness of 71, when tested in accordance with ASTM D 2240.
 8. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E 84. Flame Spread: 25, Smoke Developed: 25.
 9. UV Resistance: 9 months
 10. Volatile Organic Content (VOC): Less than 2% (25-30 g/L) when measured in accordance with ASTM C 1250.
 11. Adhesion Strength (Concrete): Greater than 33 psi when measured in accordance with ASTM D 4541.
 12. Low Temperature Crack Bridging: Pass, when tested in accordance with ASTM C 1305.
- C. Alternate Manufacturers: Subject to compliance with requirements, provide fluid-applied weather barrier materials manufactured by one of the following:
1. BASF, Enershield HP.
 2. Prosoco, R-Guard MVP.
 3. Approved equal.

2.2 Accessories

- A. Joint Treatment
1. Joint Tape:
 - a. Product: Self-adhered fiberglass mesh tape as recommended by weather barrier manufacturer.
 2. Joint Compound: Fluid-applied, vapor permeable, elastomeric flashing material; trowel applied.
 - a. Product: DuPont™ Tyvek® Fluid Applied Flashing and Joint Compound.

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- B. Flashing:
 - 1. Vapor permeable fluid-applied elastomeric flashing:
 - a. Product:
 - 2. Flexible flashing with butyl adhesive layer
 - a. Product: DuPont™ FlexWrap™ NF.
 - 3. Sheet flashing with butyl adhesive layer.
 - a. Product: DuPont™ StraightFlash™.
- C. Sealant: Elastomeric; non-vapor permeable sealant; compatible with weather barrier.
 - 1. Product: DuPont™ Sealant for Tyvek® Fluid Applied Systems.
- D. Primers for flexible flashing and sheet flashing:
 - 1. Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.
 - 2. Products:
 - a. 3M High Strength 90.
 - b. Denso Butyl Spray
 - c. SIA 655.
 - d. Permagrip 105.
 - e. ITW TACC Sta'Put SPH.

PART 3 - EXECUTION

3.1 Examination

- A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories

3.2 Preparation

- A. Complete surface preparation, priming, flashing and detailing of openings, cracks, and material transitions prior to beginning installation of fluid-applied weather barrier system.
- B. Surfaces shall be clean and free of frost, oil, grease, mold and efflorescence prior to application of fluid-applied weather barrier system.

3.3 Installation - Detailing

- A. Corners:
 - 1. Provide full coverage at all internal and external corners.
- B. Joint Treatment
 - 1. Sheathing:
 - a. Joints shall be prepared per manufacturer's approved joint treatment details.

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- b. Apply joint tape as recommended by fluid-applied weather barrier manufacturer.
 - 1) No joint treatment required for joints up to 1/16 inch.
 - 2) Joints 1/16 to 1/4 inch: Fluid-applied joint compound applied to form a 1 inch width on each side of sheathing joint; smooth joint compound across sheathing joint. Thickness shall be 15 to 25 mils.
 - 3) Joints 1/16 to 1/2 inch: Apply joint tape to bridge both sides of joint equally. Apply fluid-applied joint compound and trowel smooth embedding joint compound uniformly into joint tape to form a 1 inch width on each side of sheathing joint at a consistent thickness of 15 to 25 mils.
 - 4) Joints 1/2 to 1 inch: Apply sheet flashing primer above and below sheathing joint. Center sheet flashing over sheathing joint and press firmly in place per manufacturer's recommendations.
- 2. Non-movement joint in masonry and transitions to columns and beams:
 - a. Joints 1/4 inch wide or less: Apply fluid-applied joint compound a minimum of 2 inches wide by 60 mils thick to each side of joint or crack.
 - b. Joints 1/4 to 1/2 inch: Cover first with mesh tape.
- C. Apply fluid-applied joint compound to cladding anchors prior to installation of weather barrier membrane per manufacturer's instructions.
- D. Apply fluid-applied joint compound around penetrations in exterior walls forming a fillet bead minimum 1/2 inch onto each surface.
- E. Installation – Vapor permeable fluid-applied elastomeric flashings at openings:
 - 1. At jambs and head of rough opening: Apply 25 mil thickness of fluid-applied flashing to full depth of opening and 2 inches onto outside face of opening.
 - 2. At sills: Apply primer to substrates as recommended by manufacturer. Cut sheet flashing to fit directly between jambs of opening. Install sheet flashing to full width of sill opening and down onto outside face of opening a minimum of 2 inches. Cover sheet flashing with 25 mil thickness of vapor permeable fluid-applied elastomeric flashing per fluid-applied weather barrier manufacturer's instructions.
- F. Installation (alternate) – Self-adhered flexible and sheet flashing at openings:
 - 1. Prime substrates as recommended by self-adhered sheet membrane flashing manufacturer. Cut flexible flashing a minimum of 12 inches longer than length of sill rough opening.
 - 2. Cover horizontal sill by aligning flexible flashing so that 2 inches will extend onto the face of the wall. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure sheet membrane tightly into corners by working in along the sill before adhering up the jambs.

3. Fan flexible flashing at bottom corners onto face of wall. Firmly press in place.
 4. Apply 9-inch wide strips of sheet flashing at jambs. Align sheet flashing so that 2 inches will extend onto the face of the wall. Start sheet flashing at head of opening and lap sheet membrane at sill.
 5. Install flexible flashing at opening head using same installation procedures used at sill. Overlap jamb flashing a minimum of 2 inches.
 6. Coordinate flashing with fluid-applied weather barrier and window installation.
- G. Allow Fluid-Applied Flashing, Joint Compound and Sealant to cure for minimum 24 hours before coating with Fluid-applied Weather Barrier.

3.4 Installation – Fluid-Applied Weather Barrier

- A. Install fluid-applied weather barrier prior to installation of windows, doors, and louvers.
- B. Mask and protect any adjacent finished surfaces from fluid-applied weather barrier material.
- C. Install fluid-applied weather barrier over exterior face of required exterior wall substrates in accordance with weather barrier manufacturer recommendations and instructions.
- D. Install fluid-applied weather barrier by pressure roller to achieve 25 mils providing a consistent and uniform thickness.
- E. Repair any voids, holidays, or non-uniform installations or damage by other trades to proper mil thickness prior to installation of final cladding assemblies.

3.5 Field Quality Control

- A. Notify weather barrier manufacturer's designated representative to obtain [required] periodic observations of weather barrier system installation.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections as required in Contract Documents.
- C. Inspections: Weather barrier materials, accessories, and installation are subject to inspection for compliance with performance requirements.
- D. Tests: As determined by Owner's testing agency from among the following tests:
 1. Quantitative Air-Leakage Testing: Weather barrier assemblies will be tested for air infiltration according to ASTM E 783.
 2. Quantitative Air-Leakage Testing: Whole building air leakage will be tested in accordance with ASTM E 779, ASTM E 1827 or equivalent.

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3. Qualitative Air-Leakage Testing: Weather barrier assemblies will be tested for evidence of air leakage according to ASTM E 1186.
 4. Qualitative Water-Leakage Testing: Weather barrier assemblies will be tested for water leakage according to ASTM E 1105.
- E. Weather barriers assemblies will be considered defective upon failure of inspections and specific project testing required.
1. Apply additional fluid-applied weather barrier material, in accordance with manufacturer's instructions, where inspection results indicate insufficient thickness, voids, skips, pinholes or other defects as recommended by weather barrier manufacturer.
 2. Remove and replace deficient weather barrier system components for retesting as specified above.
- F. Repair damage to weather barriers caused by destructive testing; follow manufacturer's written instructions.

3.6 Protection and Cleaning

- A. Protect weather barrier from contact with incompatible materials and sealants not approved per weather barrier manufacturer's recommendation.
- B. Protect installed weather barrier system from damage during construction prior to cladding installation.
1. If damaged or exposed to UV beyond nine (9) months, clean and prepare surfaces and install additional, full-thickness, fluid-applied weather barrier application in accordance with weather barrier manufacturer's instructions.
- C. Remove masking materials and adjacent protection after weather barrier installation.

END OF SECTION

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SECTION 07 5300 – ELASTOMERIC MEMBRANE ROOFING

PART 1 - GENERAL

1.1 Section Includes

- A. EPDM roofing membrane, insulation, flashings and accessories, mechanically fastened conventional application, installed in accordance with drawings and specifications approved by the roofing membrane manufacturer.
 - 1. Fully adhered EPDM roofing at the low slope roof areas and vertical parapets as indicated on the drawings.

1.2 Related Requirements

- A. Administrative Requirements: Pre-Installation Meeting – Ref: Section 01 3000.
- B. Rough Carpentry: Wood nailers and curbs - Ref: Section 06 1000.
- C. Roof Insulation – Ref: Section 07 7220.
- D. Metal Roofing – Ref: Section 07 6100.
- E. Sheet Metal Flashing, Trim and Counterflashing – Ref: Section 07 6200.

1.3 Reference Standards

- A. ASTM C 1289 – Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2008.
- B. ASTM D 4637 – Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2008.
- C. FM DS 1-28 – Wind Design; Factory Mutual Research Corporation; 2007.
- D. UL (RMSD) – Roofing Materials and Systems Directory; Underwriters Laboratories Inc.; current edition.

1.4 Administrative Requirements

- A. Pre-installation Meeting: Convene two weeks before starting work of this section.
 - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.5 Submittals

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.

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- B. Product data, installation instructions, and general recommendations from single ply membrane manufacturer for types of roofing required. Include data substantiating materials comply with requirements.
- C. Samples of finished roofing sheets, including T-shaped side/end-lap seam. Also include samples of the following:
 - 1. Roof deck insulation and technical data.
- D. Shop drawings showing roof configuration, sheet layout, seam locations, colors (as applicable), details at perimeter, and special conditions.
 - 1. **Submit for typical and non-typical conditions of Project. Manufacturer's standard details are not acceptable for Shop drawings. A project specific detail drawing package will be required.**
 - 2. Indicate and identify materials to be incorporated in the work, dimensions, thickness of each material and system and relationship to adjacent construction.
 - 3. Indicate layout of tapered insulation materials, if required.
 - 4. Indicate layout of roof walkway pads.
 - 5. Submit written acceptance by manufacturer of adhesive for fully adhered membrane adhesive to Dens Deck sheathing and to polyisocyanurate insulation.
 - 6. Contractor shall provide written evidence that he has reviewed the project specifications and drawings and will abide and uphold the Guarantee and Maintenance provision as outlined in this specification. Statement shall be on Contractor's letterhead and shall be signed by an officer of the corporation.
 - 7. Manufacturer shall provide written evidence that he has reviewed the project specifications and drawings and will abide and uphold the Guarantee and Maintenance provision as outlined in this specification. Statement shall be on manufacturer's letterhead and shall be signed by an officer of the corporation.
 - 8. Submit copy of warranties of roof material manufacturer and roof contractor.
- E. Certification:
 - 1. Submit written statement of roof membrane manufacturer that contractor has experience in the application of the specified roof system, and the contractor is approved by the membrane manufacturer. Statement shall be on the roofing material manufacturer's letterhead, and shall be signed by an officer of the corporation.
 - 2. Certify that roof system meets all identified codes, industry standards and insurance requirements.
- F. Pre-Roofing Conference records. Certification is required from the contractor that he has received, read and will abide by the information contained in the pre-roofing conference meeting minutes before the work shall commence.

1.6 Quality Assurance

- A. Manufacturer: Obtain primary flexible sheet roofing from a single manufacturer. Provide secondary materials as recommended by manufacturer of primary materials.
- B. The Owner shall engage an independent roofing consultant to monitor the installation of the roofing assemblies, review all submittals and shop drawings and attend the pre-installation meeting.
- C. Installer: An experienced Installer shall apply single ply membrane roofing who has specialized in application of roofing systems similar to those required for this project for a minimum of 3 to 5 years. Installer must be acceptable to or licensed by manufacturer of primary roofing material.
 - 1. Provide and include a completed AIA Document A305 Contractor's Statement with the bid unless previously submitted prior to bid.
 - 2. Provide a list of three (3) installations of equivalent scope of this project. Give name of project, location of project and name of Owner for each installation.
 - 3. Provide written statement from primary roof material manufacturer, certifying the Project Superintendent and at least two (2) assistants have attended and passed the manufacturers installation course.
 - 4. A bidder may be required to furnish further evidence satisfactory to the Owner that he and his proposed subcontractors have sufficient means and experience in the types of Work called for to assure completion of the Contract in a satisfactory manner.
- D. **Pre-Roofing Conference: Before installation of roofing and associated work, meet at project site, or other mutually agreed location, with Installer, roofing sheet manufacturer, installers of related work, and other entities concerned with roofing performance, including (where applicable) Owner's insurer, test agencies, governing authorities, Architect, and Owner. Record discussions and agreements and furnish copy to each participant. Provide at least 72 hours advance notice to participants before convening pre-roofing conference.**
- E. Manufacturer's representative shall inspect and verify the following:
 - 1. The surfaces to which the membrane roofing is to be applied are in a condition suitable for this application.
 - 2. The materials to be installed comply in all respects with the requirements of this specification.
 - 3. The materials can be installed in complete accordance with the manufacturer's recommended methods of installation.
- F. Performance Standards:
 - 1. UL Listing: Provide labeled materials tested and listed by UL in "Building Materials Directory" or by other nationally recognized testing laboratory for application indicated, with "Class A" rated materials/system for roof slopes shown.

2. Warranty must provide wind speed coverage up to **72 mph** measured at 10 meters above the ground.

1.7 Project Conditions

- A. Weather: Proceed with roofing work when existing and forecasted weather conditions permit work to be performed in accordance with manufacturer's recommendations and warranty requirements.
- B. Substrate Conditions: Do not begin roofing installation until substrates have been inspected and are determined to be in satisfactory conditions.
- C. Coordination between trades is essential to avoid unnecessary rooftop traffic over sections of the roof and to prevent subsequent damage to the TPO membrane roofing system.
- D. If this roofing system is installed during windy conditions or on projects that are not encapsulated precautionary measures must be taken to utilize temporary ballast during installation.

1.8 Delivery, Storage, and Handling

- A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.
- B. Store products in weather protected environment, clear of ground and moisture.
- C. Protect foam insulation from direct exposure to sunlight.

1.9 Warranty

- A. See Section 01 7800 – Closeout Submittals, for additional warranty requirements.
- B. System Warranty: Provide manufacturer's total system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
 1. Warranty Term: **15** years.
 2. For repair and replacement include costs of both material and labor in warranty.
 3. The maximum wind speed coverage shall be peak gusts of **72** mph measured at 30 feet above ground level.
 4. Warranty is to be a non-prorated warranty with a no dollar liability limit. System warranty to include membrane, insulation, adhesives, fasteners metal edging and trim and any other primary roofing products.
 5. Insulation to be provided and approved in writing by roofing membrane manufacturer.

- C. The warranty shall provide that if within the warranty period the single-ply membrane roofing system becomes non-watertight, or splits, or tears, or separates at the seams, because of defective materials or workmanship, the repair/replacement of defective materials and correction of defective workmanship shall be the responsibility of the manufacturer and/or Contractor.

PART 2 – PRODUCTS

2.1 Manufacturers

- A. EPDM Membrane Materials:
1. Carlisle SynTec; www.carlisle-syntec.com.
 2. Firestone Building Products Co: www.firestonebpc.com.
 3. GenFlex Roofing Systems: www.genflex.com.
 4. Johns Manville: www.jm.com.
 5. Substitutions as approved by Architect.

2.2 Roofing

- A. Elastomeric Membrane Roofing: One ply membrane, fully adhered, over insulation.
- B. Roofing Assembly Requirements:
1. Roof Covering External Fire-Resistance Classification: UL Class C.
 2. Factory Mutual Classification: Class I and windstorm resistance of I-60, in accordance with FM DS 1-28.
 - a. Design Wind Speed: **72** mph.
 - b. Ground Roughness: Class C.
- C. Acceptable Insulation Types – Constant Thickness Application:
1. Single layer of polyisocyanurate board.

2.3 Roofing Membrane and Associated Materials

- A. Membrane:
1. Material: Ethylene-propylene-diene-terpolymer (EPDM) complying with minimum properties of ASTM D 4637.
 2. Reinforcing: None.
 3. Thickness: 0.045 inch reinforced, minimum.
 4. Sheet Width: Factory fabricated 8 feet maximum.
 5. Color: Black.
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Flexible Flashing Material: Same material as membrane; conforming to the following:
1. Thickness: 60 mil.
 2. Color: Black.

2.4 Insulation

- A. Polyisocyanurate Board Insulation as specified in Section 07 2200: Rigid cellular foam, complying with ASTM C 1289, Type II, Class 1, glass fiber mat both sides.
 - 1. Thermal Resistance: R-value of 24.0.
 - 2. Provide tapered boards where indicated for sloping to drain. Fabricate with taper of ½ inch per foot. unless otherwise indicated.

2.5 Accessories

- A. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.
- B. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
 - 1. Length as required for thickness of insulation material and penetration of deck substrate.
- C. Membrane Adhesive: As recommended by membrane manufacturer.
- D. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.
- E. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.
- F. Roofing Nails: Galvanized, hot dipped type, size and configuration as required to suit application.
- G. Strip Reglet Devices: Galvanized steel, maximum possible lengths per location, with attachment flanges.
- H. Sealants: As recommended by membrane manufacturer.

PART 3 - EXECUTION**3.1 Examination**

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

- F. Verify that positive roof slope exists in all areas.
- G. Verify location, dimensions and elevations of primary and secondary roof drainage components including roof drains and overflow scuppers.
- H. Correct unsuitable conditions before proceeding with installation. Commencing installation signifies acceptance by the installer of the substrate.

3.2 Substrate Preparation

- A. Prior to the start of work, make the substrate smooth and free of debris, sharp edges, and other surface irregularities that will be detrimental to the installation.
- B. Correct unevenness and joint gaps greater than ¼ inch in the membrane substrate as they can cause inconsistent membrane welds. When such conditions occur, fill with appropriate and properly secured insulation or material approved by manufacturer's technical review department.
- C. Nailers: Verify that:
 - 1. Nailers are installed at gravel stops and drip edges.
 - 2. Nailers are pressure-preservative treated (fire-retardant-treated where required; creosote and asphaltic preservatives are not acceptable).
 - 3. Nailers are anchored with fasteners suitable for the application having a minimum withdrawal resistance of 100 lb., staggered 6 inches on center within 8 feet of an outside corner and 12 inches on center along other perimeter areas.
 - 4. Top surfaces of nailers match the top surface of adjacent construction plus/minus ¼ inch, without contributing to ponding.
- D. Flashing Substrates: Verify that the substrate is smooth and free of sharp edges and other surface irregularities that will be detrimental to 100-percent adhesion of the flashing membrane.

3.3 Insulation – Under Membrane

- A. Attachment of Insulation:
 - 1. Mechanically fasten first layer of insulation to deck in accordance with roofing manufacturer's instructions.
- B. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
- C. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- D. Mechanically attach boards:
 - 1. Use fastener pattern and spacing in accordance with approved submittals.

2. Provide additional fasteners as necessary to conform to the substrate surface geometry.
- F. Do not apply more insulation than can be covered with membrane in same day.

3.4 Adhered Roofing Membrane Installation

- A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing. When feasible, flash all penetrations and walls with cured EPDM. Uncured flashing must be limited to overlay vertical seams or to flash inside and outside corners, scuppers, pourable sealer pockets and other penetrations or unusually shaped walls where cured membrane flashing is not practical.
- B. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- C. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- D. Shingle joints on sloped substrate in direction of drainage.
- E. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
- F. At intersections with vertical surfaces:
 1. Extend membrane over cant strips and up a minimum of 8 inches onto vertical surfaces.
 2. Fully adhere flexible flashing over membrane and up to nailing strips.
- G. At edge of roof flashing and trim, extend membrane under flashing and to the outside face of the wall.
- H. Around roof penetrations, seal flanges and flashings with flexible flashing.
- I. Install roofing expansion joints where indicated. Make joints watertight.
- J. Coordinate installation of roof drains and sumps and related flashings.
- K. Bonding Adhesive: Apply bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry. Do not apply bonding adhesive to splice area of roofing membrane.
- L. Mechanically or adhesively fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.
- M. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement, and firmly roll side and end laps of overlapping roofing membranes according to manufacturer's written instructions to ensure a watertight seam

installation. Apply lap sealant and seal exposed edges of roofing membrane terminations.

- N. Repair tears, voids, and lapped seams in roofing that does not meet requirements.

3.5 Field Quality Control

- A. See Section 01 4000 – Quality Requirements, for general requirements for field quality control and inspection.
- B. Manufacturer's Field Service: Upon completion of the installation, have the manufacturer's representative make an inspection to ascertain that the roofing membrane system has been installed according to manufacturer's approved specifications and details.
- C. Warranty Inspection: Provide manufacturer's inspection for acceptance for warranty.
- D. Rejection of Defective Work: Areas having excessive patching as a result of damage to the membrane or faulty installation may be rejected by membrane manufacturer or the Architect; replace the membrane completely in these areas.
- E. Wrinkles, fishmouths or other imperfections directly in any field sheet overlap or flashing membrane seam, shall be repaired utilizing a new membrane patch over a splice cleaned surface. Raised portion of membrane must be cut out and the area rendered flat, prior to installation of the patch. New patches to be completed using standard membrane seaming installation guidelines contained in these specifications, sized to exceed the compromised areas by 4 inches in each direction.

3.6 Cleaning

- A. In areas where finished surfaces are soiled by work of this section consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.
- B. Repair or replace defaced or damaged finishes caused by work of this section.

3.7 Protection

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

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SECTION 07 6100 - METAL ROOFING**PART 1 - GENERAL****1.1 Summary**

- A. This Section includes preformed pre-finished metal roof panels and flashings including miscellaneous trim, flashings, closures, valleys, ridges corners, rakes, drip flashing, gutters and accessories. Work includes:
 - 1. Metal standing seamed roof system with batten seam covers at sloped roof locations.
 - 2. Low slope prefinished metal roof cricket.
 - 3. Metal standing seamed roof panels with batten seam covers at vertical walls and parapets.
 - 4. Provide snow guards where indicated on drawings for sloped roofs.
- B. Related Sections:
 - 1. Rough Carpentry - Ref: Section 06 1000.
 - 2. Roofing Underlayment – Ref: Section 07 1300.
 - 3. Flashing and Sheet Metal - Ref: Section 07 6200.
 - 4. Sealants – Ref: Section 07 9000.

1.2 System Performance Requirements

- A. Provide certified test results by a recognized testing laboratory of agency in accordance with test method for each system.
 - 1. Air infiltration: Provide roof panel with no air leakage when tested in accordance with ASTM E 283 at pressure differentials up to 1.57 psf.
 - 2. Water Penetration: Provide panel systems with no water penetration, as defined in the test method in accordance with ASTM E 331, at an inward static air pressure differential of not less than 6.24 psf and not more than 12.0 psf.
- B. References
 - 1. American Iron & Steel Institute (AISI) Specification for the Design and Cold formed Steel Structural Members.
 - 2. ASTM A-653 & ASTM A924 Steel Sheet, Zinc-Coated (Galvanized).
 - 3. ASTM E-283-84.
 - 4. ASTM E-331-86.
 - 5. ASTM E-1592.
 - 6. Spec Data Sheet – Galvalume Sheet Metal by Bethlehem Corp.
 - 7. SMACNA – Architectural Sheet Metal Manual.
 - 8. Building Materials Directory – Underwriter’s Laboratories, Test Procedure 580.

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1.3 Submittals

- A. Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data including manufacturer's product specifications, standard details, and certified product test results, installation instructions, and general recommendations, as applicable to materials and finishes for each component and for each total panel system.
- C. Samples for verification purposes, on sample panels 12 inches long by actual panel width, in the profile and color indicated. Include clips, battens, fasteners closures and other panel accessories.
- D. Shop drawings showing layout of panels, details of edge conditions, joints, corners, panel profiles, supports, anchorages, trim, flashings, closures and special details. Distinguish between factory and field assembly work including the system profile sheet, system description including: material base sheet gauge, seam height, panel on-center, finish, and sealant as required.
- E. Submit a sample of each type of roof panel, complete with factory finish. In the case where custom color is specified, send a custom color chip for written approval along with a standard color product sample for review. Submit complete shop drawings, details, product data and material sample. Show expansion joint details and waterproof connections to adjoining work and at obstructions and penetrations.
- F. Submit results indicating compliance with minimum requirements of the following performance tests:
 - 1. Air Infiltration ASTM E 283-84
 - 2. Water Infiltration ASTM E 331-86
 - 3. Wind Uplift - U.L.90

1.4 Quality Assurance

- A. Qualification of installers:
 - 1. Competent and skilled sheet metal applicators familiar with the Manufacturing Company's products, standard details and recommendations. Applicator shall have at least two (2) years experience applying these types of materials with successful completion of projects with similar scope.
 - 2. Installers shall be thoroughly trained and experienced in the necessary crafts and who are completely familiar with and comply with the recommendations and details of the manufacturer and the "Architectural Sheet Metal Manual" published by SMACNA.
 - 3. Installers shall follow the manufacturers' installation details without exception unless written authorization from the manufacturer and architect are provided on an installation detail revision. Detail revision authorization must be made in advance of product installation.

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4. Submit shop drawings signed by a registered engineer licensed to practice in the State of Ohio where project is located certifying the design of the roof system meets the specified performance criteria.
- B. Qualification of the product manufacturer:
1. Manufacturer shall be a company specializing in Architectural Sheet Metal Products with at least ten (10) years experience. Being listed as a pre-qualified manufacturer does not release manufacturer from providing complete, current and acceptable test data for each performance, thermal, and wind load requirement specified for specific profile proposed.
 2. Manufacturer shall operate a permanent, full-time, manufacturing facility where the metal roof panels are produced on fixed based roll forming machines that are included in the Underwriter's Laboratory field inspection services. These facilities must be currently under inspection at least four times per year by Underwriter's Laboratory personnel to verify compliance that the products fabricated are in accordance with the specifications of the products which were originally tested
 3. Field Measurements: Where possible, before fabrication of the panels, take field measurements of structure or substrates to receive panel system. Allow for trimming panel units where final dimensions cannot be established before fabrication.

1.5 Delivery, Storage and Handling

- A. Deliver panels and other components so they will not be damaged or deformed. Package the panels for protection against transportation damage. Upon receipt of panels and other materials, installer shall examine the shipment for damage and completeness.
- B. Exercise care in unloading, storing, and erecting roof panels to prevent bending, warping, twisting and surface damage.
- C. Stack materials on platforms or pallet, covered with tarpaulins or other suitable watertight ventilated covering. Store panels so they will not accumulate water. Panels should be stored in a clean, dry place. One end should be elevated to allow moisture to run off. Do not store panels in contact with other materials that might cause staining, denting or other surface damage. Stack all materials to prevent damage and to allow for adequate ventilation.
- D. Panels with strippable film must not be stored in the open, exposed to the sun.

1.6 Warranty

- A. Manufacturer to provide twenty (20) year warranty on system paint finish against cracking, peeling and fade (not to exceed 5 N.B.S. units). Furnish manufacturer's Twenty (20) Year Warranty stating the architectural fluorocarbon coating will:

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1. Not crack, chip, peel or exhibit any other mechanical failure of paint to adhere to the substrate.
 2. Not exhibit fading or color change in excess of five (5) hunter delta E units as determined by ASTM D2244-79.
 3. Not chalk in excess of a numerical rating of eight (8) as determined by ASTM D4214-89.
- B. Installer to provide five (5) year warranty on system components, installation and watertightness. Furnish manufacturer's Standard Watertightness Warranty for a 5 year period after the date of substantial completion. Entire source of material and labor shall be the sole responsibility of one subcontractor.
- C. Galvalume material shall have a twenty year guarantee against failure due to corrosion, rupture or perforation.
- D. Warranty shall be limited to the value of the installed metal roof assembly.
- E. Warranty shall be signed by the manufacturer of the metal roof system and his authorized installer, agreeing at their option to replace or repair defective materials and workmanship as required maintaining the metal roof system in watertight condition.
- F. Warranty shall not exclude any conditions such as flashing, valleys, gutters, penetrations, etc. which are an integral part of the roof system.
- G. The manufacturer of the metal roof system shall review installation details and perform on site inspections as required to certify proper watertight roofing material installation.
- H. Applicator shall furnish guarantee covering watertightness of the roofing system for the period of two (2) years from the date of substantial completion.

PART 2 - PRODUCTS

2.1 Manufacturers

- A. Manufacturer: Dimensional Metals Inc. Additional manufacturers approved to bid this project are listed below. Being listed as a pre-qualified manufacturer does not release the manufacturer from providing a similar product that meets the performance criteria as listed in this specification. It is the responsibility of the manufacturers to provide evidence of meeting the specification parameters.
- B. Equal products are acceptable from the following manufacturers:
1. Berridge Manufacturing Company
 2. Peterson Aluminum Co.
 3. Approved equal.

2.2 Metal Roof Panels

- A. Prefinished Metal shall be Hot-Dipped Galvanized - ASTM A446-85 Grade C G90 Coating A525-86 24 Gauge core steel or prefinished Galvalume - ASTM 792-86 AZ-55.
- B. Unfinished Metal shall be Grade C Galvalume ASTM A792-86, AZ 55.
- C. Finish shall be full strength Kynar 500 Fluoropolymer coating, applied by the manufacturer on a continuous coil coating line, with a top side dry film thickness of 0.70 to 0.90 mil over 0.25 to 0.35 mil prime coat, to provide a total dry film thickness of 0.95 to 1.25 mil. Bottom side shall be coated with primer with a dry film thickness of 0.25 mil. Finish shall conform to all tests for adhesion, flexibility, and longevity as specified by the Kynar 500 finish supplier and shall have a 20 year warranty.
- D. Finish color from the manufacturer's current standard color selection guide. Unless otherwise noted all products shall be of the same finish and color.
- E. Strippable film shall be applied to the topside of the painted coil to protect the finish during fabrication, shipping and field handling. This strippable film must be removed during installation.
- F. Preformed Metal Roofing Systems: Fabricate roof panel face to the profile or configuration indicated from 24 gauge zinc-coated steel sheets as follows:
 - 1. **MTL-1:** Dimensional Metals Inc., Snap on High Seam Profile SS15-18 with Low Bead Stiffener.
 - a. Color: Classic Bronze.
 - 2. **MTL-2:** Dimensional Metals Inc., Double Lock Profile SS15-17 with Low Bead Stiffener.
 - a. Color: Classic Bronze.
 - 3. Provide Dimensional Metals Inc. 22 gage galvanized metal soldered to form a watertight cricket/valley at locations indicated on the drawings.
 - 4. All exposed adjacent flashing shall be of the same material and finish as the roof panels.
 - 5. Hem all exposed edges of flashing on underside, 1/2 inch.
 - 6. Certification shall be submitted, based on independent testing laboratory, indicating no measurable water penetration or air leakage beyond allowable tolerances through the system when tested in accordance with ASTM E-331-86 and E-283-84.
- G. Standing seams shall incorporate a continuous engineered interlocking connection with concealed anchor clips that prevents the entrance of water passage.
- H. Standing seams shall contain factory injected butyl sealant that runs continuously throughout the panel length as job conditions dictate.

2.3 Miscellaneous Materials

- A. Panel clips shall be as recommended by the manufacturer to meet the performance criteria of this specification. All exposed adjacent flashing shall be of the same material and finish as the roof panels.
- B. All exposed adjacent flashing shall be of the same material and finish as the roof panels.
- C. Fasteners: provide Galvanized Steel, Stainless Steel or Cadmium Plated Steel with washers where required. Verify fasteners and fastening with roof manufacturer prior to installation.
 - 1. Provide non-corrosive galvanized steel, stainless steel with neoprene washers as required to prevent any reaction from dissimilar metals.
 - 2. There shall be no exposed fasteners except to fasten flashing, at fixing points, or as indicated on the shop drawings.
- D. Closures:
 - 1. Hip and ridge closures shall be factory fabricated from similar material to the roof panels. Hip and ridge closures shall be field cut to fit properly between the panel seams.
- E. Sealant:
 - 1. Factory-applied seam sealant shall be non-curing butyl designed for metal to metal connection in concealed joints, if specified.
 - 2. Field applied sealant and/or butyl tape shall be as recommended by the manufacturer of the metal roof system.
 - 3. Vinyl Weatherseal Insert.
- F. Felts: Asphalt-saturated un-perforated organic felts conforming to ASTM D 226, Type II (No. 30).
- G. Underlayment: Water protection sheet at locations indicated on drawings - Ice and Water Shield by W.R. Grace.
- H. Bituminous Coating: Cold-applied asphalt mastic, SSPC paint 12, compound for mil dry film thickness per coat.
- I. Snow-Guards: Snojax Medium Bronze "Deuce" mechanically fastened.
 - 2. Mount per manufacturer's recommendations.

2.4 Panel Fabrication

- A. Panels shall be fabricated in permanent fabrication facilities in continuous lengths as required. No horizontal end lap joints will be accepted, unless panels exceed 65' in length or jobsite conditions dictate.
- B. Panel design shall incorporate concealed clips and fasteners. Exposed fasteners in roofing panels will not be accepted.

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- C. Standing seam design shall prevent water infiltration by utilizing a capillary break to prevent siphoning.
- D. Fabricate roofing and related sheet metal work in accordance with approved shop drawings and applicable standards set forth in the Sheet Metal and Air Conditioning Contractors National Association - Architectural Sheet Metal Manual (1987 edition).
- E. All roofing and sheet metal flashing shall be fabricated in minimum 10'-0" lengths except as noted otherwise. All flashing shall have a minimum 1/2" hemmed edges in exposed locations. Provide field fabricated miters for components that change direction on the project.
- F. All gutter to be in continuous lengths up to 50 feet. Expansion joints are to be utilized so as not to have lapped gutter joints.
- G. Apply bituminous coating or other permanent separation materials on concealed panel surfaces where panels would otherwise be in direct contact with substrate materials that are non-compatible or could result in corrosion or deterioration of either material or finishes.
- H. Expansion Provisions: Where lapped or bayonet-type provisions cannot be used, form expansion joints of intermeshing hooked flanges not less than 1" deep, filled with mastic sealant.
- I. Sealant Joints: Where movable, non-expansion joints are indicated, form metal to provide for proper installation of elastomeric sealant in compliance with SMACNA standards.

PART 3 - EXECUTION

3.1 Examination

- A. Examine substrates and installation conditions. Examine alignment and placement of building roof structure before proceeding with installation of preformed metal roofing. Verify that the edges of all roof sheathing panels are properly supported. Do not proceed with metal roof panel work until unsatisfactory conditions have been corrected.
- B. Inspect roof deck to verify deck is clean and smooth, free of depressions, waves or projections, level to +/- 1/4" in 20 feet and properly sloped to valleys and eaves.
- C. Verify roof openings, curbs, pipes, sleeves, ducts and vents through the roof as solidly set, cant strips and reglets in place and nailing strips located.
- D. Verify flutes in steel deck are dry and free of snow or ice.
- E. Examine alignment and placement of building roof structure before proceeding with installation of preformed metal roofing.

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- F. Examine metal roof deck before starting installation. Deck must be clear, clean and smooth, free of depressions, waves, or projections, dry and must remain dry and free of ice and snow, after roofing application commences. Deck flutes must be clean and dry.
- G. Field check dimensions and check support alignment with taut string or wire. Support misalignment may cause additional stresses in the panels and contribute to oil canning.
- H. Do not proceed with installation until conditions are satisfactory. Notify the architect in writing of unsatisfactory conditions.
- I. Felting:
 - 1. Verify #30 unperforated asphalt saturated roofing felt and ice and water shield membrane underlayment have been installed over solid substrate.
- J. Ensure felt is installed horizontally, starting at the eave working to the ridge with a 6" minimum overlap and 18" end laps.
- K. Ensure that all fasteners are totally flush with the substrate. Nails shall be galvanized roofing nails with manufacturer's coated felt caps. Panel system shall not come in contact with dissimilar materials that will cause harmful reactions between the metals and/or finish.
- L. Separate dissimilar metals with coat of bituminous paint, concealed on one or both sides.
- M. Panels shall be fully interlocked with its adjacent panel.

3.2 Preparation

- A. Cover entire roof area with a minimum of one layer of un-perforated #30 roofing felt laid and lapped horizontally, starting at the eaves to ridge. Provide minimum 6 inch overlap and 18 inch end laps.

3.3 Panel Installation

- A. Comply with manufacturer's instructions and recommendations and standards set forth in the Architectural Sheet Metal manual published by SMACNA in order to achieve a watertight installation. Install continuous cleats at all exposed edges, and as applicable to project conditions and supporting substrates. Anchor panels and other components of the work securely in place, with provisions for thermal and structural movement.
 - 1. Field cutting of exterior panels is not permitted.
 - 2. Install panels with concealed fasteners. Install proper protection to finished substrate to prevent moisture infiltration to roofing assembly prior to placement of panels. Cover complete roof area to receive metal roof panels with a self adhered ice and water underlayment membrane or a combination of #30 roofing felt and self adhered ice and water underlayment at the eaves, ridges, hips, valleys, rake walls, rake edges, and around all penetrations.

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- B. Install sealants for preformed roofing panels as approved on the shop drawings. Refer to Section 07900, Joint Sealers for post-installation requirements on joint sealers that are not work of this section.
- C. Remove and replace any panels or components that are damaged beyond successful repair.
- D. Accessories: Install components required for a complete roof panel system, including trim, fascias, clips, seam covers, battens, flashing, sealants, gaskets, fillers, closure strips and similar items.
- E. Install roofing and flashing in accordance with approved shop drawings and manufacturer's product data, within specified tolerances.
- F. Isolate dissimilar metals, masonry and concrete from metal roof system with bituminous coating. Do not allow panels or trim to come into contact with dissimilar materials.
- G. Anchorage shall allow for thermal expansion and contraction without stress or elongation of panels, clips or anchors.
- H. Coordinate flashing and sheet metal work to provide watertight conditions at roof terminations. Fabricate and install in accordance with standards set forth in the SMACNA Manual using continuous cleats at all exposed edges.
- I. Underlayment:
 - 1. Install proper protection to finished substrate to prevent moisture infiltration to roofing assembly prior to placement of panels. Cover complete roof area to receive metal roof panels with a self adhered ice and water underlayment membrane or a combination of #30 roofing felt and self adhered ice and water underlayment at the eaves, ridges, hips, valleys, rake walls, rake edges, and around all penetrations. Ice & Water Shield underlayment to be on roof areas specified or complex roofs per manufacturer's and other requirements.
- J. Preformed Metal Panels:
 - 1. Fasten anchor clips with fasteners as recommended by the manufacturer as required to meet the performance criteria specified.
 - 2. Install starter and edge trim before installing roof panels.
 - 3. Remove strippable plastic film prior to installation of roof panels.
 - 4. Erect metal roofing with lines, planes, rises and angles sharp, true and plumb, and plane surfaces free from objectionable warp, dents, buckle or other physical defects.
 - 5. Do not allow traffic on completed roof.
 - 6. Protect installed roof panels and trim from damage caused by adjacent construction until completion of installation.
 - 7. Remove and replace any panels or flashing components which are damaged beyond successful repair.

- K. Flashing:
1. Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for installation work where the manufacturer's approved shop drawings do not define a specific detail.
 2. Conceal fasteners and expansion provisions wherever possible.
 3. Hem all exposed edges of sheet metal flashing that are exposed with at least 1/2" fold under.
 4. Insert metal flashing into reglets, anchor with wedges and seal all joints.
 5. Set sheet metal items level, true to line and plumb.
 6. Secure all metal flashing to wood nailers with screws as indicated on the approved shop drawings.
 7. Use cleats to keep flashing end laps closed when face width exceeds eight (8) inches.
- L. Tolerances:
1. Applicable erection tolerances: Maximum variation from true planes or lies shall be 1/4" in 20'-0" or 3/8" in 40'-0".
 2. Metal roof systems can not correct any previously installed support or wood nailer problems that do not meet the above tolerances.
- M. Manufacturer's Field Service:
1. Manufacturer's representative shall inspect all Watertight Warranted projects during the installation of the metal roof system.
 2. Inspections shall be scheduled as required by the manufacturer of the roofing system.
 3. Three mandatory visits are required:
 - a. Inspection of substrate and proper underlayment.
 - b. Inspection of proper panel and flashing installation.
 - c. Final inspection upon completion of the metal roof installation.
 4. Upon final inspection a report will be issued to the installer of any discrepancies and requirements for additional work. If additional work required the manufacturer will provide another final inspection to verify acceptance of completed work.

3.4 Cleaning and Protection

- A. Clean exposed surfaces of work promptly after completion of installation. To prevent rust from staining the painted finish, immediately remove filings produced by drilling or cutting.
- B. Clean roof in accordance with manufacturer's recommendations.
- C. Touch up minor abrasions and scratches in finish.
- D. Remove all scrap and construction debris from the site.
- E. Clean and remove grease, finger marks or stains from the installed panels per manufacturer's recommendations.

END OF SECTION

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SECTION 07 6200 – SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 Section Includes

- A. Fabricated sheet metal items, including flashings, counter-flashings and copings.

1.2 Related Requirements

- A. Rough Carpentry: Wood nailers – Ref: Section 06 1000.
- B. Elastomeric Membrane Roofing - Ref: Section 07 5300.
- C. Metal Roofing – Ref: 07 6100.
- D. Joint Sealers – Ref: Section 07 9005.

1.3 Reference Standards

- A. AAMA 2605 – Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2005.
- B. ANSI/SPRI ES-1 – Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.
- C. ASTM A 653/A 653M 0 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009a.
- D. SMACNA (ASMM) – Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2003, Sixth Edition.

1.4 Submittals

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Submit manufacturer's full range of color options for Architect selection.
- D. Warranty Specimen: For approval.

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1.5 Quality Assurance

- A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.
- B. Roof edge metal assemblies including copings, fascias and gravel stops shall be designed in accordance with ANSI/SPRI ES-1.

1.6 Delivery, Storage, and Handling

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

1.7 Warranty

- A. See Section 01 7800 – Closeout Submittals, for additional warranty requirements.
- B. Warrant flashing and sheet metal work to be free of defects in materials and workmanship for a period of two years from Date of Substantial Completion.
- C. Roof edge metal assemblies shall be included in the roof system warranty. See Section 07 5400 – Thermoplastic Membrane Roofing.
- D. Prefinished Metal: Warrant against fading and peeling for a period of 10 years.

PART 2 – PRODUCTS

2.1 Sheet Metal Flashing and Trim Materials

- A. Zinc-Coated Steel: Commercial quality with .20 percent copper, ASTM A 526, except ASTM A 527 for lock forming, G90 hot-dip galvanized, mill phosphatized where indicated for painting.
- B. Material gages to be as follows:
 - 1. Metal flashing: 24 ga.
 - 2. Metal cap/coping: 24 ga.
 - 3. Miscellaneous Trim: 24 ga.
- C. All flashings and copings to be self-locking with permanent hold-down clips. All edges to be hemmed.
- D. All cap flashing and copings and scuppers shall be pre-finished in "Kynar 500" and shall have a 20 year limited paint warranty.
 - 1. **MTL-3:** DMI Classic Bronze.
- E. See Drawings for Exterior Sheet Metal Flashing and Trim Schedule.

2.2 Manufacturers

- A. Copings and Fascias: All metal trim and fascia panels are to be pre-approved by roofing system manufacturer to ensure compatibility with specified system. Installer to provide warranty as part of roofing system "total system" warranty.

2.3 Fasteners

- A. Generally composed of same materials as flashings being fastened. Exposed fasteners shall have 5/8 inch steel/neoprene washers under the head. Fasteners shall be treated for resistance to rust and corrosion.
1. Sheet Metal to Wood:
 - a. Concealed Application: Annular threaded nail with minimum 3/16 inch diameter head, not less than 12 gauge and of sufficient length to penetrate substrate 1-1/4 inch minimum.
 - b. Exposed Application: No. 10 screws minimum. Penetrate wood blocking minimum 1-1/2 inches. Installed withdrawal resistance shall be a minimum of 150 pounds per screw.
 2. Sheet Metal to Sheet Metal: Self-tapping sheet metal screws of 1/2 inch length and a minimum No. 8 diameter.
 3. Concrete and Masonry Anchors: Specially threaded anchors, 3/16 inch minimum diameter, length to penetrate minimum 1-1/2 inches into concrete or masonry. Installed withdrawal resistance shall be a minimum of 150 pounds per anchor.

2.4 Fabrication

- A. General Metal Fabrication: Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate waterproof and weather resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to substrates. Comply with material manufacturer's instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated, with exposed edges folded back to form seams, and solder.
- B. Seams: Fabricate non-moving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- D. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.

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- E. Separations: Provide for separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.
- F. Provide gage suitable for purpose as recommended by SMACNA Manual.
- G. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- H. Form pieces in longest possible lengths.
- I. Hem exposed edges on underside ½ inch; miter and seam corners.
- J. Fabricate corners from one piece with minimum 4 inch nor more than 12 inch long legs; seam for rigidity, seal with sealant.
- K. Fabricate vertical faces with bottom edge formed outward ¼ inch (6 mm) and hemmed to form drip.
- L. Blind clips and cleats shall be at least the same gauge as sheet metal flashing.

2.5 Miscellaneous Materials and Accessories

- A. Solder: For use with steel or copper, provide 50-50 tin/lead solder (ASTM B 32), with rosin flux.
- B. Bituminous Coating: SSPC - Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15 mil dry film thickness per coat.
- C. Mastic Sealant: Polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant.
- D. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 7 section "Joint Sealers".
- E. Epoxy Seam Sealer: 2-part non-corrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior non-moving joints including riveted joints.
- F. Adhesives: Type recommended by flashing sheet manufacturer for waterproof/weather-resistant seaming and adhesive application of flashing sheet.
- G. Paper Slip Sheet: 5-lb. rosin-sized building paper.
- H. Polyethylene Underlayment: Minimum 6 mil carbonated polyethylene film; resistant to decay when tested in accordance with ASTM E 154.

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- I. Reglets: Metal or plastic units of type and profile indicated, compatible with flashing indicated, non-corrosive.
- J. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, non-corrosive, size and gauge, required for performance.
- K. Elastic Flashing Filler: Closed cell polyethylene or other soft cell material recommended by elastic flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on flashing sheet.
- L. Roofing Cement: ASTM D 2822, asphaltic.

PART 3 - EXECUTION

3.1 Examination

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, with reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 Installation Requirements

- A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual". Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, set units true to line and level as indicated. Install work with laps, joints and seams which will be permanently watertight and weatherproof.
- B. Underlayment: Where stainless steel or aluminum is to be installed directly on cement or wood substrates, install a slip sheet of red rosin paper and a course of polyethylene underlayment.
- C. Bed Flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.
- D. Install reglets to receive counterflashing in manner and by methods indicated. Where shown in concrete, furnish reglets to trades of concrete work for installation as work of Division 3 sections. Where shown in masonry, furnish reglets to trades of masonry work, for installation as work of Division 4 sections.
 - 1. Install counterflashing in reglets, either by snap-in seal arrangement, or by welding in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.

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- E. Install elastic flashing in accordance with manufacturer's recommendations. Where required, provide for movement at joints by forming loops of bellows in width of flashing. Locate cover or filler strips at joints to facilitate complete drainage of water from flashing. Seam adjacent flashing sheets with adhesive, seal and anchor edges in accordance with manufacturer's recommendations.
- F. Except as otherwise indicated, comply with the installation recommendations of SMACNA and Factory Mutual Data Sheet 1-49 Perimeter Flashing.
- G. Coordinate flashing at roof surfaces with roofing work to provide weather-tight condition at roof terminations.
- H. Sheet metal items shall be installed true to line, without buckling, creasing, or warp.
- I. Anchor units of work securely in place, providing for thermal expansion of metal units. Conceal fasteners where possible. Exposed fasteners shall be covered with sealant.
- J. Fastening:
 - 1. Nails: Confine to one edge only of flashing 12" or less in width. Space nails at 4" o.c. maximum.
 - 2. Cleats: Continuous, formed to profile of item being secured.
 - 3. Clips: Minimum 2" wide by 3" long formed to profile of item being secured. Space at 24" o.c. maximum except as otherwise indicated.
- K. Roof Penetration Flashing: Flash and install penetrations in accordance with sheet roofing manufacturer's product data.

3.3 Cleaning and Protection

- A. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.
- B. Protection: Advise the Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction, to ensure that work will be without damage or deterioration, other than natural weathering at time of substantial completion.

END OF SECTION

SECTION 07 8400 - FIRESTOPPING**PART 1 - GENERAL****1.1 Section Includes**

- A. Provide labor, materials, services, coordination, and equipment necessary for complete installation of tested or engineering judgment based firestopping materials and systems. Section includes firestopping for the following:
 - 1. Penetrations through fire resistance rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
 - 2. Penetrations through fire resistance rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
 - 3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.
 - 4. Sealant joints in fire resistance rated construction.
 - a. Gaps between the top of walls and ceilings or roof assemblies.
 - b. Openings around structural members which penetrate floors or walls.
 - 5. Walls enclosing plenum spaces, rated and unrated.
 - a. Gaps between the top of walls and ceilings or roof assemblies.
 - b. Openings around items which penetrate walls.

- B. Firestopping Performed By
 - 1. Penetrations: Trade causing or requiring the penetration.
 - 2. Multiple Use Penetrations: Trade utilizing the greatest amount of the penetration space.
 - a. Cost of work shared by all users of penetration in direct proportion to each trade's use of space.
 - 3. Others: General Contractor.
 - a. Perimeter slab/wall and slab/curtainwall.
 - b. Terminations of fire-rated construction; walls and partitions.

1.2 Related Requirements

- A. Masonry – Ref: Section 04 2000.
- B. Gypsum Wallboard Partitions – Ref: Section 09 2116.
- C. Plumbing - Ref: Division 22.
- D. HVAC – Ref: Division 23.
- E. Electrical – Ref: Division 26.

1.3 Reference Standards

- A. American Society for Testing and Materials (ASTM)
 - 1. E119: Fire Tests of Building Construction Materials.
 - 2. E814: Fire Tests of Through Penetration Fire Stops.
 - 3. E2174: Standard Practice for On-Site Inspection of Installed Fire Stops.

- B. National Fire Protection Association (NFPA)
 - 1. 70: National Electrical Code (NEC)
 - 2. 101: Code for Safety to Life from Fire in Buildings and Structures (Life Safety Code).

- C. Underwriters' Laboratories (UL)
 - 1. UL1479 Fire Tests of Through Penetration Fire Stops.

- D. Firestop Design Classification References
 - 1. Warnock Hersey Listing Manual.
 - 2. UL Fire Resistance Directory – Vol. 1

1.4 Submittals

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.

- B. Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of UL or other nationally recognized independent testing laboratories firestop systems to be used, and manufacturer's installation instructions.
 - 1. Manufacturer's engineering judgment identification number and drawing details when no tested system is available.

- C. Shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetration firestop system, and each kind of penetrating item. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop configuration for construction and penetrating items.
 - 2. Where project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration approved by firestopping manufacturer with modifications marked.

- D. Product certificated signed by manufacturers of firestopping products certifying that their products and installation comply with specified requirements. Certification shall be signed by the Installer.

- E. Certification is required from manufacturer that installer has been trained in the handling and installation of their products.

- F. Firestopping installer shall provide a letter of certification stating that all firestopping systems have been installed in accordance with the Contract Documents.

1.5 Definitions

- A. Firestopping: Material or combination of materials (assembly) to retain integrity of fire rated construction by maintaining an effective barrier against the spread of flame, smoke, and gases.
- B. Through-penetration: Any penetration of a fire-rated wall or floor that completely breaches the barrier.
- C. Through-Penetration Firestop Systems: Material or combination of materials which are field constructed of fill, void, or cavity materials and forming materials, designed to resist fire spread when installed as a complete firestop system.
- D. Through-Penetration Firestop Devices: Factory built products designed to resist fire spread. Complete when delivered to site; ready for installation.
- E. System: The use of a specific firestop material or combination of materials in conjunction with a specific wall or floor construction type and a specific penetrant(s).
- F. Barrier: Any bearing or non-bearing wall or floor that has an hourly fire and smoke rating.
- G. Membrane-penetration: Any penetration in a fire-rated wall that breaches only one side of the barrier.
- H. Fire Resistive Joint: Any gap, joint, or opening, whether static or dynamic, between two fire rated barriers including where the top of a wall meets a floor; wall edge to wall edge applications; floor edge to floor edge configurations; floor edge to wall.
- I. Perimeter Barrier: Any gap, joint, or opening, whether static or dynamic, between a fire rated floor assembly and a non-rated exterior wall assembly.

1.6 System Performance Requirements

- A. System Design and Product Selection: Contractor responsible for selection of products and tested designs that fulfill the firestopping requirements of this section.
- B. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gasses.

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- C. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated as determined per ASTM E814, UL 1479 but not less than that equaling or exceeding the fire resistance rating of the constructions penetrated.
- D. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T-rated assemblies are required where specified by codes or where the following conditions exist:
 - 1. Where firestop systems protect penetrations located outside of wall cavities.
 - 2. Where firestop systems protect penetrations located outside fire resistive shaft enclosures.
 - 3. Where firestop systems protect penetrations located in construction containing doors required to have a temperature rise rating.
 - 4. Where firestop systems protect penetrating items larger than a 4 inch diameter nominal pipe or 16 square inch in overall cross sectional area.
- E. Fire Resistive Joint Sealants: Provide joint sealants with fire resistance ratings indicated, as determined per ASTM E119, UL 1479 and UL 2079 but not less than that equaling or exceeding the fire resistance rating of the construction in which the joint occurs.
- F. For firestopping exposed to traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions and will meet load requirements.
 - 1. For piping penetrations for plumbing and wet pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 - 2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means.
 - 3. For penetrations involving insulated piping, provide through-penetration firestop systems not required removal of insulation.
- G. For through-penetration firestop systems exposed to view, provide products with flame spread of less than 25 and smoke developed ratings of less than 450, as determined per ASTM E 84.
- H. Where there is no specific third party tested and classified firestop system available for an installed condition, the contractor shall obtain from the firestopping material manufacturer an Engineering Judgment (EJ) to be submitted to the Approving Authority and Authority Having Jurisdiction for approval prior to installation. The EJ shall follow International Firestop Council (IFC) guidelines.

1.7 Quality Assurance

- A. Meet requirements of ASTM E814 or UL 1470 tested assemblies that provide a fire rating equal to that of construction being penetrated and other ASTM Standards as applicable for the installation.
 - 1. ASTM E84 "Test Method for Surface Burning Characteristics of Building Materials".
 - 2. ASTM E119 "Test Methods for Fire Tests of Building Construction and Materials".
- B. Requirements of Regulatory Agencies: Comply with the applicable requirements for fire separations and penetrations of the following:
 - 1. OBC: See Chapter 6, Table 601 and 602 for the time rated construction requirements.
 - 2. NFPA 70.
 - 3. NFPA 101.
- C. Installer: Specialist in the installation of type(s) of firestopping required; trained and approved by the firestop manufacturer.
 - 1. Shown to have successfully completed not less than 5 firestop projects similar in type and size to that of this Project.
- D. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 753, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy".
- E. Do not use any product containing solvents that require hazardous waste disposal or which after curing dissolve in water.
- F. Coordinating Work: Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.

1.8 Delivery, Storage and Handling

- A. Deliver firestopping undamaged products to project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacturer; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multi-component materials.
 - 1. Comply with recommended procedures, precautions, or remedies described in material safety data sheets as applicable.
- B. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.
- C. Do not use damaged or expired materials.

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1.9 Project Conditions

- A. Environmental Conditions: Do not install firestopping when ambient or substrate temperatures are outside limits permitted by firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilation: Ventilate firestopping per firestopping manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.

1.10 Sequencing and Scheduling

- A. Coordinate this Work as required with work of other trades. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- B. Do not cover up those firestopping installations that will become concealed behind other construction until Owner's inspection agency and authorities having jurisdiction, if required, have examined each installation.

PART 2 – PRODUCTS

2.1 Manufacturers

- A. Provide Products from one or more of the following manufacturers according to the suitability of the product for the intended purpose.
 - 1. W.R. GRACE (Flamesafe System)
 - 2. FYRESLEEVE INDUSTRIES
 - 3. TREMCO
 - 4. HILTI, INC.
 - 5. SPECIFIED TECHNOLOGIES (STI)
 - 6. 3M FIRE PROTECTION PRODUCTS
 - 7. THE RECTORSEAL CORPORATION (Metacaulk and Bio Fireshield).
 - 8. NELSON FIRESTOP PRODUCTS.

2.2 Materials - General

- A. As selected by Contractor. See SYSTEM PERFORMANCE REQUIREMENTS in Part 1 hereinbefore.
- B. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.
 - 1. All materials shall comply with ASTM E814 or E 119 (UL 1429), and shall be manufactured of nontoxic, non-hazardous, asbestos free materials, and unaffected by water or moisture when cured.
 - 2. Primers: Conform to manufacturer's recommendations for primers required for various substrates and conditions.

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3. Backup Materials: Backup materials, supports, and anchoring devices shall be provided as required by UL testing.
 4. Provide all firestopping sealant materials within the VOC limits specified in Section 01 8113.
- C. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire resistance rated systems. Accessories include but are not limited to the following items:
1. Permanent forming/damming/backing materials must be noncombustible and may include the following:
 - a. Semi-refractory fiber (mineral wool) insulation.
 - b. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
 - c. Joint fillers for joint sealants.
 2. Temporary forming materials.
 3. Substrate primers.
 4. Collars.
 5. Steel sleeves.

2.3 Rated Stud Deflection Assembly

- A. Deflection Track Ceiling Runner: See Section 09 2116.
- B. Gypsum Wallboard: See Section 09 2116.
- C. Insulation: Mineral wool, 3.5 PCF minimum density.
- D. Firestopping Compound: Types as manufactured by listed manufacturers in 2.01A herein.
- E. Accessories: Provide all fasteners, clips and other related installation accessories as required for a complete UL approved assembly.

2.4 Mixing

- A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION**3.1 Examination**

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.
 - 1. Verify Penetrations are properly sized and in suitable condition for application of materials.

3.2 Preparation

- A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:
 - 1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.
 - 2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop systems seal with substances.

3.3 Installing Through-Penetration Firestops

- A. General: comply with the "System Performance Requirements" in Part 1 and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

- C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
 - 1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 Installing Fire Resistive Joint Sealants

- A. General: Comply with the "System Performance Requirements" in Part 1 with ASTM C1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install joint fillers 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 movements capability and develop fire resistance rating required.
- C. 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 width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.
- D. Tool non-sag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire resistance rating as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.5 Identification

Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

- 1. The words "Warning – Through-Penetration Firestop System – Do Not Disturb. Notify Building Management of Any Damage".
- 2. Contractor's name, address, and phone number.
- 3. Through-penetration firestop system designation of applicable testing and inspecting agency.
- 4. Date of installation.
- 5. through-penetration firestop system manufacturer's name.

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3.6 Cleaning

- A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.

- B. Provide final protection and maintain conditions during and after installation that ensure through-penetration firestop systems are without damage or deterioration at time of Contract Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce through-penetration firestop system complying with specified requirements.

END OF SECTION

SECTION 07 9005 – JOINT SEALERS**PART 1 - GENERAL****1.1 Section Includes**

- A. This section includes joint sealers for the following locations:
 - 1. Exterior joints in vertical surfaces and non-traffic horizontal surfaces as indicated below.
 - a. Control and expansion joints in cast-in-place concrete.
 - b. Joints between different materials and finishes:
 - 1. Metal door frames to stone veneer, if applicable.
 - 2. Aluminum storefront members to stone veneer.
 - 3. Other joints as indicated.
 - c. Joints in exterior DensGlass wall and exterior wall sheathing.
 - d. Other joints as indicated.
 - 2. Exterior joints in horizontal traffic surfaces as indicated below:
 - a. Control, expansion, and isolation joints in cast-in-place concrete slabs for floors and paving.
 - b. Other joints as indicated.
 - 3. Interior joints in vertical surfaces and horizontal non-traffic surfaces as indicated below:
 - a. Perimeter joints of exterior openings where indicated.
 - b. Perimeter joints between interior doorframes, window frames and exterior door frames.
 - c. Perimeter joints of toilet fixtures.
 - d. Perimeter joints of fire separation assemblies.
 - 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. Other joints as indicated.
 - 5. Internal component seals relied on to manage infiltrated water.
 - 6. Interior seals at perimeter of window systems.
 - 7. Sealant backers required for proper joint configuration and as bond breaker.

1.2 Related Requirements

- A. Concrete– Ref: Section 03 3300.
- B. Masonry – Ref: Section 04 2000.
- C. Flashing and Sheet Metal – Ref: Section 07 6200.
- D. Aluminum Storefront Windows – Ref: Section 08 4113.
- E. Glazing sealants and accessories – Ref: Section 08 8000.

1.3 Reference Standards

- B. ASTM C 834 – Standard Specification for Latex Sealants; 2010.
- B. ASTM C 920 – Standard Specification for Elastomeric Joint Sealants; 2010.
- C. ASTM C 1193 – Standard Guide for Use of Joint Sealants; 2009.
- D. ASTM D 1667 – Standard Specification for Flexible Cellular Materials— Poly(Vinyl Chloride) Foam (Closed-Cell); 2005.
- E. BAAQMD 8-51 – Bay Area Air Quality management District Regulation 8, Rule 51, Adhesive and Sealant Products; www.baaqmd.gov; current edition.
- F. SCAQMD 1168 – South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

1.4 Performance Requirements

- C. Provide joint sealers that have been produced and installed to establish and maintain watertight and air tight continuous seals.
- B. Conformance with the requirements of this Section shall be demonstrated, where applicable, by submitting appropriate manufacturer's test reports, product technical data and certification letters.
- C. Sealed Joint Design
 - 1. Design and install joint widths to accommodate expected movements, without failure of joint sealant.
 - 2. In no case shall a sealed joint, susceptible to movement, be installed at less than 1/4" (6mm).
 - 3. Sealant and backer shall be installed of proper configuration to maximize compression/extension of sealant capacity and to minimize stress at bond line on substrates.
- D. Adhesion
 - 1. When tested in conformance to ASTM C794, joint sealant shall not fail in adhesion.
- E. Compatibility
 - 1. When test in conformance to ASTM C1087, sealants shall be shown to be compatible with project materials coming in contact with sealant such as backers, gaskets and setting blocks.
- F. Staining
 - 1. When tested in conformance to ASTM C1248, porous substrates shall show no permanent staining.

1.5 Submittals

- D. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating sealant performance criteria, substrate preparation, limitations, and color availability.
- C. Color Samples:
 - 1. Submit samples of manufacturer's standard caulking material colors and special colors as indicated at least 30 days prior to commencement of application.
 - 2. Samples shall be actual materials. Owner reserves the right to reject work not in conformance with selected colors, based upon samples submitted.
 - 3. Should Contractor select a manufacturer meeting specified requirements, except for minimum color range requirements, he shall be responsible for furnishing special colors within color range requirements.

1.6 Quality Assurance

- E. Installer Qualifications: Installer shall be able to demonstrate not less than five (5) years of successful experience in the installation of comparable projects.
- F. Manufacturer shall be capable of providing the following:
 - 1. Field service representation during construction.
 - 2. Performing laboratory tests as specified herein.
 - 3. Review and comment of contractor's shop drawings, as requested, related to sealant details.
- G. Single Source Responsibility for Joint Sealer Materials: Obtain joint sealer materials from a single manufacturer for each different product required.
- D. Pre-Installation Conference:
 - 1. Before substantially commencing work on site, the sealant installer, Contractor, and sealant manufacturer shall meet with the Architect and General Contractor to address the following:
 - a. Coordinate installation of sealants with installation of substrates. Specifically coordinate schedule with window perimeter trim, if any.
 - b. Verify understanding of approved shop drawings as relative to this work.
 - c. Verify minimum joint widths expected to accommodate sealant capability.
 - d. Review laboratory and field test results for direction on required priming.

- e. Review proper substrate cleaning procedures and recommended by manufacturer.
 - f. Coordinate mobility, storage, use of lifts and scaffolding.
 - g. Review limitations of product application manufacturer.
- E. Mock-up:
- 1. If requested by General Contractor or Architect, install sealant samples to project materials for review. This may also serve as location for field tests.
- F. In addition to manufacturer's recommendations, conform to guidelines of the FGMA Sealant and Glazing Manuals.

1.7 Delivery, Storage, and Handling

- A. Deliver materials to Project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, batch number 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.
- C. Provide Material Safety Data Sheet for each product.

1.8 Project Conditions

- A. Environmental Conditions: Do not proceed with installation of joint sealers under the following conditions.
 - 1. When the ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturers.
 - 2. When joint substrates are wet due to rain, frost, condensation, or other causes.
 - 3. All limitations as set by the manufacturer.

1.9 Warranty

- A. Manufacturer shall warrant for 5 years from date of substantial completion, that the installed sealants will perform as watertight weatherseals and will not change colors when used with back-up materials and substrates that have been approved for compatibility.
- B. Glazing Contractor and Sealant Installer (if different than Glazing contractor) shall jointly warranty for two (2) years from date of substantial completion, that the installation is not defective in workmanship or materials.

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- C. Provide a written warranty in writing from both manufacturer and installer, agreeing to replace any or all joints failing within the warranty period at no cost to the owners, labor and material inclusive.
 - 1. Installer to provide a two (2) year warranty.
 - 2. Manufacturer to provide a five (5) year warranty.
- D. Warranty shall apply to both patent and latent defects.
- E. Responsibility of the Contractor/Installer during the two (2) year warranty period shall be repair or replace defective work. No cost of remedial work shall be borne by the Owner.

PART 2 – PRODUCTS

2.1 Manufacturers

- A. Acceptable Sealant Manufacturers:
 - 1. Dow Corning Corporation
1255 Northmeadow Parkway, Suite 104
Roswell, GA 30076
(770) 751-7979
 - 2. Pecora Corporation
165 Wambold Road
Harleysville, PA 19438
(800) 523-6688
 - 3. Sonneborn, Division of ChemRex, Inc.
889 Valley Park Drive
Shakopee, MN 55379
(800) 433-9517
 - 4. Tremco
3735 Green Road
Beachwood, OH 44122
(800) 321-7906
 - 5. General Electric Company
260 Hudson River Road
Waterford, NY 12188
(800) 255-8886

2.2 Materials, General

- A. Compatibility: Provide joint sealers, 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 sealers as selected by Architect from manufacturer's standard colors.

2.3 Horizontal Joints in Sidewalks, Control, Construction and Expansion Joints in Exterior Concrete Slabs: Multi-part Polyurethane Sealants:

- A. Multi-component, chemically curing polyurethane sealant meeting Fed. Spec. TT-S-00227E, Class A, Type 1 (self-leveling) and /or ASTM C-920, Type M, Grade P, Class 25 Use T, M, A and O.
- B. Products: Subject to compliance with requirements, provide the following:
 - 1. Tremco Inc., THC-900/901.
 - 2. Vulkem, 245.
 - 3. Pecora Corp., NR 200.

2.4 Exterior Joints Bordered by Aluminum Framing Systems: One Part Silicone:

- A. One-part neutral cure medium modulus moisture curing silicone meeting Fed. Spec. TT-S-00230C, Type II, Class A and/or ASTM C-920, Type S, Grade NS, Class 25, Use NT, M, G, A, and O and capable of withstanding movement of 50 percent extension and compression.
- B. Products: Subject to compliance with requirements, provide the following:
 - 1. Dow Corning 795 (+/- 50% movement)
 - 2. Dow Corning 791 - (+/- 50% movement)
 - 3. Dow Corning 790 (+ 100%, - 50% movement)
 - 4. General Electric Silpruf (+/- 50% movement)
 - 5. General Electric Silglaze II (+/- 50% movement)
 - 6. Pecora 864 (+/- 50% movement)
 - 7. Pecora 890 (+ 100%, -50% movement)
 - 8. Pecora 895 (+/- 50% movement)
 - 9. Tremco Spectrem 1 (+100%, -50% movement)
 - 10. Tremco Spectrem 2 (+/- 50% movement)

2.5 Vertical Exterior/Interior Control Joints and Expansion Joints at Stone Veneer and Concrete Masonry Units: Multi-Part Polyurethane Sealant

- A. High Performance Polyurethane Sealant: Manufacturer's standard multi-part, nonsag, polyurethane sealant complying with Fed. Spec. TT-S-00227E, Type II, Class A and/or ASTM C 920 for Type M, Grade NS; Class 25 Uses NT, T, A, M and O for substrate specified.
 - 1. Max. cyclic movement capability: plus 100%/minus 50%.
- B. Products: Subject to compliance with requirements, provide on of the following:
 - 1. "922", Vulkem.
 - 2. "Dymeric 240", Tremco, Inc.
 - 3. "Dynatrol II", Pecora Corp.
 - 4. "NP2", Sonneborn Building Products Division, Rexnord Chemical Products, Inc.
 - 5. "Chem-Calk 500", Bostick.

2.6 Horizontal Joints in Concrete Slab Floor – Two-Part Elastomeric Sealant:

- A. Polyurethane Sealant: Manufacturer's two-part, self-leveling, slope grade, neutral curing elastomeric polyurethane sealant complying with Fed. Spec. TT-S-00227E, Type I, Class A and/or ASTM C 920 for Type M; Grade P; Class 25 Uses T and M as applicable to joint substrates indicated, Maximum cyclic movement capability as listed below.
- B. Product: Subject to compliance with requirements, provide one of the following:
 - 1. SL 2, Sonneborn Building Products Division, Rexnord Chemical Products, Inc. (+/- 25% movement)

2.7 Structural Silicone Glazing Applications

- A. Single-Component Medium to High Modulus, Neutral-Cure Silicone Sealant/Adhesive: For structural silicone glazing applications.
 - 1. Dow Corning 795
 - 2. Dow Corning 995
 - 3. General Electric Ultraglaze SSC4000
 - 4. Pecora 895
- B. Multi-Component Medium to High Modulus, Neutral-Cure Silicone Sealant/Adhesive: For structural silicone glazing performed in factory.
 - 1. Dow Corning 983
 - 2. General Electric Ultraglaze SSG4400
 - 3. Pecora 985

2.8 Sealant at Exterior Densglass wall board sheathing:

- A. Products:
 - 1. "#795 Building Sealant", Dow Corning.
 - 2. "Spectrum 2", Tremco, Inc.

2.9 Interior Wet Areas: One-Part Silicone Joint Sealants:

- A. Polyurethane Sealant: Manufacturer's standard one-part, mildew-resistant, non-sag, neutral curing silicone sealant complying with Fed. Spec. TT-S-00230C, Class A, TT-S-1543A, Class A and/or ASTM C 920 for Type S; Grade NS; Uses NT, A, and as applicable to joint substrates indicated, O; formulated with fungicide, intended for sealing interior joints and subject to exposure to conditions of high humidity and temperature extremes except for selected test properties which are revised as follows:
 - 1. Max. cyclic movement capability; plus 100%/minus 50%.
- B. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Silicone:
 - a. Tremco, Tremsil 600.

2.10 Interior Joints: Latex Joint Sealants

- A. Acrylic-Emulsion Sealant: Manufacturer's standard, one part, non-sag, sealant complying with ASTM C 834, formulated to be paintable and recommended for exposed applications on interior and on protected exterior locations involving joint movement of not more than plus or minus 5%.
- B. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Acrylic-Emulsion Sealant:
 - a. "Chem-Calk 600"; Bostic Construction Products Div.
 - b. "AC-20"; Pecora Corp.
 - c. "Sonolac"; Sonneborn Building Products Division, Rexnord Chemical Products, Inc.
 - d. "Tremco Acrylic Latex 834"; Tremco Inc.

2.11 Joint Sealant Backing

- A. General: Provide sealant backings of material and type which are non-staining; 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, non-waxing, non-extruding strips of flexible, non-gassing plastic foam of material indicated below; nonabsorbent to water and gas; and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
 - 1. Closed-cell polyethylene foam, unless otherwise indicated, subject to approval of sealant manufacturer, for cold-applied sealants only.
 - a. HBR, Closed-cell.
 - b. NMC, SofRod.
 - 2. ***Provide sufficient sizes and diameters of backers to accommodate varying joints widths on the project, such that backers are backers compressed about 25 percent for all installations.***
 - 3. ***Closed cell gassing rods are not acceptable.***
- C. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.12 Miscellaneous Materials

- A. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from pre-construction joint sealer-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Provide non-staining, chemical cleaners of type which are acceptable to manufacturers of sealants and sealant backing materials, which are not harmful to substrates and adjacent nonporous materials, and which do not leave oily residues or otherwise have a detrimental effect on sealant adhesion or in-service performance.
 - 1. **DO NOT USE SOLVENTS THAT ARE HARMFUL TO PAINT FINISHES OR THE ALUMINUM WINDOW FRAME FINISHES.**
- C. Bond Breaker Tape: Provide non-staining, non-absorbent type polyethylene tape or other plastic tape compatible with joint sealants and to surfaces adjacent to joints.
- D. Accessory Materials for Fire-Stopping Sealants: Provide forming, joint fillers, packing and other accessory materials required for installation of fire-stopping sealants as applicable to installation conditions indicated.

PART 3 - EXECUTION**3.1 Examination**

- A. Examine joints indicated to receive joint sealers, with Installer present, for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance. Do not proceed with installation of joint sealers until unsatisfactory conditions have been corrected.

3.2 Preparation

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements.
 - 1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; old joint sealers; oil; grease; waterproofing; water repellents; water; surface dirt; and frost.
 - 2. Clean concrete, masonry, unglazed surfaces of ceramic tiles 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 sealers. 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 by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.
 5. Clean joint surfaces just prior to sealant installation to remove all laitance and surface dirt.
 - a. Non-porous substrates shall be cleaned with a solvent as recommended or acceptable by sealant manufacturer, and as required depending upon contaminants to be removed. Use "two-cloth" cleaning method as described herein.
 - b. Porous substrates shall be cleaned by dusting, or solvent, or both as dictated by field testing and as recommended or acceptable to sealant manufacturer. Abrasion cleaning may be required to remove surface treatments or coatings.
 6. "Two-Cloth" Cleaning Method
 - a. Use clean, soft, absorbent, lint-free cloths. This method consists of a solvent cloth wipe followed by a dry cloth wipe.
 - b. Thoroughly clean all surfaces of loose debris.
 - c. Pour or dispense acceptable cleaning solvent onto the cloth. A plastic squeeze bottle works best for organic cleaning solvents. Do not dip cloth into solvent container, as this will contaminate the cleaning agent.
 - d. Wipe vigorously to remove surface contaminants. Rotate the cloth to clean area before re-wiping.
 - e. Immediately wipe the cleaned area with a separate clean, dry cloth. Organic solvent must be removed with the dry cloth before the solvent evaporates.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.
1. If primer is required per project substrate adhesion testing, mask adjacent surfaces where aesthetics is a consideration to keep excess primer or sealant off these surfaces.
 2. Apply primer (if required) to cleaned, dry substrates using a clean, dry cloth or brush. Do not apply too thick of coat. A white, powdery film will form if primer has been applied too thick. Remove excess primer with clean cloth.
 3. Allow primer to dry until all solvent is evaporated; this may take 5 to 30 minutes, depending on weather conditions.
 4. After inspecting for dryness, the joint is ready for backer and sealant installation. Sealant must be installed same day as joint preparation.
- C. Bond Breaker Tape: Use polyethylene tape or other plastic tape where required to prevent contact of sealant with adjoining surfaces which 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 Sealers

- A. General: Comply with joint sealer manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply. Comply with the requirements of ASTM C1193 for proper sealant and backer installation.
- B. Solvent-Release-Curing Sealant Installation Standard: Comply with requirements of ASTM C 804 for use of solvent-release-curing sealants.
- C. Latex Sealant Installation Standard: Comply with requirements of ASTM C 790 for use of latex sealants.
- D. 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.
 - 2. Install bond breaker tape between sealants and joint fillers, or back of joints where adhesion of sealant to surfaces at back joints would result in sealant failure.
 - 3. Install proper diameter or size backer to depth in joint to develop a proper sealant bead configuration.
 - 4. If backers become wet due to exposure, remove and replace with dry material.
 - 5. Install bond breaker tape where required to prevent three-sided adhesion in moving joints.
- E. 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 which allow optimum sealant movement capability.
 - 1. Completely fill voids in joints to ensure full adhesion and proper joint profile.
 - 2. Tool sealant concave, pushing sealant into void. Do not wet tooling aids as this may interfere with sealant cure and adhesion.
 - 3. Structural silicone applications require that the sealant be fully cured and adhered before the adhesive is stressed. Temporary support of substrates must be used during cure time. Follow written instructions by sealant manufacturer for duration criteria of temporary support. Do not move shop sealed units until fully cured.
- F. Tooling of Non-sag 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 which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 6A in ASTM C 962, unless otherwise indicated.
- G. Installation of Fire-Stopping Sealant: Install sealant, including forming, packing and other accessory materials to fill openings around mechanical and electrical services penetrating floors and walls to provide fire-stops with fire resistance rating indicated for floor or wall assembly in which penetration occurs. Comply with installation requirements established by testing and inspecting agency.

3.4 Field Quality Control

- A. Do not allow excess sealant to contact adjacent surfaces if aesthetics is a consideration. However, should this occur, remove immediately by method of solvent, abrasion, or both as applicable. Solvents will not fully remove sealants or primers from porous surfaces.
- B. Remove masking tape before sealant cures.
- C. Dispose of all trash and solvent wipe rags in non-combustible containers.

3.5 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 sealers and of products in which joints occur.

3.6 Protection

- A. Protect joint sealers 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 sealers immediately and repair so that repaired areas are indistinguishable from original work.

END OF SECTION

Division 8

Openings

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SECTION 08 1113 - STANDARD STEEL DOORS AND FRAMES

PART I - GENERAL

1.1 Section Includes

- A. Provide steel door frames, hollow metal doors, and other similar work as may be shown on the drawings, Door Schedule, and as specified.
 - 1. Doors: Exterior insulated hollow metal doors with hardware as scheduled.
 - 2. Frames: Galvanized steel frames for exterior doors openings shall be of following type:
 - a. Welded unit type for clip anchorage into masonry.
 - 3. Accessories, fittings, anchors, spreaders, floor clips, cutouts and reinforcing hardware.
- B. Provide anchors, spreaders, floor clips, and similar items as required for a complete installation.
- C. Provide hardware preparation and reinforcement to accommodate specified hardware.

1.2 Related Requirements

- A. Finish Hardware - Ref: Section 08 7100.
- B. Painting Primed Doors and Frames - Ref: Section 09 9000.

1.3 Reference Standards

- A. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard.
 - 1. ANSI: American National Standards Institute.
 - 2. ASTM: American Society for Testing and Materials.
 - 3. SDI: Steel Door Institute.
 - 4. DHI: Door and Hardware Institute.
- B. ANSI/ICC A 117.1 – American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2011.
- C. ANSI A250.8 – SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 2003.
- D. ANSI A250.10 – Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1998 (R2004).
- E. ASTM A 653/A 653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009a.

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- F. ASTM C 1363 – Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus; 2005.
- G. BHMA a156.115 – Hardware Preparation in Steel Doors and Steel Frames; 2006.
- H. DHI A115 Series – Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute; 2000 (ANSI/DHI A115 Series).
- I. NAAM HMMA 840 – Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2007.
- J. NFPA 80 – Standard for Fire Doors and Other Opening Protectives; 2010.
- K. SDI-105 – Recommended Erection Instructions for Steel Frames.
- L. UL 10C – Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.4 Submittals

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- 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 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.
- D. Label Construction Certification: For door assemblies required to be fire-rated and exceeding limitations of labeled assemblies, submit manufacturer's certification that each door and frame assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction.
 - 1. Preparation of fire door assemblies for all hardware, louvers and visions panels shall be in full compliance with NFPA 80, Fire Doors and Windows.

1.5 Quality Assurance

- A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications Standard Steel Doors and Frames" ANSI/SDI-100, 1991 Edition, and as specified.

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1. Materials and methods shall equal or exceed NAAM Standard HMMA-861 of the Hollow Metal Manufacturers Association entitled "Guide Specifications for Commercial Hollow Metal Doors and Frames" except as modified.
- B. Provide metal doors and frames fabricated by one manufacturer to ensure uniformity in appearance and construction.
- C. Fire rated doors and frames: Provide units that comply with NFPA 80, are identical to door and frame assemblies tested for fire-test-response characteristics per ASTM E152, and are labeled and tested by Factory Mutual (FM), Underwriters Laboratories (UL), or other National Recognized testing agency. Units shall bear testing agency labels.
 1. Provide UL labels permanently fastened on each door and frame which is within the size limitations established by NFPA and UL for labeling.
 2. Provide anchors for UL labeled frames required by the authority having jurisdiction
- D. Sound transmission class: Provide certificate that door assemblies have been tested in accordance with ASTM E413 and ASTM E1408 to achieve minimum sound transmission class (STC) specified.

1.6 Delivery, Storage, and Handling

- A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage.
- 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 individual stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.1 Manufacturers

- A. Manufacturer: Ceco Corp. Substitutions for architect approval may be submitted by:
 1. Amweld Building Products, Inc.
 2. Curries Company.
 3. Masker Company
 4. Pioneer Industries.

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5. Republic Builders products.
6. Steelcraft Manufacturing Co.

2.2 Materials

- A. Hollow metal doors and frames shall be manufactured of commercial quality level, cold rolled steel, ASTM A366.
- B. Supports and Anchors: Fabricate of not less than 18-gage sheet steel; galvanized where used with galvanized frames.
- C. 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.
- D. Shop Applied Primer 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 and Frames

- A. Requirements for All Doors and Frames:
 1. Accessibility: Comply with ANSI/ICC A117.1.
 2. Door Texture: Smooth faces.
 3. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
 4. Hardware Preparation: In accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
 5. Finish: Factory primed, for field finishing.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.4 Steel Doors

- A. Exterior Doors:
 1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 2, seamless (18 gage). No visible seams permitted.
 2. Core: Polystyrene foam.
 3. Top Caps: Flush with top of faces and edges.

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4. Galvanizing: All components hot-dipped zinc-iron alloy-coated (Galvannealed) in accordance with ASTM A 653/A 653M, with manufacturer's standard coating thickness.
5. Insulating Value: U-value of 0.50, when tested in accordance with ASTM C 1363.
6. Weatherstripping: Separate, see Section 08 7100.
7. Provide fixed metal louvers at indicated on the drawings.

2.5 Steel Frames

- A. General:
 1. Comply with the requirements of grade specified for corresponding door.
 - a. ANSI A250.8 Level 2 Doors: 16 gage frames.
 2. Finish: Same as for door.
 3. Frames in Masonry walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.
- B. Exterior Door Frames: Face welded, seamless with joints filled.
 1. Galvanizing: All components hot-dipped zinc-iron alloy-coated (Galvannealed) in accordance with ASTM A 653/A 653M, with manufacturer's standard coating thickness.
 2. Weatherstripping: Separate, see Section 08 7100.

2.6 Jamb Anchors

- A. Frames for installation in stud partitions shall be provided with steel anchors of suitable design, not less than 18 gage thickness, securely welded inside each jamb as follows:
 1. Frames to 7'-6" height: 4 anchors
 2. Frames 7'-6" to 8'-0" height: 5 anchors
 3. Frames over 8'-0" height: 1 anchor for each 2 feet or fraction thereof.
- B. All frames shall be provided with a steel spreader temporarily attached to the feet of both jambs to serve as a brace during shipping and handling. The steel spreader is not to be used for installation purposes.
- C. Loose glazing stops shall be of cold-rolled steel, not less than 20 gage thickness, butted at the corners joints and secured to the frame with cadmium plated screws.
- D. Frame Reinforcement shall be as follows:
 1. Hinge and pivot reinforcements: 7 gage, 1-1/2 foot by 10 inch min.
 2. Strike reinforcements: 12 gage
 3. Flush bolt reinforcements: 12 gage
 4. Closer reinforcements: 12 gage
 5. Surface-mounted hardware: 12 gage
 6. Hold-open arms: 12 gage
 7. Surface panic devices: 12 gage
 8. Provide closer reinforcement in all frames, whether or not closers are listed in the hardware schedule.

- E. Floor Anchors:
 - 1. Floor anchors shall be securely welded to inside each jamb, with two holes provided at each jamb for floor anchorage.
 - 2. Where required, adjustable floor anchors, providing not less than 2 inches height adjustment shall be provided.
 - 3. Minimum thickness of floor anchors shall be 14 gage.

2.7 Accessories

- A. Louvers: Roll formed steel with overlapping frame; finish same as door components; factory-installed.
- B. Removable Stops: Formed sheet steel, mitered corners; prepared for countersink style tamperproof screws.
- C. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.
- D. Temporary Frame Spreaders: Provide for all factory-or shop-assembled frames.

2.8 Fabrication

- A. Fabricate steel door units to be rigid, neat in appearance and free from defects, warp or buckle. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at project site. Comply with ANSI/SDI-100 requirements as follows:
 - 1. Interior doors: Face sheets shall not be less than 18 gage.
 - 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.
 - 3. Edge profiles shall be provided on both vertical edges of door as follows:
 - a. Single acting swing doors: beveled 1/8 inch in 2 inches.
 - b. Double acting swing doors: rounded on 2-1/8 inches radius.
- B. Doors shall be made of commercial quality, level, cold rolled steel conforming to ASTM A366. Steel face shall have smooth finish. Faces shall be joined at their vertical edges by a continuous weld extending the full height of the door. All such welds shall be ground filled and dressed smooth to make them invisible and provide a smooth flush surface.
- C. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware, (including all function holes for locksets and exit devices), 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. Hardware preparation, except for surface mounted items, shall be done in the factory.

- E. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at project site except as indicated otherwise.
 - 1. Hinge and pivot reinforcement: 7 gage.
 - 2. Reinforcement for lock face, flush bolts, concealed or surface-mounted closers: 12 gage.
 - 3. Reinforcement for all other surface mounted hardware: 16 gage.

- F. 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. The location of hardware on doors and frames shall be as follows:
 - 1. Top hinge: 5 inches from head of the frame to top of hinge.
 - 2. Bottom hinge: 10 inches from finished floor to bottom of hinge.
 - 3. Intermediate hinge: centered between top and bottom hinges.
 - 4. Dutch Doors: 5 inches from head of frame to top hinge; 10 inches from finished floor to bottom of bottom hinge; 5 hinges from split line to top and bottom of lower and upper intermediate hinges.
 - 5. Unit and integral type locks and latches: 38 inches to centerline of knob.
 - 6. Deadlocks: 60 inches to centerline of cylinder.
 - 7. Panic hardware: 38 inches to centerline of crossbar.
 - 8. Door pulls: 42 inches to centerline of grip.
 - 9. Push-pull bars: 42 inches to centerline of bar.
 - 10. Arm pulls: 47 inches to centerline.
 - 11. Push plates: 48 inches to centerline of plate.

- G. Shop Painting: Clean, treat, and pre-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 in field.

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 specified.

- B. Placing Frames: Comply with provisions of SDI-105 "Recommended Erection Instructions for Steel Frames," unless otherwise indicated.
 - 1. Place frames before construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set and frames will retain proper position during construction. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.

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2. Frames for openings over 4 feet wide shall have a vertical brace placed at the center to support frame head during installation until grouting has cured.
 3. Install fire-rated frames in accordance with NFPA Standard No. 80.
 4. In wood stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In closed steel stud partitions, attach wall anchors to studs with screws. Fasten floor anchors to concrete floors using expansion bolts or power actuated drive pins.
 5. Install rubber silencers prior to grouting or make provision to enable their installation following grouting. Protect rubber silencers from damage and replace damaged units.
- C. Door Installation: Fit hollow metal doors accurately in frames using stainless steel shims, within clearances specified in ANSI/SDI-100-91.
1. Install fire-rated doors with clearances as specified in NFPA Standard No. 80.
 2. Exterior Doors without threshold: Maximum 1/4 inch clearance to bottom of door from sill.
- D. All hardware except hinges shall be installed after field painting.

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 doors.
- C. Final Adjustments: Check and readjust operating hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition. Upon completion of installation, each door shall operate smoothly and easily. Doors with closers shall latch under power of closer.

END OF SECTION

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SECTION 08 3113 – ACCESS DOORS

PART I - GENERAL

1.1 Section Includes

- A. Provide and install lockable attic access panels at the ceiling locations as located on the plans.

1.2 Related Requirements

- A. Gypsum Board Assemblies – Ref: Section 09 2116.

1.3 Submittals

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Submit for approval shop drawings, product data.
- C. Install fire-rated units to comply with fire resistance rating required. Coordinate installation and field finishing with other trades.
- D. Adjust hardware and operation. Replace damaged units.

PART 2 - PRODUCTS

2.1 Materials

- A. Larsen's Manufacturing Company or approved equal.
 - 1. Provide flush mount, non-rated access doors for gypsum finishes:
 - a. Larsen's L-DPM 22" x 30 with lock.

PART 3 - EXECUTION

3.1 General

- A. Install per manufacturers recommended installation requirements.

END OF SECTION

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SECTION 08 4113 - ALUMINUM ENTRANCES AND STOREFRONTS**PART 1 - GENERAL****1.1 Section Includes**

- A. This Section includes all necessary materials, labor and equipment for complete installation of the following types of storefronts as indicated on the drawings.
 - 1. Aluminum storefront framing sizes and shapes to receive 1 inch low-e insulated glazing units at locations indicated on the drawings.

1.2 Related Sections

- A. Sealants - Ref: Section 07 9005.
- B. Glass and Glazing - Ref: Section 08 8000.

1.3 Reference Standards (Latest Edition)

- A. Aluminum Association (AA)
 - 1. Aluminum Standards and Data
 - 2. Standards for Anodized Architectural Aluminum, SAA-46
- B. American Architectural Manufacturers Association (AAMA)
 - 1. 501 Methods of Test for Exterior Walls
 - 2. 501.2 Field Check for Metal Curtain Walls for Water Leakage
 - 3. 603.8 Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum
 - 4. 605.2 Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.
 - 5. 611 – Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 1998.
 - 6. 1503.1 Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
 - 7. CW-10 – Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 2004.
- C. American Iron and Steel Institute (AISI)
 - 1. Steel Products Manual
- D. American Society Civil Engineers (ASCE)
 - 1. ASCE 7 – Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers; 2005.
- E. American Society for Testing and Materials (ASTM)
 - 1. A 36 Specification for Carbon Structural Steel
 - 2. A 123 Specification for Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products

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3. 76 Specification for Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip
 4. 653 Specification for Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process
 5. A 666 Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar for Structural
 6. B 209 Specification for Aluminum and Aluminum-Alloy Sheet and Plate, 2007.
 7. B 221 Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes, 2008.
 8. B 221M – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2007.
 9. B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2007.
 10. E 283 – Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004.
 11. E 330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2002 (Reapproved 2010).
 12. E 331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).
 13. E 783 Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Door
 14. E 1105 Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Curtain Walls, and Doors by Uniform or Cyclic Static Air Pressure Difference.
- F. American Welding Society
1. D1.1 Structural Welding Code - Steel
 2. D1. 2 Structural Welding Code - Aluminum
- G. Consumer Products Safety Commission (CPSC)
1. 16 CFR 1201 Safety Standard for Architectural Glazing Materials
- H. Flat Glass Marketing Association (FGMA)
1. Glazing Manual
 2. Sealant Manual

1.4 Submittals

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections:
1. Shop drawings to indicate the following:
 - a. Building exposure category stated.
 - b. Design wind pressure stated.

- c. Water penetration and air infiltration designs stated.
- d. Structural design parameters including pressure, deflection and thermal movement stated.
- e. Condensation resistance factor and criteria stated.
- 2. Product data for each window system required, including:
 - a. Manufacturer's standard details and fabrication methods.
 - b. Project specific details and attachment details.
 - c. System installation instructions.
 - d. Data on finishing, hardware and accessories.
 - e. Recommendations for maintenance and cleaning of exterior surfaces.
 - f. Type of setting blocks and verification of compatibility with Silicone.
 - g. Aluminum alloy materials specified.
- 3. Shop drawings for window system required, including:
 - a. Layout and installation details, including relationship to adjacent work.
 - b. Elevations at 1/4-inch scale.
 - c. Detail sections of typical composite members.
 - d. Anchors and reinforcement requirements including minimum embedment length and limits on spacer height (distance from aluminum frame to structure). Also note material to be anchored into and which holes will be slotted (one end fixed, one end slotted) and slot size for thermal movement.
 - e. All weep hole locations and spacing.
 - f. Hardware mounting heights showing compliance with ADAAG.
 - g. Provisions for expansion and contraction.
 - h. Drawings to show aluminum, glass, sealants, gaskets, fasteners, baker rod, bond breaker tape, flashings and insulation. Insulation joints to be shown taped and insulation to be continuous.
 - i. Drawings to show all joint, splice and end dam conditions. Splice locations to note expected thermal movement.
 - j. Locations of tempered glass shown.

1.5 System Performance Requirements

- A. General: Provide aluminum entrance and storefront assemblies that comply with the performance characteristics specified, as demonstrated by testing the manufacturer's corresponding stock assemblies according to test methods indicated.
- B. Thermal Movement: Design the aluminum entrance and window wall framing systems to provide for expansion and contraction of the component materials. Entrance doors shall function normally over the specified temperature range.
 - 1. The system shall be capable of withstanding a metal surface temperature range of 180 deg. F (100 deg. C) without buckling, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance, stress on glass, or other detrimental effects.

2. Do not permit "Life/Safety" type failures (glass breakage, anchor failures, or structural damage) when tested in accordance with AAMA 501.4, seismic test (lateral cycling).
- C. Design and size windows to withstand the following load requirements, when tested in accordance with ASTM E 330 using test loads equal to 1.5 times the design wind loads with 10 second duration of maximum load:
 1. Design Wind Loads: Comply with requirements of ASCE 7.
 2. Design Wind Load: 22 psf.
 3. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
- D. Air Infiltration: Limit air infiltration through assembly to 0.3 cu ft/min/sq/ft of wall area, measured at a reference differential pressure across assembly of 1.57 psf as measured in accordance with ASTM E 283.
- E. Water Penetration: Provide framing systems with no uncontrolled water penetration (excluding operable door edges) as defined in the test method when tested in accordance with ASTM E 331 at an inward test pressure differential of 6.24 lb. per sq. ft. Do not permit uncontrolled water entry when tested in accordance with ASTM E-331 "Water Penetration of Exterior Windows, Curtainwalls and Doors by Uniform Static Air Pressure Difference" at a test pressure of 15 PSF.
 1. ***Window installer to perform an on-site water test in the presence of the General Contractor. All deficiencies shall be corrected to the satisfaction of the General Contractor.***
- F. Condensation Resistance: Where framing systems are "thermal-break" construction, provide units tested for thermal performance in accordance with AAMA 1503 showing condensation resistance factor (CRF) of not less than 60.

1.6 Quality Assurance

- A. Installer Qualifications: Engage an experienced Installer with not less than 5 years successful experience who has completed installations of aluminum storefront and entrances 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. Fabricator Qualifications: Provide aluminum entrances and storefront systems fabricated by a firm experienced in producing systems that are similar to those indicated for this Project, and that have a record of successful in-service performance. The fabricator shall have sufficient production capacity to produce components required without causing delay in progress of the work.
- C. Single Source Responsibility: Obtain aluminum entrance and storefront systems from one source and from a single manufacturer.

- D. Design Criteria: The drawings indicate the size, profile, and dimensional requirements of aluminum entrance and storefront work required and are based on the specific types and models indicated.
- E. Structural Performance: Design, engineer, fabricate, and install the glazed aluminum storefront wall system to withstand the effects of a wind load of speed at height of installation as required by the applicable Building Code, with no material failures or permanent deformation of structural members.
 - 1. Structural test pressure shall be equal to 150 percent of the inward and outward acting design wind pressures.
 - 2. Maximum deflection shall be 1/175 of the span.
 - 3. Allowable stress with a safety factor of 1.65.

1.7 Delivery, Storage, and Handling

- A. Deliver aluminum entrance and storefront components in the manufacturer's original protective packaging.
- B. Store aluminum components in a clean dry location away from uncured masonry or concrete. Cover components with waterproof paper, tarpaulin or polyethylene sheeting in a manner to permit circulation of air.
 - 1. Stack framing components in a manner that will prevent bending and avoid significant or permanent damage.

1.8 Project Conditions

- A. Field Measurements: Check openings by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of the work.
 - 1. Where necessary, proceed with fabrication without field measurements, and coordinate fabrication tolerances to ensure proper fit.

1.9 Warranty

- A. Warranty: Submit a written warranty, executed by the manufacturer, agreeing to repair or replace units that fail in materials or workmanship within the specified warranty period. Failures include, but are not necessarily limited to:
 - 1. Structural failure of framing members.
 - 2. Excessive deflection, excessive leakage or air infiltration.
 - 3. Faulty operation of swing doors.
 - 4. Deterioration of gaskets and seals.
- B. Warranty Period: 3 years after the date of Substantial Completion.
- C. Finish Coating: Furnish Owner with a five (5) year warranty stating that the anodized coating applied to storefront will not bleed, crack, chalk, change color or have other forms of degradation for the full warranty period.

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- D. Defects may be defined as follows however: this list is not inclusive of all potential problems:
 - 1. Air infiltration beyond specified limits
 - 2. Water penetration (as defined by AAMA Metal Curtain Wall Manual)
 - 3. Doors and hardware not operating properly
 - 4. Finish degradation beyond normal
 - 5. Structural failures of framing members or anchors not subjected to unusual loads.

- E. Warranties for glass and sealants are specified elsewhere.

PART 2 - PRODUCTS

2.1 Manufacturers and Products

- A. Aluminum framing systems and doors shall be provided from one of the following manufacturers.
 - 1. **Kawneer Company, Inc.**
555 Guthridge Court, Norcross, GA 30092
(770) 449-5555
 - 2. **Tubelite**
4878 Mackinaw Trail, Reed City, MI 49677
(616) 832-2211
 - 3. **Vistawall Architectural Products**
803 Airport Road, Terrell, TX 75160
(972) 551-6100

- B. Aluminum Storefront/ Window System:
 - 1. **STF-1:** Kawneer Co., Inc., Trifab VG 451-T System, 2 inches x 4 1/2 inches for 1 inch insulated glazing units, thermal break, center plane glazing.
 - a. Finish/Color: Dark Bronze.

- C. Manufactured within commercial tolerance and free from defects impairing strength and/or durability.

- D. Screws, bolts and all other accessories to be compatible with the aluminum under normal service conditions.

- E. Thermal barrier is a two-part chemically cured polyurethane casting resin, poured in place for perimeter members and shall be by means of a flexible 90 durometer EPDM isolator located at the exterior side of the glass plane preventing continuous contact between exterior and interior metal.

- F. Trim Details: Coordinate with storefront manufacturer.

2.2 Materials

- A. Aluminum Members: Alloy and temper recommended by the manufacturer for strength, corrosion resistance, and application of required finish; extrusions shall be 6063 T5 alloy and temper to comply with ASTM B 221 for aluminum extrusions, ASTM B 209 for aluminum sheet or plate, and ASTM B 211 for aluminum bars, rods and wire.
- B. Carbon steel reinforcement of aluminum framing members shall comply with ASTM A 36 for structural shapes, plates and bars, ASTM A 611 for cold rolled sheet and strip, or ASTM A 570 for hot rolled sheet and strip.
- C. Glass and Glazing Materials: Comply with requirements of Section 08800, "Glass and Glazing" of these specifications.
- D. Fasteners: Provide fasteners of aluminum, nonmagnetic stainless steel, in accordance with ASTM A164, or other material warranted by the manufacturer to be non-corrosive and compatible with aluminum components, hardware, anchors and other components.
 - 1. Reinforcement: Where fasteners screw-anchor into aluminum members less than 0.125 inches thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard non-corrosive pressed-in splined grommet nuts.
 - 2. Exposed Fasteners: Do not use exposed fasteners except for application of hardware. For application of hardware, use Phillips flat-head machine screws that match the finish of member or hardware being fastened.
- E. Concealed Flashing: 0.0179-inch (26 gage) minimum dead-soft stainless steel, or 0.026-inch-thick minimum extruded aluminum of alloy and type selected by manufacturer for compatibility with other components.
- F. Brackets and Reinforcements: High-strength aluminum brackets and reinforcements; where use of aluminum is not feasible provide nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A 123.
- G. Concrete and Masonry Inserts: Cast iron, malleable iron, or hot-dip galvanized steel inserts complying with ASTM A 123.
- H. Compression Weather-stripping: Manufacturer's standard replaceable compressible weather-stripping gaskets of molded neoprene complying with ASTM D 2000 or molded PVC complying with ASTM D 2287.

2.3 Aluminum Finishes

- A. Finish shall be Permanodic® AA-M12C22A41, AAMA 611, Architectural Class I Clear Anodic Coating (Color #14 Clear). Coating system consisting of an inhibitive primer and a solid color coat. Coating shall meet or exceed AAMA 2605.

- B. Metal Preparation and Pre-Treatment: Remove organic and inorganic surface soil, grease, oils and other foreign materials using a minimum five stage cleaning and pre-treatment process.
- C. Finishing: Coating shall be applied by conventional air or electrostatic spray over aluminum surfaces which have been thoroughly cleaned, pre-treated and primed according to specifications of the licensed formulator. Dipping and flowcoating are not permitted.
 - 1. Application shall comply with AAMA finish designation AA-M12-C42-R1x and to methods approved by the coating manufacturer.
- D. Primer Coat: Spray a thin film of primer at a minimum dry film thickness of 0.3 mils. Type of primer shall be as recommended and approved by the coating manufacturer. If baked-on primer is used, test primer for cure using prescribed solvent rub as outlined by coating supplier.
- E. Finish Coat: Spray coat to obtain a dry film thickness of 1.2 mils minimum on exposed surfaces.

2.4 Adhesives and Sealants

- A. Adhesives and Sealants used in interior locations must not emit more VOCs than 30 g/l for metal to metal sealants, 100 g/l for structural glazing adhesives, 70 g/l for multipurpose construction adhesives and 250 g/l for architectural sealants.

2.5 Components

- A. Window Framing System: Provide storefront and entrance framing systems fabricated from extruded aluminum members of size and profile indicated. Include sub-frames and other reinforcing members of the type indicated.
- B. Entrance Door Frames: Provide tubular and channel frame entrance door frame assemblies, as indicated, with welded or mechanical joints in accordance with manufacturer's standards. Reinforce as necessary to support required loads.

2.6 Fabrication

- A. General: Fabricate aluminum entrance and storefront components to designs, sizes and thickness indicated and to comply with indicated standards. Sizes and profile requirements are indicated on the drawings. Variable dimensions are indicated, with maximum and minimum dimensions required, to achieve design requirements and coordination with other work.
- B. Prefabrication: Complete fabrication, assembly, finishing, hardware application, and other work to the greatest extent possible before shipment to the Project site. Disassemble components only as necessary for shipment and installation.
 - 1. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces. Complete these operations for hardware prior to application of finishes.
 - 2. Pre-glaze door and frame units to greatest extent possible.

- C. Welding: Comply with AWS recommendations. Grind exposed welds smooth to remove weld spatter and welding oxides. Restore mechanical finish.
 - 1. Welding behind finished surfaces shall be performed in such a manner as to minimize distortion and discoloration on the finished surface.
- D. Reinforcing: Install reinforcing as required for hardware and as necessary for performance requirements, sag resistance and rigidity.
- E. Dissimilar Metals: Separate dissimilar metals with bituminous paint, or a suitable sealant, or a non-absorptive plastic or elastomeric tape, or a gasket between the surfaces. Do not use coatings containing lead.
- F. Continuity: Maintain accurate relation of planes and angles with hairline fit of contacting members.
 - 1. Uniformity of Metal Finish: Abutting extruded aluminum members shall not have an integral color texture variation greater than half the range indicated in the sample pair submittal.
- G. Fasteners: Conceal fasteners wherever possible.

PART 3 - EXECUTION

3.1 Examination

- A. Examine substrates and supports, with the Installer present, for compliance with requirements indicated, installation tolerances, and other conditions that affect installation of aluminum entrances and storefronts. Correct unsatisfactory conditions before proceeding with the installation.
 - 1. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 Installation

- A. Comply with manufacturer's instructions and recommendations for installation.
- B. Set units plumb, level, and true to line, without warp or rack of framing members, doors, or glazing panels. Install components in proper alignment and relation to established lines and grades indicated. Provide proper support and anchor securely in place.
- C. Construction Tolerances; Install aluminum entrance and storefront to comply with the following tolerances:
 - 1. Variation from Plane: Do not exceed 1/8 inch in 12 feet of length or 1/4 inch in any total length.
 - 2. Offset from Alignment: the maximum offset from true alignment between two identical members abutting end to end in line shall not exceed 1/16 inch.

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3. Diagonal Measurements: The maximum difference in diagonal measurements shall not exceed 1/8 inch.
 4. Offset at Corners: The maximum out-of-plane offset of framing at corners shall not exceed 1/32 inch.
- D. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
1. Zinc or cadmium plate steel anchors and other unexposed fasteners after fabrication.
 2. Paint dissimilar metals where drainage from them passes over aluminum.
 3. Paint aluminum surfaces in contact with mortar, concrete or other masonry with alkali resistant coating.
- E. Drill and tap frames and doors and apply surface-mounted hardware items. Comply with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.
- F. Set sill members and other members in bed of sealant as indicated, or with joint fillers or gaskets as indicated to provide weathertight construction. Comply with requirements of Division 7 for sealants, fillers, and gaskets.

3.3 Cleaning

- A. Clean the completed system, inside and out, promptly after installation, exercising care to avoid damage to coatings.
1. All aluminum surfaces are to be cleaned with alcohol prior to installation of silicone sealants.
 2. Adjacent surfaces to be power washed prior to installation of silicone window sealants.
- B. Clean glass surfaces after installation, complying with requirements contained in Section 08 8000 for cleaning and maintenance. Remove excess glazing and sealant compounds, dirt and other substances from aluminum surfaces.

3.4 Protection

- A. Institute protective measure required throughout the remainder of the construction period to ensure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION

SECTION 08 7100 - FINISH HARDWARE

PART 1 - GENERAL

1.1 Section Includes

- A. Definition: "Finish Hardware" includes items known commercially as finish hardware which are required for swing, sliding and folding doors, except special types of unique and non-matching hardware specified in the same section as the door and door frame.
 - 1. Door Hardware is scheduled on the drawings.
 - 2. ***Coordinate all coring of exterior locksets with the Owner.***
- B. Provide labor, materials, transportation, services and appliances necessary to complete the following work:
 - 1. Finish door hardware installation including necessary screws, bolts, special fasteners, expansion shield and other devices necessary and required for proper hardware application and use.
 - 2. Furnish and install cylinders and latches at exterior storefront entrance as indicated. Coordinate keying with other locksets.
 - 3. Provide temporary locksets at exterior doors during construction.

1.2 Related Sections

- A. Standard Steel Doors and Frames - Ref: Section 08 1113.
- B. Painting - Ref: Section 09 9000.

1.3 Reference Standards

- A. BHMA A156.18 – American National Standard for Materials and Finishes; Builders Hardware Manufacturers Association, Inc.; 2006 (ANSI/BHMA A156.18).
- B. NFPA 80 – Standard for Fire Doors and Other Opening Protectives; 2010.
- C. UL (BMD) – Building Materials Directory; Underwriters Laboratories Inc.; current edition.

1.4 Submittals

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Supplier shall submit for approval four (4) copies of a proposed hardware Schedule listing complete architectural finish hardware derived from the schedule provided in this Section.

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1.5 Administrative Requirements

- A. Coordinate the manufacture, fabrication, and installation of products onto which door hardware will be installed.
- B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

1.6 Intent

- A. This specification contemplates providing proper hardware, in accord with applicable codes for all doors as listed. Finish hardware contractor's responsibility is to examine plans and specifications and call out conflicts, omissions or obvious requirements not listed to the attention of the Construction Manager or Architect for instructions.
 - 1. The hardware supplier shall furnish all finish hardware required for the Work and furnished under another section. Where specific hardware is not indicated, provide the same hardware required for similar doors and function elsewhere in the building.

1.7 Quality Assurance

- A. All hardware shall meet all state and local codes, and comply with the Americans with Disabilities Act (ADA), Section 4.13, Doors.

1.8 Product Handling

- A. Supplier is responsible for delivery of proper items to proper installer, with tags attached, catalog number, and specific location, indicating manufacturer.

1.9 Warranty

- A. This Contractor shall warrant and guarantee all materials for which he is responsible under this Section that all materials will be free from defects of material, workmanship and function for a period of one (1) year from the date of final acceptance. This contractor further agrees that he will at his own expense replace any defective items and damaged articles resulting from such defective materials. This contractor must notify the Architect in writing if any of the materials and/or items he has supplied have been damaged by other trades on the project.
- B. Six (6) months after substantial completion, all hardware shall be re-inspected and adjusted as required.

PART 2 - PRODUCTS

2.1 Materials and Fabrication

- A. Hardware supplier shall furnish paper templates with copies of approved hardware schedule to installer.
- B. Miscellaneous Items: Furnish hardware with all incidental items, i.e. screws, bolts, expansion sleeves, or shields, anchors, and other fasteners, as recommended by manufacturer to insure heavy usage and long life.
- C. Instructions: Full manufacturer's printed instructions and special information needed for the proper installation and adjustment of hardware and any assistance necessary to make hardware function as intended shall be provided by the supplier to insure proper operation.

2.2 Manufacturers

- A. Any manufacturer from the following list may be used with prior approval for items equal to those listed in **BOLD** text. See Schedule for specific requirements.
 - 1. Locks and Latches:
 - a. **Sargent**
 - b. Schlage
 - 2. Cylinders (Note: Coordinate Final Coring with Owner):
 - a. **Sargent**
 - b. Schlage
 - 3. Hinges/Butts:
 - a. **Hager**
 - b. Stanley
 - c. McKinney
 - d. Ives
 - 4. Door Closers:
 - a. **Sargent**
 - b. Dorma
 - c. LCN
 - d. Yale
 - 5. Thresholds/Weather-stripping:
 - a. **National Guard**
 - b. Pemco
 - c. Reese
 - d. Hager
 - 6. Stops/Wall Bumpers/Silencers/Kickplates/Drip Caps:
 - a. **Hager**
 - b. Quality
 - c. Ives
 - d. Rockwood

2.3 Hinges, Butts and Pivots

- A. Screws: Furnish Phillips flat-head or machine screws for installation of units, except furnish Phillips flat-head wood screws for installation into woods. Finish screw heads to match surface of hinges or pivots.
- B. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - 1. Hinges: Five-knuckle.
 - 2. Exterior Doors: Non-removable pins.
 - 3. Number of hinges: Provide number of hinges indicated but not less than 3 per door leaf for 90" or less in height and one additional hinge for each 30" of additional height.

2.4 Lock Cylinders and Keying

- A. General: Supplier will meet with Owner to finalize keying and obtain final instructions in writing.
- B. Keying: Provide a master-keyed system with keying arrangements as scheduled. Provide three (3) master keys and three (3) keys per lock clearly labeled with location of lockset they operate.

2.5 Miscellaneous Provisions

- A. Silencers: Provide three (3) silencers per door unless otherwise specified.
- B. Provide one pair of flush bolt at inactive leaf of all double doors.
- C. Provide a wall stop at each door unless a floor stop is required.
- D. No stick on adhered weather-stripping will be accepted.

PART 3 - EXECUTION**3.1 Installation**

- A. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and as may be otherwise directed by Architect.
- B. Install each hardware item in compliance with the manufacturer's instruction and recommendations using fully experienced and qualified personnel. Wherever cutting and fitting is required to install hardware onto or into surfaces which 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 Division 9 sections. Do not install surface-mounted items until finishes have been completed on the substrate.

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- C. Coordinate with door and frame suppliers to obtain door frame hardware installations which are listed by approved testing agency.
- D. Set units level, plumb and true to line location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- E. All surface mounted closers to be mounted on the room side of doors in all corridors, lobbies and other public spaces.

3.2 Adjust and Clean

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation of function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
 - 1. Upon completion, door shall latch without forcing and close latch under the force of the closer.
 - 2. Provide door control equipment as required. Mount equipment so as to permit maximum door opening, but to prevent contact of the door with building construction and equipment.
- B. Remove all hardware from doors prior to painting.
- C. Clean adjacent surfaces soiled by hardware installation.
- D. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work 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 function and finish of hardware and doors. Adjust door devices to compensate for final operation of heating and ventilating equipment.
- E. Instruct Owner's personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustments.

3.3 Hardware Schedule (See Drawings)

END OF SECTION

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SECTION 08 8000 – GLASS AND GLAZING

PART 1 - GENERAL

1.1 Section Includes

- A. Extent of glass and glazing work is indicated on drawings and schedules. Types of work in this section include glass and glazing for:
 - 1. Aluminum windows and window wall construction to have 1 inch insulated glass units.
 - 2. Aluminum windows and window wall construction to have 1 inch low-e clear frosted insulated glass units.

1.2 Related Requirements

- A. Joint Sealers – Ref: Section 07 9000.
- B. Aluminum Framed Storefronts – Ref: Section 08 4113.

1.3 Reference Standards

- A. 16 CFR 1201 – Safety Standard for Architectural Glazing Materials; current edition.
- B. ASTM C 864 – Standard Specification for Dense Elastomeric compression Seal Gaskets, Setting Blocks, and Spacers; 2005.
- C. ASTM C 920 – Standard Specification for Elastomeric Joint Sealants; 2010.
- D. ASTM C 1036 – Standard Specification for Flat Glass; 2006.
- E. ASTM C 1048 – Standard Specification for Heat-Treated Flat Glass – Kind HS, King FT Coated and Uncoated Glass; 2004.
- F. ASTM C 1193 – Standard Guide for Use of Joint Sealants; 2009.
- G. ASTM E 1300 – Standard Practice for Determining Load Resistance of Glass in Buildings; 2009a.
- H. ASTM E 2190 – Standard Specification for Insulating Glass Unit Performance and Evaluation; 2008.
- I. GANA (GM) – GANA Glazing Manual; Glass Association of North America; 2004.
- J. GANA (SM) – FGMA Sealant Manual; Glass Association of North America; 2008.

1.4 Submittals

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
- C. Samples: Submit two samples 12 x 12 inch in size of glass units, showing coloration and design.
- D. Certificates
 - 1. Provide certification from glass fabricator of acceptance of results of all required analysis and shop drawing checks as specified under “Quality Assurance”.
 - 2. Provide certifications that installer’s and glass fabricator’s experience meets criteria specified under “Quality Assurance”.
 - 3. Separate certification will not be required for glazing materials bearing manufacturer’s permanent labels designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authorities having jurisdiction.
- E. Shop Drawings
 - 1. On shop drawings submitted for Architectural approval, show and describe the following as a minimum:
 - a. Glass thickness
 - b. Description of glass, including: manufacturer, coatings, tint, heat treatment, special edge seal/adhesive, laminate, pattern, and frit, as applicable.
 - c. Nominal glass bite at framing
 - d. On elevations, indicate which lites are tempered.

1.5 System Description

- A. Provide glass and glazing that has been produced, fabricated and installed to withstand normal thermal movement, wind loading and impact loading (where applicable), without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glass and glazing materials and other defects in the work.
 - 1. Normal thermal movement is defined as that resulting from an ambient temperature range of 120 degrees F and from a consequent temperature range within glass and glass framing members of 180 degrees F.
 - 2. Deterioration of insulating glass is defined as failure of hermetic seal due to other causes than breakage which results in intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coating, if any, resulting from seal failure, and any other visual evidence of seal failure or performance.

1.6 Performance Requirements

- A. Select type and thickness of exterior glass to withstand dead loads and wind loads acting normal to plane of glass at design pressures in accordance with the International Building Code.
- B. Glass Strength
 - 1. Provide glass thickness capable of resisting an equivalent design load, as defined by ASTM E1300, with a probability of failure of approximately 8 lites per thousand.
 - a. For monolithic annealed lites determine glass thickness per ASTM E1300.
 - b. For heat treated, tempered, laminated, and insulating glass units, determine per manufacturer's method.
- C. Glass Deflection
 - 1. Using ASTM E1300, Appendix X1, provide glass having sufficient thickness to limit center deflection, relative to glass edges, per following criteria.
 - a. At 50% design windload, deflection shall not exceed 1% of least glass dimension, and not more than 1".
 - b. At 150% design windload, deflection shall be limited to prevent glass disengagement from frame.
- D. Heat Treatment
 - 1. Provide heat treated glass when thermal stress analysis determines a solar absorption of 60 % or more, or where unfavorable shadow patterns occur on glass.
 - 2. Provide heat treated glass as further required for strength to resist windload.
 - 3. Provide fully tempered glass or other approved glazing for "safety glazing" applications. Heat strengthened glass is not an approved product.

1.7 Quality Assurance

- A. Qualifications
 - 1. Installer shall be able to demonstrate not less than five (5) years successful experience in the installation of comparable projects.
 - 2. Glass fabricator shall be able to demonstrate not less than ten (10) years successful experience in the fabrication of specified glass products, and capable of providing the following:
 - a. Review and comment of glazing shop drawings and installation instruction as relating to:
 - 1) Proper system drainage, and protection of insulation glass unit seals.
 - 2) Proper glass edge bite and support
 - 3) Other conditions that affect warranty
 - b. Thermal stress analysis

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- c. Glass strength and deflection checks
 3. All glass shall be provided by a single manufacturer and fabricated by a single fabricator.
 - B. In addition to manufacturer's recommendations, conform to guidelines of the FGMA Glazing Manual.
 - C. Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply 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.
 1. Tempered glass shall be permanently marked with certification label of Safety Glass Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.
 - D. Pre-Installation Conference
 1. Before substantially commencing the glazing work on site, the Glazing Contractor shall meet with the Architect and Construction Manager to address the following as a minimum:
 - a. Verification of acceptance of mock-up samples
 - b. Coordinate glazing with related window framing and sealing work
 - c. Verification of review and acceptance of glazing details by glass manufacturer
 - d. Verification of understanding of approved shop drawings, relative to glazing
 - e. Coordinate mobility, storage, use of lifts or scaffolding
 - f. Review safety and protection procedures while moving, storing, installing, and post installation of glass.

1.8 Delivery, Storage, and Handling

- A. Deliver, handle, and store all materials to prevent damage or deterioration, in conformance with manufacturer's instructions.
- B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

1.9 Site Conditions

- A. Do not install glazing products in environmental conditions that are beyond the limitations set by the manufacturer.
- B. Glazing channels shall be clear of water or ice and construction debris before installing glass.

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1.10 Warranty

- A. Insulating Glass Units
 - 1. Fabricator shall warrant to the Owner that the edge seal will not fail in adhesion or moisture vapor seal for a period of ten (10) years from date of substantial completion, when handled and installed in accordance with good industry practices and fabricator's instructions. Fogged or delaminated I.G. units constitute failure.
- B. Coated Glass
 - 1. Manufacturers of reflective coated glass shall warrant to the Owner that the coating will not fail or be defective for a period of ten (10) years from the date of substantial completion.

PART 2 – PRODUCTS**2.1 Acceptable Manufacturers**

- A. The basis of this specification is PPG Industries, Inc.
- B. Acceptable substitutions may be accepted per the requirements of Section 01 1600. Subject to compliance with requirements, provide products of one of the following:
 - 1. Manufacturers of Clear Float Glass:
 - a. Viracon, Inc.
 - b. Guardian Industries Corp.
 - c. LOF Glass, Inc.
 - 2. Manufacturers of Heat Treated Glass:
 - a. Viracon, Inc.
 - b. Guardian Industries Corp.
 - c. LOF Glass, Inc.
 - d. PPG Industries, Inc.
 - 3. Manufacturers of Insulated Glass:
 - a. Viracon, Inc.
 - b. Guardian Industries Corp.
 - c. LOF Glass, Inc.
 - 4. Manufacturers of Insulated Spandrel Glass:
 - a. Viracon, Inc.
 - b. Guardian Industries Corp.
 - c. LOF Glass, Inc.

2.2 Exterior Glass Types

- A. **Type A** – Sealed Insulating Glass Units: Frosted glazing, low-E.
 - 1. Application(s): All exterior glazing unless otherwise indicated. All exterior glazing shall meet Maximum U value and Maximum SHGC criteria as specified in ASHRAE 90.1 (2009) Table 5.5-4.
 - 2. Between-lite space filled with air.
 - 3. Thermal Resistance (U-Value): 0.29, nominal.

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4. Total Solar Heat Gain Coefficient: 0.38, nominal.
5. Total Visible Light Transmittance: 70.0 percent.
6. Shading Coefficient: 0.44.
7. Basis of Design: PPG Industries, Inc: www.ppgglazing.com.
8. Outboard Lite: Annealed float glass, ¼ inch thick, minimum.
 - a. Low E Coating: PPG Solarban 60 S (2) Clear + Clear
 - b. Tint: None (clear).
9. Inboard Lite: Annealed float glass, ¼ inch thick.
 - a. Tint: None (clear).
10. Total Thickness: 1 inch.
11. Provide white frosted coating on the #3 surface to obscure vision.

NOTE: SUBMITT SAMPLES FOR ARCHITECT'S FINAL SELECTION

- B. Type B** – Sealed Insulating Glass Units: Vision glazing, low-E.
1. Application(s): All exterior glazing unless otherwise indicated. All exterior glazing shall meet Maximum U value and Maximum SHGC criteria as specified in ASHRAE 90.1 (2009) Table 5.5-4.
 2. Between-lite space filled with air.
 3. Thermal Resistance (U-Value): 0.29, nominal.
 4. Total Solar Heat Gain Coefficient: 0.38, nominal.
 5. Total Visible Light Transmittance: 70.0 percent.
 6. Shading Coefficient: 0.44.
 7. Basis of Design: PPG Industries, Inc: www.ppgglazing.com.
 8. Outboard Lite: Annealed float glass, ¼ inch thick, minimum.
 - a. Low E Coating: PPG Solarban 60 S (2) Clear + Clear
 - b. Tint: None (clear).
 9. Inboard Lite: Annealed float glass, ¼ inch thick.
 - a. Tint: None (clear).
 10. Total Thickness: 1 inch.
- C. Alternate Products/Manufacturers**
1. Guardian Industries,
 2. PPG Industries, Inc.
 3. AFG Industries, Inc
 4. Viraspan TM Ceramic Frit Spandrel/Viracon
 5. Equal by Interpane Coating, Oldcastle

2.3 Glass Materials

- A. Float Glass:** All glazing is to be float glass unless otherwise indicated.
1. Annealed Type: ASTM C 1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
 2. Heat-Strengthened and Fully Tempered Types: ASTM C 1048.
 3. Tinted Types: Color and performance characteristics as indicated.
 4. Thicknesses: As indicated; for exterior glazing comply with specified requirements for wind load design regardless of specified thickness.

2.4 Sealed Insulating Laminated Glass Materials

- A. Sealed Insulating Glass Units: Types as indicated.
 - 1. Durability: Certified by an independent testing agency to comply with ASTM E 2190.
 - 2. Edge Spacers: Aluminum, bent and soldered corners.
 - 3. Edge Seal: Glass to elastomer with supplementary silicone sealant.
 - 4. Purge interpane space with dry hermetic air.

2.5 Coated Glass Products

- A. Metallic oxide reflective coatings applied by high performance wet chemical or vacuum deposition shall be applied to #2 surface of monolithic, or #2 or #3 surfaces of insulating glass units. Pyrolitic deposition coatings may be applied to #1 (exterior) surface.
- B. Quality Inspection Guidelines
 - 1. Pinhole Inspection
 - a. Glass is to be inspected from a distance of six (6) feet (1.8m). Pinholes larger than 1/16" (1.5mm) in diameter are not allowed.
 - b. Within any 12" (305mm) diameter circle, there shall be no more than four (4) pinholes, only one of which may exceed 1/32" (1mm) diameter.
 - 2. Scratch Inspection
 - a. Glass is to be inspected from a distance of ten (10) feet (3m). Scratches or rub marks shall not exceed 1/2" (12mm) x 1/32" (1mm).
 - 3. Reflectance and Transmission Inspection
 - b. Must fall within the range of approved samples or mock-up.

2.6 Heat-Treated Flat Glass Products

- A. Provide heat-treated glass products that meet the requirements of ASTM C 1048.
- B. Manufacture heat-treated glass by horizontal (roller hearth) process, with roll wave distortion parallel with bottom edge of glass as installed, unless otherwise indicated.
- C. Tempered glass (Kind FT) shall have a minimum surface compression of 10,000 psi.
- D. Heat Strengthened glass (Kind HS) shall have a minimum surface compression of 3500 psi, and a minimum edge compression of 5500 psi.
- E. Tempered glass shall be permanently identified with the Safety Glazing Certification Council (SGCC) label, located inconspicuously at a corner, indicating certification of the product.

2.7 Glazing Compounds

- A. Silicone Sealant: Single component; moisture curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920, Type S, Grade NS, Class 100/50, cured Shore A hardness of 15 to 25; color as selected.

2.8 Glazing Accessories

- A. Dense Elastomeric compression Seal Gaskets
1. Provide molded or extruded gaskets of material compatible with interfacing sealants, complying with ASTM C 864, Option I, of profile and hardness required to maintain watertight seal. Color black.
 - a. EPDM
 - b. Neoprene
 - c. Silicone - Comply with ASTM C 1115, classification CH7S3
- B. Cellular Elastomeric Preformed Gaskets
1. Provide extruded or molded closed cell, integral-skinned EPDM, Neoprene, or silicone of profile and hardness required to maintain watertight seal, complying with ASTM C 509, Option I, Type II, color black.
- C. Setting Blocks
1. Provide setting blocks of material which has been tested to be compatible with interfacing glazing sealants and insulating glass unit seals. Hardness shall be Shore 'A' durometer of 85 +/-5.
 - a. EPDM
 - b. Neoprene
 - c. Silicone – Comply with ASTM C 1115, classification CH9S3.
 2. Provide blocks of sufficient width to transfer the deadload of the glazing to the framing. Block shall be sized to support both lites of an insulating unit without inducing stress at edge seal.
 3. Provide blocks of sufficient length as recommended by FGMA Glazing Manual and as further required by glass fabricator. In no case (excluding door glazing) shall less than two (2) blocks be used to support deadload, or less than 4" long per block. Cutting blocks down from size supplied and intended, whether in length or profile, is not allowed.
 4. Spacing of setting blocks shall be at 1/4 points typically, and in no case closer to ends of supporting horizontal than 1/8 points.
 5. Profile of setting blocks shall allow water to flow past, even if block is inadvertently set diagonally in glazing pocket.
- D. Anti-Walk Edge Blocks
1. Provide solid edge blocks at vertical edges of glass of material and size as intended by framing manufacturer. Further comply with recommendations of glass fabricator and FGMA Glazing Manual.
 2. Provide "W" type anti-walk blocks at vertical glass edges where solid blocks cannot be installed.

- E. Spacers for Structural Glazing Systems
 - 1. Spacer blocks, tapes, or extrusions adjacent to structural silicone shall be compatible as tested in Accordance with ASTM C 1087 and Complying with ASTM C 1115.

PART 3 - EXECUTION

3.1 Examination

- A. Glazier shall inspect framing prior to commencing glass installation. He shall report deficiencies and proceed only after such deficiencies are corrected. Items to inspect include, but are not limited to the following:
 - 1. Compare framing openings to shop drawings for size and squareness.
 - 2. Check that glazing channels are free of debris
 - 3. Inspect weep system for conformance to shop drawings and that holes are not clogged. Check that weep pathways are open.
 - 4. Ensure all necessary blocks and gaskets are in place.
 - 5. Inspect internal joinery seals and splices that they are watertight. Check that corner seals do not interfere with glazing.

3.2 Preparation

- A. Pre-Installation Meeting
 - 1. General Contractor, Contractor, and Glazier shall meet to coordinate glazing work. Include other trades as affected and applicable. Ensure that stored and in-place glass will not be susceptible to damage by adjacent trades. Coordinate such that once glazing channels are cleaned and inspected, and work from adjacent trades does not contaminate areas ready for glazing.
- B. Protection
 - 1. Protect surrounding areas from potential falling or breaking glass during installation or handling. Comply with applicable safety codes.
 - 2. Use rolling blocks when rotating glass. Protect insulating glass edge seals from damage.
- C. Clean contact surfaces with solvent and wipe dry.
- D. Prime surfaces scheduled to receive sealant.
- E. Install sealants in accordance with ASTM C 1193 and FGMA Sealant Manual.
- F. Install sealant in accordance with manufacturer's instructions.

3.3 Installation – Exterior/Interior Dry Method (Gasket Glazing)

- A. Place setting blocks at ¼ points with edge block no more than 6 inches from corners.
- B. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

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

3.4 Cleaning

- A. Remove glazing materials from finish surfaces.
- B. Remove labels after Work is complete.
- C. Wash all glass prior to Date of Substantial Completion using a mild detergent or glass cleaner, leaving glass clean and free of streaks.

3.5 Protection

- A. Remove and replace broken, cracked, chipped or otherwise damaged glazing materials prior to Date of Substantial completion.

END OF SECTION

Division 9

Finishes

Coffman Park Expansion

Phase 2A

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SECTION 09 2116 - GYPSUM DRYWALL

PART I -GENERAL

1.1 Section Includes

- A. Extent of each type of gypsum drywall construction required is indicated on Drawings. This Section includes the following types of gypsum board construction:
 - 1. Gypsum board screw-attached to wood framing and furring members.
 - 2. Moisture resistant gypsum board where indicated.
 - 3. "DensGlass Gold" wallboard as substrate sheathing to exterior veneer systems.
 - 4. "Dens Deck" Prime wallboard is to receive fully adhered roofing membrane system at parapet locations and horizontal roof locations.
 - 5. Accessories and finishing materials.

1.2 Related Requirements

- A. Rough Carpentry – Ref: Section 06 1000.
- B. Thermal Insulation – Ref: Section 07 2100.
- C. Fire Stopping - Ref: Section 07 8400.
- D. Joint Sealers - Ref: Section 07 9005.
- E. Standard Steel Doors and Frames - Ref: Section 08 1113.
- F. Access Doors – Ref: Section 08 3113.
- G. Painting - Ref: Section 09 9000.

1.3 Reference Standards

- A. ASTM C 475/C 475M – Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2002 (Reapproved 2007).
- B. ASTM C 840 – Standard Specification for Application and Finishing of Gypsum Board; 2008.
- C. ASTM C 1047 – Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2009.
- D. ASTM C 1177/C 1177M – Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2008.

- E. ASTM C 1280 – Standard Specification for Application of Gypsum Sheathing; 2009.
- F. ASTM C 1396/C 1396M – Standard Specification for Gypsum Board; 2009a.
- G. GA-216 – Application and Finishing of Gypsum Board; Gypsum Association; 2007.

1.4 Submittals

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Product data from manufacturers for each type of product specified.
- C. Product test reports indicating compliance of gypsum board with fire resistance, structural performance, and moisture resistance performance requirements.
- D. Product Data: Provide data on gypsum board, accessories, and joint finishing system.

1.5 Quality Assurance

- A. Installer Qualifications: Company specializing in performing gypsum board application and finishing, with minimum three years of documented experience.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Gypsum materials and installation to comply with the following Gypsum Association publications:
 - 1. GA-214, Recommended Levels of Gypsum Board Finish.
 - 2. GA-216, Application and Finishing of Gypsum Board.
 - 3. GA-226, Application of Gypsum Board to Curved Surfaces.
 - 4. GA-235, Gypsum Board Typical Mechanical and Physical Properties.
 - 5. GA-801, Handling Gypsum Board.
- D. Single Source Responsibility: Obtain each type of gypsum board and related joint treatment materials from a single manufacturer.
- E. Gypsum Board Systems: Comply with ASTM C840 "Application and Finishing of Gypsum Board", and as specified.
- F. Reference Standards: Wherever the following abbreviations are used herein they shall refer to the corresponding standard:
 - 1. ASTM: American Society for Testing and Materials.
 - 2. GA: Gypsum Association.

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- G. Guarantee: Submit written guarantee stating that cracks, delaminations or other imperfections in the drywall work which may develop within a period of two (2) years from date of acceptance will be repaired at no cost to the Owner.

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 boards flat to prevent sagging.
- C. Handle gypsum boards 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 application and finishing gypsum board to comply with ASTM C 840 and with gypsum board manufacturer's recommendations.
- B. Minimum Room Temperatures: For non-adhesive attachment of gypsum board to framing, maintain not less than 40 degrees F. For adhesive attachment and finishing of gypsum board maintain not less than 50 degrees F for 48 hours before application and continuously thereafter until drying is complete.
- C. Ventilate building spaces to remove water not required for drying joint treatment materials. Avoid weather to prevent materials from drying too quickly.

PART 2 - PRODUCTS

2.1 Manufacturers

- A. Gypsum Boards and Related products: Interior and exterior gypsum board and accessories by United States Gypsum (USG) form the basis-of-design. Products with comparable material characteristics, ratings, and finishes by listed manufacturers are also acceptable.
 - 1. American Gypsum Co.
 - 2. BPB America Inc.
 - 3. G-P Gypsum.
 - 4. Lafarge North America Inc.
 - 5. National Gypsum Company.
 - 6. Temple.

2.2 Interior Gypsum Board Materials

- A. General: Materials complying with ASTM C 36 or ASTM C 1396, as applicable to type of gypsum board indicated and whichever is more stringent.
- B. Panel Size, General: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated. Thicknesses indicated.
- C. Gypsum Wallboard: ASTM C 36, with long edges tapered. Provide thickness indicated.
 - 1. Regular Type: "SHEETROCK Brand Gypsum Panels", at interior non-rated partitions and soffits.
 - 2. Water-resistant Panels: ASTM C 630, "Fiberock Brand Aqua-Tough Panels", at interior mechanical/janitor room walls and restroom "wet" walls, walls to receive ceramic tile. Provide Type X fire-resistant type where required to meet rated assembly requirements.
 - 3. Mold Resistant Panels: "SHEETROCK Brand HUMITEK Gypsum Panels", with moisture and mold-resistant gypsum core encased in moisture resistant papers, at all interior surfaces of exterior walls.
 - 4. Interior Ceiling Panels: "SHEETROCK Brand Interior Gypsum Ceiling Board", 5/8" thick at non-rated ceilings.
 - 5. Water-Resistant Backing Board (WR): ATM C 1396, regular types unless noted otherwise. Provide Type X for fire-resistant rated assemblies.
 - a. Thickness: 5/8" minimum.
 - b. Edges: Tapered.
 - 6. Thicknesses: As indicated on Drawings.

2.3 Exterior Gypsum Board Products

- A. Exterior Grade Water-Resistant Gypsum Board: A gypsum core exterior panel with additives to enhance the sag resistance of the core; surface with water repellent paper on front, back and long edges; and complying with ASTM C 931.
- B. Georgia-Pacific: "Dens-Glass Gold" Gypsum Wall Board: A non-structural glass mat faced gypsum board, both sides and long edges with a silicone treated water-resistant gypsum core.
 - 1. Location: Vertical surfaces to receive brick veneer and EIFS coating systems.
- C. Georgia-Pacific: "Dens-Deck" Prime Gypsum Roof Board: A non-structural glass mat faced gypsum board, both sides and long edges with a silicone treated water-resistant gypsum core.
 - 1. Location: Vertical surfaces to receive fully adhered EPDM roofing at rear and sidewall parapets.

2.4 Interior Trim Accessories

- A. Metal Trim Accessories: ASTM C 1047, galvanized steel. Exposed and plastic trim not permitted. Comparable products by metal framing manufacturer are also acceptable.
1. Provide sizes to match gypsum panel thickness at installation conditions.
 2. Corner bead: "DUR-A-BEAD Corner Bead" No. 103, all-metal, galvanized steel reinforcement with 1 ¼" x 1 ¼" flange width. Use at standard 90 degree outside corners unless otherwise indicated.
 3. J-Bead: No 200-A, J-shaped galvanized steel casing.
 4. L-Bead: No. 200-B, L-shaped galvanized steel casing.
 5. Expansion (Control) Joint: "Zinc Control Joint No. 093", roll-formed zinc with tape-protected opening ¼" wide x 7/16" deep.
 6. Flexible Corner Trim: "SHEETROCK Brand Flex Metal Tape (Flex Tape)" with two 7/16" wide galvanized rust-resistant steel strips with 1/16" gap between the strips. Form to fit inside or outside angles greater or less than 90 degrees. Provide width to suit application.
- B. Paper Faced Trim Accessories: Paper faced trim accessories by Drywall Systems International. Products with comparable performance characteristics by Dietrich Metal Framing and U.S.G. Corp. are acceptable.
1. Paper Faced Trim Accessories: "No-Coat Paper Faced Trims", latex saturated paperboard laminated to proprietary copolymer plastic and paper joint tape.

2.5 Interior Joint Treatment Materials

- A. Joint Treatment Materials: Comply with ASTM C 475.
1. Joint Compound for Interior Gypsum Wallboard: Ready-mixed, non-asbestos, materials for each coat that is compatible with other compounds applied on previous or for successive coats.
 - a. Prefilling: At open joints, beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - b. Embedding and First Coat: For embedding tape and first coat on joints, flanges of trim accessories, and fasteners, use "SHEETROCK Taping Joint Compound Ready-Mixed", or "SHEETROCK All Purpose Joint Compound Ready-Mixed".
 - c. Fill Coat: For second coat, use "SHEETROCK Topping Joint Compound Ready-Mixed", or "SHEETROCK Lightweight All Purpose Joint Compound Ready-Mixed (PLUS 3)".
 - d. Finish Coat: For third coat, use "SHEETROCK Topping Joint Compound Ready-Mixed", or "SHEETROCK Lightweight All Purpose Joint Compound Ready-Mixed (PLUS 3)".
 - e. Laminating Adhesive: ASTM C 475, "SHEETROCK Taping Joint Compound Ready-Mixed", or "SHEETROCK All Purpose Joint Compound Ready Mixed" joint compound.
 2. Joint Compound for Interior Cement Board: Latex fortified mortar with "Durock Interior Tape".

3. Joint Tape: "SHEETROCK Brand Joint Tape", cross-fibered paper, or "SHEETROCK Brand Fiberglass Drywall Tape" Self-adhesive, with cross-fiberglass construction.
4. Cement Board Joint Tape: "DUROCK Brand Interior Tape: 2" wide, alkali-resistant glass-fiber tape.
5. Mold Resistant Panels:
 - a. Joint Compound: "SHEETROCK Brand Setting-Type Durabond or Lightweight Setting-Type Easy Sand Joint Compound".
 - b. Tape: "SHEETROCK Brand Paper Tape".
 - c. First Coat: "SHEETROCK First Coat".
 - d. Trim: "SHEETROCK Brand Paper-Faced Metal Bead and Trim" for areas requiring Level 4 finish or less.
 - e. Finish: "SHEETROCK Brand Primer-Surfacer Tuff Hide" for areas requiring Level 5 finish.

2.6 Miscellaneous Materials

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033" to 0.112" thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- C. Wood Framing Adhesive: ASTM C 557, commercial grade material as recommended by the panel manufacturer.

PART 3 - EXECUTION

3.1 Examination

- A. Examine substrates to which drywall construction attaches or abuts, preset 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 drywall construction. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 Application and Finishing of Gypsum Board, General

- A. Gypsum Board Application and Finishing Standard: Install and finish gypsum board to comply with ASTM C 840.
- B. Install sound attenuation blankets where indicated, before gypsum board unless readily installed after board has been installed.

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- C. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24 inches in alternate courses of board.
- D. Install ceiling boards across framing in a manner to minimize the number of end-butt joints, and which avoids end joints in the central area of each ceiling. Stagger end joints at least 24 inches.
- E. Install wall/partition boards in a manner to minimize the number of end-butt joints or avoid them entirely where possible. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs.
- F. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16 inch open space between boards. Do not force into place.
- G. Locate either edge or end joints over supports, except in horizontal applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
- H. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.
- I. Form control joints and expansion joints at maximum of 20 feet on center, with space between edges of boards, prepared to receive trim accessories.
- J. Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except in chase walls that are braced internally.
 - 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. area, and may be limited to not less than 75 percent of full coverage.
 - 2. Fit gypsum board around ducts, pipes, and conduits.
- K. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4" wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- L. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members, or provide control joints to counteract wood shrinkage.
- M. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4 inch to 1/2 inch space and seal. Seal joints with acoustical sealant.

- N. Where sound-rated drywall construction is indicated, seal construction at perimeters, control and expansion joints, openings and penetrations with a continuous bead of acoustical sealant including a bead at both faces of partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim, and close off sound-flanking paths around or through construction, including sealing of partitions above acoustical ceilings.
- O. Space fasteners in gypsum boards in accordance with referenced gypsum board application and finishing standard and manufacturer's recommendations.

3.3 Methods of Gypsum Board Application

- A. Single-Layer Application: Install gypsum wallboard as follows:
 - 1. Ceilings: Apply ceiling gypsum board before wall/partition board application to the greatest extent possible.
 - 2. Partitions/Walls: Apply gypsum board vertically (parallel to framing), unless otherwise indicated, and provide sheet lengths that will minimize end joints. Stagger joints in drywall on opposite sides of metal studs.
- B. Double-Layer Application: Install gypsum backing board for base layer and gypsum wallboard for face layer.
 - 1. Partitions/Walls: Apply base layer and face layers vertically (parallel to framing), with joints of base layer over supports and face layer joints offset at least 10 inches with base layer joints.
- C. Direct-Bonding to Substrate: Where gypsum board is indicated to be directly adhered to a substrate (other than studs, joists, furring members or base layer of gypsum board), comply with gypsum board manufacturer's recommendations, and temporarily brace or fasten gypsum board until fastening adhesive is set.
- D. Single-Layer Fastening Methods: Screw apply gypsum boards to in accordance with manufacturer's recommendations.
- E. Double-Layer Fastening Methods: Screw apply gypsum board base layer and face layer separately to supports.

3.4 Accessories Installation

- A. Insulation: Install sound attenuation blankets in sound rated partitions and ceilings where indicated.
 - 1. Completely fill space between studs and framing to full height of partition wall or full ceiling area.
 - 2. Fit carefully behind electrical outlets and other work penetrating sound-rated construction.
- B. Acoustical Sealant:
 - 1. At partition walls, provide continuous beads of acoustic sealant at juncture of both faces of runners with floor and ceiling construction, and

- wherever gypsum board abuts dissimilar materials, prior to installation of gypsum board.
2. At ceilings, provide continuous beads of sealant wherever gypsum board abuts dissimilar materials.
 3. Provide continuous bead of sealant behind faces of control joints prior to installation of control joint accessories.
 4. After installation of gypsum board base layers, cut face layer sheets 1/2" less than floor to ceiling height and position with 1/4" open space between gypsum board and floor, ceiling and dissimilar vertical construction. Fill 1/4" open space with continuous sealant beads after installation of face layer.
 5. At openings and cutouts, fill open spaces between gypsum board and fixtures, cabinets, ducts and other flush or penetrating items, with continuous bead of sealant.
 6. Seal sides and backs of electrical boxes to completely close off openings and joints.

3.5 Trim Accessories Installation

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Interior Trim: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
 1. Install metal corner beads at external corners.
 2. Install metal casing bead trim where edge of gypsum board is exposed or semi-exposed.

3.6 Finishing Gypsum Board

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Pre-fill open joints, rounded or beveled edges and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below:
 1. Level 0: No taping, finishing, or accessories required. Use at temporary construction and draft stopping areas.
 2. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.

3. Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where panels are substrate for tile.
 4. Level 3: Embed tape and apply separate first and fill coats of joint compound to tape, fasteners, and trim flanges. Use in areas scheduled to receive heavy texture painted finish.
 5. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view and scheduled to receive a painted finish or wall covering.
 6. Level 5: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat of joint compound over entire surface. Use in areas exposed to view and scheduled to receive a gloss, semi-gloss, or enamel painted finish.
- E. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.
- F. Cementitious Backer Units: Finish according to manufacturer's written instructions.
- G. Abuse Resistant Panels:
1. Surface Preparation: complete gypsum board surface treatment to Level 4 finish before applying primer-surfacer.
 2. Primer-Surfacer: Machine apply materials in conformance with manufacturer's written application instructions to a wet film thickness of 15 to 20 mils (9-12 mils dry film thickness).
- H. Sand joint compound at exposed finished areas to provide surfaces free of tool marks, ridges, and other imperfections, and ready for application of scheduled finishes.

3.7 Protection

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.
- C. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.
- D. Install corner beads at external corners.

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- E. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound.
 - 1. Install "LC" bead where drywall construction is tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
 - 2. Install "L" bead where edge trim can only be installed after gypsum board is installed.

- F. Install control joints at locations indicated, or if not indicated, at spacings and locations required by referenced gypsum board application and finish standard, and approved by the Architect for visual effect.

- G. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall construction being without damage or deterioration at time of Substantial Completion.

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SECTION 09 9000 – PAINTING AND COATING

PART 1 - GENERAL

1.1 Section Includes

- A. Surface preparation.
- B. Field application of paints, stains, and other coatings.
- C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
- D. Paint exposed surfaces whether or not colors are designated in Finish Schedule, except where a surface or material is specifically indicated not to be painted or is to remain natural. If color or finish is not designated, the Tenant will select from standard colors or finishes available.
- E. 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. Acoustic materials.
 - b. Finished mechanical and electrical equipment.
 - c. Light fixtures.
 - d. Switchgear.
 - e. Distribution cabinets.
 - 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.
 - 3. Finished metal surfaces not to be painted include:
 - a. Anodized or mill finished aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper.
 - e. Bronze.
 - f. Brass.
 - 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. Other Items:
 - a. Concrete floors, except as specifically indicated otherwise.
 - b. Pipes, ducts, valves, fittings, conduits, fans, and insulation, in areas above suspended ceilings.

- c. Striping of exterior pavements.
- 6. Labels: Do not paint over Underwriter's Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- 7. Extra and excess materials indicated.

1.2 Related Requirements

- A. Exterior Metal Doors: Shop-primed items – Ref: Section 08 1113.

1.3 Reference Standards

- A. 49 CFR 59, Subpart D – National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental protection Agency; current edition.

1.4 Submittals

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on all finishing products, including VOC content.
- C. Samples: Submit two painted samples, illustrating selected colors for each color and system selected. Submit on durable sheet material, 8 x 11 inch in size.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 – Product Requirements, for additional provisions.
 - 2. Extra Paint and Coatings: 2 gallons of each color; store where directed.
 - 3. Label each container with color in addition to the manufacturer's label.

1.5 Quality Assurance

- A. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.
- B. Installation: Installation by skilled commercial painters with not less than five (5) years of continuous experience with materials equal in quality on projects of comparable scope. A satisfactory crew of qualified painters shall be maintained throughout the duration of the work.
- C. MPI Standards:
 - 1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List".
 - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
- D. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample

submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft.
 - b. Other Items: Architect will designate items or areas required.
2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
3. Final approval of color selections will be based on benchmark samples.
 - a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

E. Materials:

1. Provide ready-mixed paints and stains. Job mixing and tinting is not acceptable.
2. Provide lead free materials with mildew and mold resistant top coatings.
3. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer's testing and field experience.
4. Minimum dry film thickness (dft) for each coat is listed in millimeters (mils) in the Material Schedule within this Section.

F. Material Quality: Provide 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.

1.6 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. Federal Specification number, if applicable.
4. Manufacturer's stock number and date of manufacture.
5. Contents by volume, for pigment and vehicle constituents.
6. Thinning instructions.
7. Application instructions.
8. Color name and number.
9. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 degrees F. 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 workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 Project Conditions

- A. Storage: Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain stored containers in a clean condition, free of foreign materials and residue. Protect from freezing.
1. Deliver painting materials in sealed, original labeled containers bearing manufacturer's name, brand name, type of paint or coating, color designation, standard compliance, materials content as well as mixing and/or reducing and application requirements.
 2. Take necessary precautionary and safety measures to prevent fire hazards and spontaneous combustion and to protect environment from hazard spills. Store all materials that constitute a fire hazard (paints, solvents, drop cloths, etc.) in suitable closed and rated containers. Post adequate warnings (e.g. no smoking) as required.
 3. Keep storage areas neat and orderly. Remove oily rags and waste daily, and dispose of off-site in a manner approved by authorities having jurisdiction.
- B. Environmental Conditions:
1. Apply waterborne paints and finishes only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.
 2. Apply solvent-thinned paints and finishes only when temperatures of surfaces to be painted and surrounding air are between 45 F.
 3. Do not apply paint or finish material in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
- C. Work Conditions:
1. Coordinate with other trades to insure adequate illumination, ventilation and dust-free environment during paint and finish application and drying. Maintain temperature and humidity within manufacturer's recommended tolerances throughout the work.
 2. Before commencing work on any surface type, carefully inspect same and verify they are clean, dry and in all other respects suitable to receive specified treatment. Use cleaning materials and methods appropriate for substrate and field conditions.
 3. Protection and Cleaning: Provide clean drop cloths, and other protection as approved, to protect floors, doors, windows and other parts from damage. Where any work is splattered, clean promptly and leave in satisfactory condition.
 4. Use no plumbing fixtures, open waste or vent pipe, or pipe of any kind to dispose of paint, used rags, waste or other materials.
 5. Water closets, tubs, and other fixtures, cabinets, furniture, etc., shall not be used as supports for planking, and shall be thoroughly protected from damage at all times.
 6. Mixed species of wood occurring within the same room or adjacent to one another shall be finished to match the selected species and finish.

- D. Concrete Slab Curing Materials and Methods: Review concrete slab curing and sealing material submittals provided by General Contractor for compatibility with floor coating materials provided under this Section. Notify General Contractor, in writing, of materials' compatibility or non-compatibility with floor coating materials provided under this Section. Proceed with installation only after compatible materials and/or curing methods have been approved, or non-compatible curing or sealing materials have been removed by the General Contractor.
- E. Waste Management and Disposal:
1. Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) are regarded as hazardous products and subject to regulations for disposal. Obtain information on required controls from applicable authorities having jurisdiction.
 2. Collect, separate and recycle waste materials where recycling is available. Treat materials that cannot be reused as hazardous waste and disposed of in an appropriate manner.
 3. Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated on-site for hazardous waste.
 4. The following procedures shall be strictly adhered to:
 - a. Retain cleaning water for water based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.
 - b. Retain cleaners, thinners, solvents and excess paint, and place in designated containers and ensure proper disposal.
 - c. Return solvent and oil soaked rags for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
 - d. Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
 - e. Empty paint cans are to be dry prior to disposal or recycling (where available).
 - f. Close and seal tightly partly used cans of materials, including sealant and adhesive containers, and store in ventilated, fire safe areas at moderate temperatures.
 5. Set Aside and protect surplus and uncontaminated finish materials not required by Owner, and arrange collection for verifiable reuse or remanufacturing.
- F. Unless specifically noted, do not paint or finish prefinished items and surfaces, concealed surfaces, operating parts and the following:
1. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating or nomenclature plates.
 2. Architectural Features: Aluminum doors, frames and windows, finish hardware, and copper, stainless steel or aluminum fabrications.

1.8 Extra Materials

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied, and that are packaged for storage and identified with labels describing contents. Deliver extra materials to Owner.
 - 1. Quantity: Furnish an additional 3 percent, but not less than 1 gal. of each material and color applied.
- B. Excess Materials: In addition to extra materials noted above, turn over unused paint and finish materials to the Owner's representative. Package materials with protective covers for storage and identify with labels describing contents and color.
- C. Provide a typed list of extra and excess materials and turn over to the Owner's representative.

PART 2 – PRODUCTS**2.1 Acceptable Manufacturers**

- A. Materials selected for coating systems for each type surface shall be the product of a single manufacturer. Except as otherwise specified, materials shall be the products of the following manufacturers:
 - 1. Benjamin Moore
 - 2. Duron
 - 3. Glidden Professional and Devoe Coatings
 - 4. Porter
 - 5. PPG
 - 6. Sherwin Williams

2.2 Paints and Coatings – General

- A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
 - 1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Supply each coating material in quantity required to complete entire project's work from a single production run.
 - 3. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
- B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
- C. Volatile Organic Compound (VOC) Content:
 - 1. Provide coatings that comply with the most stringent requirements specified in the following:

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- a. 40 CRF 59, Subpart D – National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. Architectural coatings VOC limits of State in which the project is located.
 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- D. Coating Material Compatibility: Provide block fillers, primers, under-coaters, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience
- E. Material Compatibility:
1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- F. Chemical Components of Field-Applied Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions; these requirements do not apply to primers or finishes that are applied in a fabrication or finishing shop:
1. Flat Paints and Coatings: VOC content of not more than 100 g/L.
 2. Non-Flat Paints and Coatings: VOC content of not more than 150 g/L.
 3. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
 4. Restricted Components: Paints and coatings shall not contain any of the following:
 - a. Acrolein.
 - b. Acrylonitrile.
 - c. Antimony.
 - d. Benzene.
 - e. Butyl benzyl phthalate.
 - f. Cadmium.
 - g. Di (2-ethylhexyl) phthalate.
 - h. Di-n-butyl phthalate.
 - i. Di-n-octyl phthalate.
 - j. 1,2-dichlorobenzene.
 - k. Diethyl phthalate.
 - l. Dimethyl phthalate.
 - m. Ethylbenzene.
 - n. Formaldehyde.
 - o. Hexavalent chromium.

- p. Isophorone.
- q. Lead.
- r. Mercury.
- s. Methyl ethyl ketone.
- t. Methyl isobutyl ketone.
- u. Methylene chloride.
- v. Naphthalene.
- w. Toluene (methylbenzene).
- x. 1,1,1-trichloroethane.
- y. Vinyl chloride.

2.3 Paint Systems – Exterior

- A. Ferrous Metals, Primed, Alkyd, 2 Coat:
 - 1. Touch up with rust-inhibitive primer recommended by top coat manufacturer.
 - 2. Gloss: Two coats of alkyd enamel;
 - a. Benjamin Moore: M22 I.M.C. Urethane Alkyd Gloss Enamel.
 - b. Duron: 12 Series Dura Clad Alkyd Gloss Enamel.
 - c. Devoe: 4308 Devguard Alkyd Glass Industrial Enamel.
 - d. Porter: PP2700 Porter Guard Alkyd Gloss Enamel.
 - e. PPG: 7-282 Pittsburgh Paints Industrial Oil Gloss.
 - f. Sherwin Williams: B54Z Industrial Alkyd Gloss Enamel.
- B. Galvanized Metals, Alkyd, 3 Coat:
 - 1. One coat Galvanize primer.
 - a. Manjamin Moore: MO7 I.M.C. Universal Alkyd Metal Primer.
 - b. Duron: 33-105 Dura Clad Universal Acrylic Metal Primer.
 - c. Devoe: 4160 Tank and Structural Primer.
 - d. Porter: PPG 90-712 Pitt-Tech DTM Acrylic Metal Primer
 - e. PPG: 90-712 Pitt-Tech Acrylic Metal Primer
 - f. Sherwin Williams: B50WZ3 Galvite Galvanized Metal Primer.
 - 2. Gloss: Two coats of alkyd enamel:
 - a. Benjamin Moore: 133 Impervo Alkyd High Gloss Enamel.
 - b. Duron: 12 Series Dura Clad Alkyd Gloss Enamel.
 - c. Devoe: 4160 Tank and Structural Primer.
 - d. Porter: PP2700 Porter Guard Alkyd Gloss Enamel.
 - e. PPG: 7-282 Pittsburgh Paints Industrial Oil Gloss
 - f. Sherwin Williams: B54Z Industrial Alkyd Gloss Enamel.
- C. Exterior Cedar Siding, Trim and Soffits
 - 1. Benjamin- Moore
 - a. Hardwood Finish 321/C321, Neutral. Two coats as recommended by the manufacturer.
 - 2. ***Special Project Note: All cedar paneling and trim is to be sealed all four sides prior to installation.***

2.4 Paint Systems – Interior – Low VOC

- A. Ferrous and Galvanized Metals, Primed, Acrylic Enamel, 2 Coat: (Low VOC)
 - 1. Touch up with acrylic primer.
 - a. Benjamin Moore: Super Spec HP, Acrylic Metal Primer
 - b. Glidden: 4020-1000 Devflex DTM primer (91 g/L VOC).
 - c. Porter: PPG 90-712 Pitt Tech DTM Acrylic Metal Primer (123 g/L VOC).
 - d. PPG: 90-712 Pitt Tech DTM Acrylic Metal Primer (123 g/L VOC).
 - e. Sherwin Williams: B66-310 Series Pro Industrial ProCryl Universal Primer.
 - 2. Semi-gloss: Two coats of acrylic enamel;
 - a. Benjamin Moore: M29 I.M>C> DTM 100% Acrylic Semi-Gloss Enamel
 - b. Glidden: 9200 Lifemaster No VOC Semi-gloss Interior (0 g/L VOC)
 - c. Porter: 90-1210 PittTech Plus DTM Waterborne Acrylic Semi-Gloss (90 g/L VOC).
 - d. PPG: 7-374 Pittsburgh Paints Semi Gloss Acrylic Metal Finish (82 g/L VOC).
 - e. Sherwin Williams: B66-600 Pro Industrial 0 VOC Acrylic Semi-Gloss.

- B. Gypsum Board, Latex-Acrylic, 3 Coat: (Low VOC)
 - 1. One coat of latex primer sealer.
 - a. Benjamin Moore: Fresh Start All Purpose 100% Acrylic Primer 023.
 - b. Glidden: 3210 Gripper Primer (<100 g/L VOC)
 - c. Porter: PP867 Pro Master 2000 Latex Primer Sealer
 - d. PPG: 6-2 Speedhide Latex Primer Sealer (<50 g/L VOC)
 - e. Sherwin Williams: B28W200 Prep-Rite 200 Latex Primer.
 - 2. Eggshell: Two coats of latex-acrylic enamel;
 - a. Benjamin Moore: C274 Super Spec Acrylic Latex Eggshell Enamel.
 - b. Glidden: 9300 – Lifemaster No VOC Eggshell Interior (0 g/L VOC).
 - c. Porter: PP6129 Pro Master 2000 Latex Eggshell Enamel (66 g/L VOC).
 - d. PPG: 6-411 Speedhide Latex Eggshell Enamel (<50 g/L VOC).
 - e. Sherwin Williams: B20W2251 ProMar 200 Acrylic Latex Eggshell Enamel.

- C. Masonry, Opaque, Latex, 3 Coat: (Low VOC)
 - 1. One coat of block filler.
 - a. Benjamin Moore: Eco Spec Interior Latex Primer Sealer 231 (0 g/L VOC).
 - b. Glidden: 3010-1200 Blockfiller (<100 g/L VOC).
 - c. Porter: PPG 6-7 Speedhide Acrylic Latex Block Filler (14 g/L VOC).

- d. PPG: PPG 6-7 Speedhide Acrylic Latex Block Filler (14 g/L VOC).
 - e. Sherwin Williams: S-W Loxon Acrylic Masonry Primer, A24W8300.
2. Semi-gloss: Two coats of latex enamel;
- a. Benjamin Moore: Eco Spec Interior Semi-Glass Enamel 224 (11 g/L VOC).
 - b. Glidden: 9200 Lifemaster No VOC Semi-Gloss Interior (0 g/L VOC).
 - c. Porter: PP6139 Pro Master 2000 Latex Semi-Gloss Enamel (108 g/L VOC).
 - d. PPG: PP6139 Pro Master 2000 Latex Semi-Gloss Enamel (108 g/L VOC).
 - e. Sherwin Williams: S-W ProMar 200 Zero VOC Latex Semi-Gloss.

2.5 Accessory Materials

- A. Accessory Materials: Provide all primers, sealers cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
- B. Patching Material: Latex filler.
- C. Fastener Head cover Material: Latex Filler.

PART 3 - EXECUTION

3.1 Examination

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application. Application of primers, paints, stains or finishes represents acceptance by the contractor that the surfaces were properly prepared and suitable for application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Gypsum Wallboard: 12 percent.
 - 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
 - e. Concrete floors and Traffic Surfaces: 8 percent.

3.2 Preparation

- A. Clean surfaces thoroughly and correct defects prior to coating application.

- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- H. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- I. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- J. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
- K. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
- L. Metal Doors to be painted: Prime metal door top and bottom edge surfaces.
- M. NOTE: CMU WALLS ARE TO BE BACKEROLLED WITH EACH COAT. PANELS ARE TO BE PRESSURE WASHED PRIOR TO PAINTING TO REMOVE ALL CONTAMINANTS.**

3.3 Application

- A. Apply products in accordance with manufacturer's instructions.
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

- C. Apply each coat to uniform appearance.
- D. Dark Colors and Deep Clear colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- E. Apply paint, enamel, stain and varnish with suitable brushes, rollers or spraying equipment.
 - 1. Rate of application shall not exceed that as recommended by paint manufacturer for the surface involved.
 - 2. Keep brushes and rollers and spraying equipment clean, dry, free from contaminates and suitable for the finish required.
 - 3. Apply stain by brush.
- F. Finish coats shall be smooth, free of brush marks, streaks, laps or pile up of paints and skipped or missed areas.
- G. Leave all parts of moldings and ornaments clean and true to details with no undue amount of paint in corners and depressions.
- H. Make edges of paint adjoining other materials or colors clean and sharp with no overlapping.
- I. Change colors at corner of stop where colors differ between adjoining spaces or rooms and where door frames match wall colors.
- J. Where portion of finish or drywall partition is damaged or unacceptable, refinish entire surface of partition.
- K. Back-prime exterior carpentry and millwork with material specified for prime coat, without runs on face. Finish cut edges just prior to installation.
- L. Finish all edges of exterior doors same as faces.
- M. The number of coats specified are minimum. The Contractor shall provide at no additional cost to the Owner, as many coats as necessary for color coverage conformity and uniform appearance.
- N. Sand metal surfaces lightly between coats to achieve required finish.
- O. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 Cleaning

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5 Protection

- A. Protect finished coatings until completion of project.

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- B. Touch up and restore finish where damaged. Remove spilled, splashed or splattered paint from all surfaces.
- C. Do not mar surface finish of item being cleaned.

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SECTION 09 9860 - REINFORCED FIBERGLASS PANELS

PART 1 - GENERAL

1.1 Section Includes

- A. This Section includes reinforced fiberglass wall panels at locations noted on the drawings to include:
 - 1. Fiberglass wall panels.
 - 2. Adhesives, sealants and trim accessories.
 - 3. Substrate surface preparation.

1.2 Related Requirements

- A. Wall Substrates - Ref: Section 09 2115.
- B. Finish Painting - Ref: Section 09 9000.

1.3 Quality Assurance

- A. All materials and installation shall be accepted by the USDA for use in a area of food preparation.
- B. Fire Hazard Classification: Provide materials that comply with Class A fire rating when tested in accordance with ASTM E84.

1.4 Submittals

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Submit manufacturer's product data and installation instructions for each type of wall panel, adhesive and accessory required.
 - 1. Include data on physical properties and fire hazard characteristics of panels.
- C. Submit samples for initial color selection in the form of manufacturer's standard size samples showing full range of patterns and colors available for each wall panel type specified.

1.5 Delivery, Storage and Handling

- A. Deliver materials to project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, quality or grade, fire hazard classification, and lot number.
- B. Store materials in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures and humidity.

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- C. Protect packaged adhesives from temperature cycling and cold temperatures.

1.6 Project Conditions

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the manufacturer.
- B. Maintain these conditions 24 hours before, during, and continuously after installation of panels.
- C. Protect adjoining surfaces against damage and soiling.

1.7 Warranty

- A. Submit manufacturer's written five year warranty against manufacturing defects.

PART 2 - PRODUCTS

2.1 Manufacturers

- A. Manufacturer: Crane [Kemlite].
- B. Fiberglass Panels: Fire-X Glasbord FM with Surfaseal to comply with a Class A fire rating when tested per ASTM E-84.
 - 1. Design Part Number: FXE
 - 2. Color: White (#85)
 - 3. Finish: Embossed.
 - 4. Thickness: 0.09".

2.2 Accessories

- A. Adhesives: Adhesives used for Wall Panels must not emit more VOCs than 50 g/l.
- B. Fasteners: Manufacturer's "Nylon Drive Rivets".
- C. Termination Trim: Provide moldings manufactured expressly for use with wall panels.
 - 1. Extruded PVC one-piece and two-piece division bars.
 - 2. Extruded PVC inside and outside corners.
 - 3. Extruded PVC end cap.
- D. Sealant: Clear Silicon Construction Sealant.

PART 3 - EXECUTION

3.1 Examination

- A. Examine substrates and installation conditions.
- B. Verify substrate surfaces are ready to receive wall panels and conform to following requirements.
 - 1. Structurally sound, smooth, clean and dry.
 - 2. Free of surface defects, imperfections, indelible and water soluble crayon, ball-point and felt tip pen markings.
 - 3. Other work requiring penetration of substance surface has been completed.
- C. Beginning installation means acceptance of surfaces and conditions.

3.2 Installation

- A. Install panels per the manufacturer's written recommendations.
 - 1. Acclimate panels in area of installation for a period of 24 hours.
 - 2. Install panels plumb, square and flush with substrate. Apply adhesive to panel to and install fasteners at a maximum of 16 inches on center. Maintain adequate edge clearances at walls, ceilings, floor and joints. Provide and install temporary bracing as required to hold panel firmly in place until adhesive has fully set.
 - 3. Install fasteners no more than 1 1/2 inches from the edges and corners of panels.
 - 4. Install trim at panel joints and exposed edges. Apply clear silicone sealant at all required locations to completely seal all seams and junctures. Remove excess sealant immediately.

3.3 Cleaning

- A. Remove excess adhesive along finished seams, perimeter edges, and adjacent surfaces.
- B. Replace damaged or soiled panels that cannot be properly repaired.

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Division 10

Specialties

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SECTION 10 1400 – IDENTIFYING DEVICES**1.1 Section Includes**

- A. This section includes:
 - 1. Building Address Sign.
 - 2. Identification Signage at the following locations:
 - a. Men's and Women's Toilet Rooms.
 - b. Drinking Fountains.
 - c. Mechanical Room.
- B. Related Work:
 - 1. Exit Signage - Ref: Electrical Drawings.

1.2 Submittals

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Include plans, elevations, and if appropriate, large scale details of signage wording and lettering layout. Show anchorages and accessory items. Provide location template drawings for items supported or anchored to permanent construction. Submit a schedule, listing each sign, with type, location, color and text.
- C. Samples: submit samples of materials, construction, colors, finished and methods of attachment for review by Architect prior to fabrication.

1.3 Quality Assurance

- A. Regulatory Requirements:
 - 1. Comply with the Americans with Disabilities Act (ADA and with code provisions as adopted by authorities having jurisdiction.
 - a. Character Proportions: Letters and numbers with a width-to-height ratio between 3:5 and 1:1, and a stroke-width-to-height ratio between 1:5 and 1:10.
 - b. Character Height: Minimum 5/8", maximum 2". Minimum 3" at overhead signs (80" above finish floor).
 - c. Raised and Braille Characters and Symbols: Letters and numerals raised 1/32", upper case sans serif type, and accompanied with Grade 2 raised Braille characters. Provide pictograms with the equivalent written description placed directly below the symbol. Border dimension of pictogram minimum 6" in height.
 - d. Finish and Contrast: Characters and sign background with an eggshell, matte, or other non-glare finish. Characters and symbols with a contrast ratio of 70% or better with their background.
 - e. Mounting Location and Height: Signs installed on the wall adjacent to the latch side of the door at a distance away from the door so that a person may approach within 3" of the signage without entering the door swing. Signs mounted at 60" above the finish floor to the sign center line.

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1.4 Warranty

- A. Provide manufacturer's written warranty against defects in materials and workmanship for a period of one (1) year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 Interior Tactile and Braille Copy Signs

- A. Raised Braille and copy plastic signs by Best Sign Systems, Inc. form the basis-of-design. Products with comparable materials, design and finishes by other manufacturers may be submitted to the Architect for review no later than ten (10) days prior to the Bid Date. Include samples and product data.
- B. Signs: "Standard Word & Picture" signs with text and raised or engraved symbols.
 1. Sign Body: "MP" plastic with two-color, scratch resistant, non-static, fire retardant, washable melamine laminate with non-glare surface over brown phenolic core.
 2. Font: Standard Medium, copy raised 1/32" and minimum 5/8" high.
 3. Braille: Grade 2.
 4. Size: 6" x 8" x 1/8" thick.
 5. Mounting: Wall, adhesive tape.
- C. Restroom Signs: Graphics consistent with internationally accepted symbols in content and proportion, and include the equivalent written and Braille description directly below. Provide the following:
 1. No. WP287RB – Handicapped Access "MEN".
 2. No. WP288RB – Handicapped Access "WOMEN".
 4. Colors: Selected from manufacturer's standard palette.
- D. Identification Signage:
 1. Provide signage at locations listed on the drawings as follows:
 - a. "Drinking Fountain": Text, graphic and Braille.
 - b. "Mechanical Room": Text and Braille.
- E. Installation of sign to be determined by wall type. Locations and heights per ADA Compliance drawings and the Americans with Disabilities Act.
- F. Letters, numbers, pictograms, and Grade II Braille to be of contrasting color of at least 70% and raised 1/32" and between 5/8" to 2" length. Character proportions shall have a width to height ratio between 1:5 and 1:10. Finish is to be an eggshell (matte) finish.

2.2 Exterior Building Signs

- A. Building Address Signage:
 1. 4" High, Vinyl Letters on the face of the Mechanical Room Door or as otherwise directed by the Owner.
 - a. Helvetica type face.
 - b. Color: White.
 - c. Reverse adhesion.

PART 3 - EXECUTION

3.1 Examination

- A. Verify that substrates and conditions under which the work is to be installed are acceptable.

3.2 Installation

- A. Install sign units and components at locations indicated. Secure signs to substrates with silicone and screws, with expansion shields or toggle bolts as appropriate for wall type, in accordance with manufacturer's instructions.
- B. Install signs level, plumb, and secure at the proper heights. Cooperate with other trades for installation of sign units to finish surfaces. Repair or replace damaged units as directed by Architect.
- C. Cleaning: At the completion of installation, clean signs and leave free of stains.

END OF SECTION

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SECTION 10 1650 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 Summary

- A. This Section includes high density plastic toilet compartments. Work includes:
 - 1. Floor mounted, overhead braced toilet compartments.

1.2 Related Requirements

- A. Toilet accessories – Ref: Section 10 8000.

1.3 Submittal

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Product data for materials, fabrication, and installation including catalog cuts of anchors, hardware, fastenings, and accessories.
- C. Shop drawings for fabrication and erection of toilet compartment assemblies not fully described by product drawings, templates, and instructions for installation of anchorage devices built into other work.
- D. Samples of full range of colors for each type of unit required. Submit 6 inch square samples of each color and finish on same substrate to be used in work, for color verification after selections have been made.

1.4 Quality Assurance

- A. Field Measurements: Take field measurements before preparation of shop drawings and fabrication, where possible, to ensure proper fitting of work. However, allow for adjustments where taking of field measurements before fabrication might delay work.
- B. Coordination: Furnish inserts and anchorages that must be built into other work for installation of toilet compartments and related items. Coordinate delivery with other work to avoid delay.

PART 2 - PRODUCTS

2.1 Manufacturers

- A. Manufacturer: Bobrick- Washroom Equipment Inc.
- B. Toilet Compartments: Bobrick Partitions, Sierra Series Water and Fire Resistant Solid Color Reinforced Composite Toilet Partitions and Urinal Screens.
 - 1. Toilet Partitions: 1093 Series Post-to-Ceiling Screen. Color: To be selected from manufacturer's standard colors.

2. Panels: ½" thick Solid Color Reinforced Composite with Graffiti-OFF surface thermoset and integrally fused into one homogeneous piece. Surface, edge and core to be the same color.
3. Doors: ¾" thick Solid Color Reinforced Composite with Graffiti-OFF surface thermoset and integrally fused into one homogeneous piece. Surface, edge and core to be the same color.
4. Stiles: ¾" thick Solid Color Reinforced Composite with Graffiti-OFF surface thermoset and integrally fused into one homogeneous piece. Surface, edge and core to be the same color. Leveling Device: 7 gauge, 3/16" thick corrosion resistant, chromate treated, double zinc-plated steel angle leveling bar bolted to stile, furnished with 3/8" stainless steel diameter threaded wedge anchor, hex nuts, flat washers and shoe retainers.
5. Pilaster Shoes and Caps: ASTM A 167, Type 304 stainless steel, 22 gage, with satin finish, 4" high.
6. Posts: 1 ¼" square tubing, 18-8 S, Type 304, 18 gauge stainless steel with satin finish. Floor and ceiling connections to be 18-8 S, Type 304 16 gauge stainless steel with satin finish. Finish in 10 foot lengths and field cut to exact dimensions.
7. Hardware and Accessories: Manufacturer's Institutional Hardware (.67 option).
8. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, chromium-plated steel, or brass, finished to match hardware, with theft-resistant-type heads and nuts. For concealed anchors, use hot-dip galvanized, cadmium-plated, or other rust-resistant protective-coated steel.
9. Where grab bars attach to toilet partitions, reinforce as required to support minimum 300 pounds.

2.3 Fabrication

- A. Furnish standard doors, panels, screens, and pilasters fabricated for compartment system. Furnish units with cutouts, drilled holes, and internal reinforcement to receive partition-mounted hardware, accessories, and grab bars, as indicated.
 1. Door Dimensions: Unless otherwise indicated, furnish 24 inch wide in-swinging doors, except provide 32 inch wide (clear opening) out-swinging doors for handicap stalls.
- B. Floor Mounted Compartments: Furnish galvanized steel anchorage devices complete lock washers and leveling adjustment nuts at pilasters for connection to finish floor.
- C. Hardware and accessories (institutional series): Furnish hardware for each compartment to comply with ANSI A117.1 for handicapped accessibility and as follows:
 1. Hinges: Cutout inset type, adjustable to hold door open at any angle up to 90 degrees. Provide gravity type, spring-action cam type, or concealed torsion rod type to suit manufacturer's standards.

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2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit, designed for handicapped accessibility, with combination rubber-faced door strike and keeper.
3. Coat Hook: Manufacturer's standard unit, combination hook and rubber-tipped bumper, sized to prevent door hitting mounted accessories.
4. Door Pull: Manufacturer's standard unit for out-swinging doors. Provide pulls on both faces of handicapped compartment doors.
5. Provide wall mounted stop/bumper for out-swinging door, adjacent to walls.
6. Overhead braces: Continuous, satin finish anodized, aluminum extrusion, anti-grip profile.
7. Provide non-corrosive fasteners with theft resistant (one-way) type heads and nuts where exposed.

PART 3 - EXECUTION

3.1 Installation

- A. General: Comply with manufacturer's recommended procedures and installation sequence. Install compartment units rigid, straight, plumb, and level. Provide clearances of not more than 1/2 inch between pilasters and panels, and not more than 1 inch between panels and walls. Secure panels to walls with not less than two stirrup brackets attached near top and bottom of panel. Locate wall brackets so holes for wall anchorages occur in masonry or tile joints. Secure panels to pilasters with not less than two stirrup brackets located to align with stirrup brackets at wall. Secure panels in position with manufacturer's recommended anchoring devices.
- B. Floor Mounted Compartments: Secure pilasters to supporting structure and level, plumb, and tighten installation with devices furnished. Hang doors and adjust so bottoms of doors are level with bottom of pilasters when doors are in closed position.
- C. Screens: Attach with anchoring devices as recommended by manufacturer to suit supporting structure. Set units to provide support and to resist lateral impact.

3.2 Adjust and Clean

- A. Hardware Adjustment: Adjust and lubricate hardware for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors (and entrance swing doors) to return to fully closed position.
- B. Clean exposed surfaces of partition systems using materials and methods recommended by manufacturer, and provide protection as necessary to prevent damage during remainder of construction period.

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SECTION 10 2005 - LOUVERS AND VENTS

PART 1 - GENERAL

1.1 Summary

- A. This Section includes architectural fixed metal wall louvers. Work includes:
 - 1. Pre-formed metal stationary aluminum louvers.
 - 2. Trim, clips, fasteners, and anchors as required for a complete installation.

1.2 Related Requirements

- A. Wood Blocking - Ref: Section 06 1000.
- B. Sealants - Ref: Section 07 9005.
- C. See Mechanical Drawings for roof mounted vents and louvers.

1.3 System Performance Requirements

- A. Air Performance, Water Penetration, and Air Leakage Ratings: Provide louvers complying with performance requirements indicated as demonstrated by testing manufacturers stock units, of height and width indicated, according to Air Movement and Control Association (AMCA) Standard 500.

1.4 Submittals

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Product data for each product indicated.
- C. Shop drawings of louver units and accessories. Include plans, elevations, sections, and details showing profiles, angles, spacing of louver blades; unit dimensions related to wall openings and construction; free areas for each size indicated; and profiles of frames at jambs, heads and sills.

1.5 Quality Assurance

- A. Single Source Responsibility: Obtain architectural fixed louvers from a single source for the entire project.
- B. SMACNA Standard: Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details, and installation procedures.

1.6 Project Conditions

- A. Field Measurements: Check actual louver openings by accurate field measurements before fabrication; show recorded measurements on final shop

drawings. Coordinate fabrication schedule with construction progress to avoid delay of the Work.

PART 2 - PRODUCTS**2.1 Materials**

- A. Prefinished metal louvers in the sizes as noted on the drawings.
- B. Preassemble louvers in shop to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for assembly and coordinated installation.
- C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- D. Fabricate frames, including integral sills, to fit in openings of size indicated with allowances made for fabrication and installation tolerances of louvers, adjoining construction, and perimeter sealant joints.
- E. Include supports, anchorages, and accessories required for complete assembly.
- F. Provide sill extensions and loose sills made of same material as louvers, where indicated, or required for drainage to exterior and to prevent water penetrating to interior.

PART 3 - EXECUTION**3.1 Preparation**

- A. Coordinate setting drawings, diagrams, templates, instructions and directions for installation of anchorages which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.2 Installation

- A. Locate and place louver units plumb, level, and in proper alignment with adjacent work.
- B. 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.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Protect metal surfaces from corrosion or galvanic action by application of a heavy coating of bituminous paint on surfaces which will be in contact with concrete, masonry, or dissimilar metals.

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- E. Install concealed gaskets, flashings, joint fillers, and insulation, as louver installation progresses where required to make louver joints weathertight. Comply with Section 07900, Joint Sealers, or sealants applied during installation of louver.

3.3 Adjusting and Protection

- A. Restore louvers damaged during installation and construction period, so no evidence remains of correction work. If results of restoration are unsuccessful, as judged by Architect, remove damaged units and replace with new units.
 - 1. Clean and touch-up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

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SECTION 10 2813 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 Section Includes

- A. Provide toilet accessories, including mounting and anchorage devices and templates necessary for their installation. Work includes:
 - 1. Commercial quality surface mounted accessories as scheduled on drawings.
 - 2. Types of toilet accessories include (but not limited to):
 - a. Paper towel dispensers
 - b. Soap Dispensers
 - c. Feminine napkin disposal
 - d. Toilet tissue dispensers
 - e. Grab bars
 - f. Frameless mirrors
 - g. Wall mounted baby changing stations.

1.2 Related Requirements

- A. Wood blocking and grounds - Ref: Section 06 1000.

1.3 Submittals

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Product Data for each toilet accessory item specified, including details of construction relative to materials, dimensions, gages, profiles, method of mounting, specified options, and finishes.
- C. Product Schedule: Indicate types, quantities, sizes and installation locations.
 - 1. Identify locations using room designations indicated on Drawings.
 - 2. Identify products using designations indicated on Drawings.
- D. Warranty: Three (3) copies.

1.4 Project Conditions

- A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference and to assure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

1.5 Warranty

- A. Warranty: Provide manufacturer's written 5 year warranty against silver spoilage of mirrors, agreeing to replace any mirrors that develop visible defects within warranty period.

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- B. Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace mirrors that develop visible silver spoilage defects within ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 Manufacturers**

- A. Products with comparable materials, capacities, performance characteristics, and finishes by the following manufacturers are also acceptable.
 1. A & J. Washroom Accessories, Inc.
 2. American Specialties, Inc.
 3. Bradley Corporation.
 4. Bobrick Washroom Equipment, Inc.
 5. General Accessory Manufacturing Co. (GAMCO).
 6. McKinney/Parker Washroom Accessories Corp.
 7. Saniguard.
 8. Tough Guy.
 9. Georgia Pacific.
 10. Hospesco.

2.2 Materials, General

- A. Stainless Steel: AISI Type 304, with polished No. 4 finish, 22-gage (.034-inch) minimum thickness, unless otherwise indicated.
- B. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 20-gage (.040-inch) minimum, unless otherwise indicated. Surface preparation and metal pretreatment as required for applied finish.
- C. Galvanized Steel Sheet: ASTM A 527, G60.
- D. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B456, Type SC 2.
- E. Mirror Glass: Two pieces of 1/8 inch float glass selected for silvering, with vinyl laminate in the center. Electrolytically copper plated by the galvanic process. Provide pencil edge on all unframed units.
- F. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.
- G. Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.
- H. Keys: Unless otherwise indicated, provide universal keys for access to toilet accessory units requiring internal access for servicing, re-supply, etc. Provide minimum of four keys to Owner's representative and obtain receipt.

2.3 Toilet Accessory Types

- A. Furnish accessories with mounting and anchorage devices as recommended by the manufacturer for the type of surface on which to be mounted.
- B. Toilet Accessory Types: Provide toilet accessory model types as scheduled on the drawings. Install at scheduled mounting heights.

2.4 Fabrication

- A. General: A maximum 1-1/2 inch diameter, unobtrusive stamped logo of manufacturer, as approved by Architect, is permitted on exposed face of toilet accessory units. On either interior surface not exposed to view or back surface, provide additional identification by means of either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.
- B. Surface-Mounted Toilet Accessories: 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: 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: 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 accumulation of moisture, as follows:
 - 1. Provide galvanized steel backing sheet, not less than 22 gage (.034 inch) and full mirror size, with non-absorptive filler material. Corrugated cardboard is not an acceptable filler material.
 - 2. Mirror Unit Hangers: one-piece galvanized steel wall hanger device with spring action locking mechanism to hold mirror unit in position with no exposed screws or bolts to provide rigid, tamperproof, and theft proof installation.

PART 3 - EXECUTION**3.1 Installation**

- A. Install toilet accessory units in accordance with manufacturers' instructions, using fasteners appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.

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- 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, in accordance with manufacturer's instruction for type of substrate involved.

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 in strict accordance with manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION

Division 22

Plumbing

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SECTION 22 05 00 – BASIC PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 Description

- A. Refer to Instructions to Bidders, General Conditions, Supplementary Conditions, and the Sections of Division 1: General Requirements for specific requirements, responsibilities and methods relating to the Mechanical work.
- B. Sections 220500 contain material of a general nature and apply to all work performed under Division 22.
- C. Contractors shall perform work described in the paragraphs above, the General Conditions, Division 1 and in the following Sections (as included):
 - 1. Plumbing: Sections 22 0200 through 22 7010
- D. Refer to Section 260500: Basic Electrical Requirements for general requirements stated therein and coordination of Mechanical and Electrical work.
- E. Plumbing work shown on drawings numbered with the prefixes "P" are part of this work. Examine all other Contract Document drawings and specifications sections for additional Mechanical work.

1.2 Scope of Work

- A. Furnish all materials, labor, tools, transportation, incidentals and appurtenances to complete in every detail and leave in working order all items of work called for herein or shown on accompanying drawings.
- B. Include any minor items of work necessary to provide complete and fully operative systems whether specifically shown or not.

1.3 Quality Assurance

- A. Codes and Standards: Comply with all Local and State building codes, Life Safety Code, National Fire Protection Association (NFPA), applicable utility company requirements and applicable Federal requirements.
- B. Pressure piping systems: Comply with State Pressure Piping Systems Code, State Building Code and American Society of Mechanical Engineers. (ASME) Welding Code.
- C. Permits, fees, inspections and tests: Obtain and pay for all required permits, fees, inspections and tests. File drawings necessary to obtain permits, schedule necessary inspections and tests. Submit Certificates of Inspection and approval upon completion of the work.

- D. Material and equipment installed under this Contract shall be new, undeteriorated, and of a quality not less than the minimum specified. All equipment shall be certified, listed and labeled by UL.
- E. Work must be performed by Licensed Contractors as required by Local and State Codes.

1.4 Contract Drawings

- A. Drawings are schematic and show approximate locations and extent of work. Exact locations and extents must be coordinate with other contractors and verified in the field. Coordination of the final fabrication drawings and final coordination of the installation in the field is the Contractor's responsibility.
- B. The Drawings indicate required size and points of termination of pipes and suggest proper routes to conform to structure, avoid obstructions and preserve clearances. However, it is not intended that drawings indicate all necessary offsets, and it shall be the work of this Contractor to make the installation in such a manner as to conform to structure, avoid obstructions, preserve headroom and keep openings and passageways clear.
- C. Significant deviations from Drawings must be approved by the Architect.
- D. The Architect reserves the right to make minor changes in location which do not require additional labor, material or contract time up to the time of roughing-in without additional cost.
- E. If a conflict occurs between the Drawings and Specifications, the Contractor shall immediately call it to the attention of the Architect, who will determine which interpretation shall take precedence.
- F. Abbreviations:
 - 1. Refer to symbol list on the drawings and Architectural abbreviations.

1.5 Guarantee

- A. Guarantee all work executed under this Contract to be free from defective workmanship and/or materials. Should any defects develop within a period of one (1) year after final acceptance has been made, correct them and repair any damage that resulted from same at no additional cost.

1.6 Submittals

- A. Refer to Division 1 for submittal procedures and requirements.
- B. Submit shop drawings, product data and samples as required under Division 1, and as listed under Sections 220505.

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- C. Submit all Certificates of Inspection and Sterilization.
- D. Record Documents: Comply with applicable Section of Division 1 for record document procedures and requirements.
 - 1. Maintain a record set of prints showing exact location of and depth of bury for all below grade piping. Location notation shall be from foundation wall, center line of column, etc. Depth notation shall be from final finished floor elevation.
 - 2. Record addendum and change order items.
 - 3. Record deviations made from bid documents.
 - 4. Upon completion of work, deliver these drawings to Architect.
 - 5. Drawings shall be clean and undamaged, and shall not be used for any purpose other than recording deviations from working drawings and exact locations of concealed work. Maintain drawings at the job site and current for weekly inspection.
- E. Operation and maintenance manuals: Comply with applicable Section of Division 1 for operation and maintenance procedures and requirements.
 - 1. Submit two (2) bound copies of operation and maintenance manuals, 8-1/2" X 11" in three ring hard back binders. Submit separate manuals for each trade.
 - 2. Format as follows:
 - a. Title page: Title of Project, Address, Date of Submittal, Name and Address of Contractor, Name of Architect, Name of Engineer.
 - b. Second page: Index of manual contents.
 - c. A tabbed section for each specification section with a list of all equipment furnished under that section together with suppliers' names and addresses and a copy of each approved shop drawing. Also provide the following in each section as applicable:
 - 1) Description of systems
 - 2) Operating instructions
 - 3) Maintenance and lubrication instructions
 - 4) Servicing instructions
 - 5) Manufacturer's information and parts lists, including sources of supply.
 - 6) Equipment warranties
 - 7) Control diagrams
 - 8) Wiring diagrams
 - 9) Routine and 24 hour emergency information:

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- a) Name, address and telephone number of servicing agency
- b) Include names of personnel to be contacted for service arrangements.

F. Personnel Instruction:

- 1. After placing systems in operation, thoroughly instruct designated Owner's personnel on operation and maintenance of all equipment and systems.

1.7 Product Delivery

- A. Comply with applicable Section of Division 1 for product delivery, storage and handling procedures and requirements.

1.8 Job Conditions

- A. Locate existing utilities prior to beginning work. Reroute or replace existing utilities where necessary to permit installation of work. Provide adequate means of protection during work operations. Repair existing utilities damaged during work operations to the satisfaction of the Utility Owner and at Contractor's expense.
- B. Should uncharted or incorrectly charted piping or other utilities be encountered during work operations, notify the Architect immediately for procedure directions. Cooperate with utility companies in maintaining active services and facilities in operation.

PART 2 - PRODUCTS

2.1 Design Base Manufacturers

- A. The Drawings and Specifications are based on the requirements and layouts of the equipment of the Design Base Manufacturers. Design coordination of equipment with the building and with other Trades has been made for these specific models and manufacturers of equipment. Whenever the Contractor furnishes equipment or material other than the Design Base Manufacturer specified, he is responsible for the cost and coordination of all modifications required not only for his work, but also for the work of all other Trades affected.

2.2 Approved Equal

- A. Equal components by manufacturers not listed but meeting the specifications may be submitted to the Architect and Engineer for approval in accordance with Division 1 and subsequent inclusion into the bidding documents. Submission must be received no later than 7 working days before bid date.

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2.3 Substitutions

- A. Contractor may submit substitutes of his choice, without prior approval, on the "Substitution Sheet" included in the Bid Schedule. Such substitutes will not form basis of award and may be considered only after selection of lowest bidder furnishing "Base Design" as specified.

2.4 Quantities

- A. Items may be referred to as singular or plural on the drawings and in the specifications. Contractor is responsible for determining quantity of each item required.

PART 3 - EXECUTION

3.1 Temporary Facilities

- A. Comply with applicable Section of Division 1 for specific requirements, responsibilities and methods for temporary facilities and controls.

3.2 Excavating and Backfilling

- A. Comply with Division 2 requirements.
- B. Do all excavating and backfilling required for execution of this work. Dig excavations to exact grade and depth. Provide adequate shoring or sheet piling to prevent caving or endangering workers, work of others, or existing structures.
- C. No pipe shall be laid in water. Furnish pumping equipment, power, temporary connections, etc., and pump to remove ground or casual water.
- D. All piping shall be laid on firm undisturbed subgrade with minimum 6" pipe bedding. Should excavation be extended to below required pipe elevation, backfill to proper elevation with compacted shot sand.
- E. Fill immediately around pipes and to an elevation of 1"-0" above the top of pipes with shot sand, lightly vibrated, unless noted otherwise on the drawings. Encase piping in concrete if noted on the drawings.
- F. Fill remaining trench with pit run gravel.
- G. Patch all concrete and/or paved areas cut by excavating and refinish to match adjacent surfaces.
- H. Protect all trenches with suitable barricades and bridges. Adequately protect trenches with signs or flags during the day and with lights at night.

- I. Determine the locations of all existing underground utilities and protect same from damage. Damage to any utility shall be promptly replaced or repaired to the full satisfaction of Utility Company. All costs for repair of damage to such services shall be paid by Contractor causing the damage.
- J. Remove surplus earth from premises or dispose of it on premises as directed by the Architect.

3.3 Cutting and Patching

- A. Comply with Division 1 requirements.
- B. Avoid cutting of concrete, masonry and other new work by use of sleeves and inserts. Inform the General Contractor of the locations of all sleeves and inserts required and deliver sleeves and inserts to the General Contractor for installation.
- C. Perform cutting and patching when required for installation of new work in existing construction. Methods and procedures shall be acceptable to the Architect.
- D. Cut holes through concrete, brick, tiles etc., when necessary by rotary core drilling. Methods and procedures shall be acceptable to the Architect.
- E. Patching shall match adjacent materials and shall be accomplished only by tradesmen skilled in the respective craft required. Materials and equipment used in the patching work shall comply with requirements of those Sections of the Specifications relating to material to be used in new construction.

3.4 Cleaning and Painting

- A. Finish painting of piping and equipment installed under this Contract is included under Division 9 except as noted.
- B. Spot prime factory finished equipment which has rusted or been damaged with zinc chromate primer. Repaint entire item matching original color.
- C. Division 22 exposed support steel and bare ferrous metal shall be cleaned, rust removed, primed, and painted in accordance with applicable section of Division 9 Specifications.
- D. Upon completion of work, all material, fixtures and equipment furnished in this Contract shall be thoroughly cleaned of dirt, stickers, grease, rust, oil and other foreign matter. Prepare for finish painting, where painting is specified.
- E. Cleaning shall comply with applicable Section of Division 1.
- F. Clean insulation coverings, size if necessary, and provide ready for finish painting.

- G. Clean and prime ferrous metals which are not provided with rust inhibitive, finish with zinc chromate primer and provide ready for finish painting.
- H. Clean piping and equipment. Remove dirt, grease, dust and oil; prime where necessary with zinc chromate primer and provide ready for finish painting.
 - 1. Clean galvanized piping in exposed areas with diluted acetic acid.
 - 2. Clean copper piping in exposed areas with emery cloth and solvent.
- I. Clean all gauges, thermometers, traps, strainers and fittings.
- J. All insulation coverings shall be cleaned. If pre-sized insulation is not used, insulation coverings shall be sized, if finish painting is required.
- K. Maintain all areas as clean as possible during construction.

3.5 Protection and Finishing

- A. Protect equipment and materials during construction from damage from water, dirt, welding and cutting, spatters paint droppings, etc. by use of shields and drop cloths. Repair or replace as directed any materials damaged during construction operations.
- B. Protect floors from soiling and damage caused by chips and cutting oil.
- C. Cover all site stored motors, bearings, fans, pumps, etc. Protect from soiling and water and weather damage.
- D. All materials or equipment stored outside shall be elevated and protectively covered.
- E. Materials and equipment sensitive to weather or construction conditions shall be stored inside. Where necessary, sensitive equipment shall be stored in a heated area.
- F. Damaged equipment or materials must immediately be repaired or replaced by this Contractor, to the satisfaction of the Architect and at no additional cost to the Owner.

3.6 Sterilizing Potable Water System

- A. All new potable water lines shall be sterilized with Chlorine. Sterilization shall provide complete coverage for the entire system. Minimum chlorine levels, as required by the State, shall be maintained for twenty-four (24) hours. Required levels shall be checked at all outlets.

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- B. All piping and fixture outlets shall be tagged "DANGER - NOT FOR HUMAN CONSUMPTION" prior to and during sterilization. Tags shall remain until the entire system has been thoroughly flushed and certified by an independent testing agency licensed in the State.
- C. Furnish all taps and fittings required for sterilization.
- D. Notify Architect seventy-two (72) hours prior to sterilization. Provide Architect with Certificate of Sterilization for forwarding to Owner.

3.7 Tests and Balancing

- A. Perform tests in connection with this work in the presence of the Architect. Furnish all tools, equipment and connections necessary for testing. Notify the Architect at least seventy-two (72) hours in advance of any test. Failure to notify the Architect shall require the test to be performed a second time.
- B. Test piping systems and make tight before any work is concealed, covered or painted. Repair leaks which develop under test in piping by replacement of the pipe, the fitting, or both. Caulking will not be permitted. Material or workmanship found defective in any way, shall be replaced at this Contractor's expense and again tested until approved by the Architect.
- C. Piping shall be tested according to the following schedule:

Line	Test Pressure Medium	Minimum	Test Time Minimum	Notes
Sanitary, Storm, Vent		Per Local Codes		
Hot & Cold Water	Water	125 lbs.	6 Hrs.	No Drop

- D. Deliver all performance and inspection certificates to the Architect.

3.8 Electrical Coordination

- A. Electrical Contractor to provide conduit and wiring for devices as indicated on Electrical Drawings and in Specifications. Additional wiring required for equipment furnished under this Division to be a responsibility of this Contractor.
- B. All wiring to be installed in metal conduit and to comply with latest edition of National Electric Code, NFPA 70, and with the Electrical Division of these Specifications, Division 26.

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- C. Furnish to the Electrical Contractor approved wiring diagrams required for equipment furnished in this Contract. This Contractor will be responsible for the successful operation of systems.
- D. This Contractor shall reimburse the Electrical Contractor for any changes, caused by installation of other than base equipment, in wiring and devices required to provide proper connections to equipment furnished. Wiring changes to be submitted to the Architect for review, prior to installation.
- E. Furnish motors for motor driven equipment. Motor horsepower requirements are, in general, specified with equipment. In no instance shall nameplate motor horsepower rating be less than the brake horsepower requirements of the equipment at startup and at specified operating conditions, or less than that shown. Motor service factor to be 1.15.
- F. Motor sizes shown on Drawings are for base Specification equipment. Equipment manufacturers to be responsible for electrical changes required for installation of their equipment.
- G. Motor starters, where specifically noted to be furnished with equipment specified herein, to be magnetic type, NEMA design with hot leg overload protection complete with properly sized heater elements.
- H. Unless otherwise specified, 3 phase motors 1/2 HP and larger to be open drip-proof, NEMA Design B; single phase motors to be permanent-split capacitor or capacitor-start type. Insulation Class "B", "F", or "H".

END OF SECTION 22 05 00

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SECTION 22 05 05 – PLUMBING SHOP DRAWINGS

PART 1 - GENERAL

1.1 Scope

- A. Submit six (6) copies of shop drawings for review of the following equipment. Submittals shall include, but not limited to the following:

- | | |
|----------------------------|---------------------------|
| 1. Piping | 10. Valves |
| 2. Insulation | 11. Supporting Members |
| 3. Floor Drains | 12. Wall and Floor Plates |
| 4. Cleanouts | 13. Shock Arrestors |
| 5. Pressure Reducing Valve | 14. Thermometers |
| 6. Backflow Preventors | 15. Gauges |
| 7. Water Heaters | 16. Wall Hydrants |
| 8. Expansion Tank | 17. Plumbing Fixtures |
| 9. Mixing Valves | |

- B. Plumbing Contractor shall submit a complete shop drawing to the General Contractor showing all sleeves and floor penetrations for Structural Engineer's review and comments. General Contractor shall combine plumbing, HVAC, and electrical drawings onto one sheet. No reinforcing is to be cut or interrupted.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.1 Procedures

- A. Check, sign and approve all shop drawings. Drawings not signed and approved by the Contractor will be returned.
- B. Submit shop drawings for all items of equipment, piping, and insulation for review before construction. Prepare required drawings at sufficient scale to clearly show details of construction, physical dimensions and related work of others. Review of shop drawings shall not relieve the Contractor of responsibility for accuracy of shop drawings or of full requirements of the Contract drawings.

END OF SECTION 22 05 05

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SECTION 22 05 10 - SLEEVES

PART 1 - GENERAL

1.1 Scope

- A. This Contractor shall furnish sleeves for his work to the General Contractor, who installs where directed by this Contractor.
- B. Furnish Schedule #40 sleeves for all pipe openings through new masonry construction and all fire-rated walls and floors.
- C. Sleeves shall be sized to allow for pipe and insulation to pass thru sleeve.

PART 2 - PRODUCTS

2.1 Sleeve Material

- A. In exterior masonry walls below grade: "Linkseal" casing seal with EPDM elastomeric elements system as manufactured by Thunderline Corporation. Install per manufacturer's instructions thru core drilled hole or galvanized steel sleeve opening.
- B. In masonry and/or fire rated wall and floor openings: Schedule 40 steel pipe, machine cut.

PART 3 - EXECUTION

3.1 Installation

- A. Furnish sleeves sized to provide an annular space of 1" between the passing pipe or pipe insulation. Use 1/2" annular space for pipes less than 1".
- B. Sleeves through walls and roofs shall be cut flush with each surface, except where clamping flanges are use.
- C. Sleeves through floors above grade shall be cut flush with underside of floor and shall extend 1" above the top side of the floor.
- D. In rated firewalls, fire partitions, smoke stops and floors, fill annular space around pipe with fire stopping materials as specified in Section 220515.
- E. In sleeves through exterior wall, pack annular space with insulating material, seal and make waterproof.
- F. Seal off all spaces around rectangular ducts through walls with sheet metal collars.
- G. Plug unused sleeves and finish to match adjacent surfaces.

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- H. Openings required through any masonry wall or floor after it is in place shall be done by core drilling.

END OF SECTION 22 05 10

SECTION 22 05 20 - PIPE HANGERS AND ATTACHMENTS

PART 1 - GENERAL

1.1 Scope

- A. Furnish and install pipe hangers and attachments for all piping and piping system components.
- B. Furnish and install supplementary channels, plates, etc., where required between building structural members.
- C. Provide dielectric protection between dissimilar metals, such as copper to steel.
- D. Provide blocking and supports at pipe rough-ins to fixtures and equipment.

1.2 Quality Assurance

- A. All supports and parts shall conform to the latest requirements of the ASA Code for Pressure Piping B31.1 and MSS Standard Practice SP-69.
- B. Supports and parts shall have a stress safety factor of 5.
- C. Hanger and attachments which are used in fire protection systems shall be UL or FM listed for the usage.

PART 2 - PRODUCTS

2.1 Manufacturers

- A. Products are based on Grinnell Figure numbers unless otherwise noted. Optional manufacturers: Modern Pipe Supports, PHD, M-CO or Uni-strut.

2.2 Supports for Suspended, Horizontal Piping

- A. Pipe Hangers

<u>Pipe</u>	<u>2" and Smaller</u>	<u>2-1/2" and Larger</u>
Copper, uninsulated	Fig. CT-99	Fig. CT-65
Copper, insulated	Fig. 260 w/shield	Fig. 260 w/shield
Steel, uninsulated	Fig. 97	Fig. 260
Steel, insulated	Fig. 260 w/shield	Fig. 260 w/shield

B. Attachments for Structural Steel Construction

<u>Structure</u>	<u>Attachment</u>
Steel bar joists	Top beam clamp, Fig. 227
Steel beam with corrugated metal deck above	Top beam clamp, Fig. 227
Steel beam with concrete deck above	Bottom beam clamp, Fig. 227 (Use only where top beam clamps are not possible.)

C. Attachments for Wood Construction

<u>Service</u>	<u>Attachment</u>
Wooden beam	Side beam bracket, Fig. 202

2.3 Supports for Suspended Horizontal Piping (Trapeze Hanger)

- A. Pipe Clamps: Uni-strut Series P2000 pipe clamp. Steel pipe shall have galvanized clamp, copper pipe shall have copper coated steel strap and hardware. If pipe is insulated, pipe clamp shall be installed over top of insulation. Provide protective insulation pipe shields. Pipe to be installed on top of uni-strut. Do not suspend pipe.
- B. Channel: Uni-strut P1000 channels.

2.4 Supports for Roof Piping

- A. Pipe supports
 - 1. 3/4 inch to 2 inch diameter: Equal to Miro Model 02, PVC base.
 - 2. 2-1/2 inch to 4 inch diameter pipe: Equal to Miro Model 24-R, PVC base, nylon roller on teflon base.

2.5 Supports for Vertical Piping

- A. Pipe clamps:

<u>Pipe</u>	<u>Attachment</u>
Copper, floor support	Fig. CT-121 - riser clamp
Steel, floor support	Fig. 261 - riser clamp

2.6 Supports for Wet Areas or Exterior

- A. Use nonferrous, galvanized steel, plated steel or plastic coated steel supports and hangers in kitchens, locker rooms, shower rooms, and in exterior applications.

2.7 Supports for Pipe Rough-Ins

- A. Pipe brackets: Holdrite pipe brackets, copper plated, secured to wall and/or chase framing. If galvanized brackets are used or piping is installed in metal stud walls, plastic isolation inserts shall be installed.

2.8 Insulation Protection Shields

- A. Half-round galvanized metal shields with radius formed to fit the insulation and 12" long. Use 18" long shields for all pipes greater than 4.

PART 3 - EXECUTION

3.1 General

- A. Do not hang pipe from other pipe. In chase spaces, provide additional pipe stands and framing for attachment of pipe brackets and piping.
- B. Use correct size hangers. Increase hanger size to allow for increased diameter of line caused by pipe covering.
- C. Double nut, ping or spot weld all hanger support nuts in areas subject to vibration.

3.2 Support Spacing and Hanger Rod Diameters

- A. Support horizontal piping according to the following schedule:

<u>Pipe Size</u>	<u>Steel</u>	<u>Copper</u>	<u>Rod Diameter</u>
3/4" and smaller	7'	5'	3/8"
1"	8'	6'	3/8"
1-1/2", 2"	10'	8'	3/8"
2-1/2", 3"	11'	9'	3/8"
4"	12'	10'	1/2"
6" and larger	12'	12'	3/4"

1. Horizontal DWV Plastic Piping: At branch connections, at each change of direction and 4-foot maximum intervals.
2. Vertical DWV Piping: At branch connections, at each change of direction, at each floor, mid-story and provide additional supports as necessary to maintain piping alignment at the base.
3. Cast Iron Piping: Horizontal - at intervals not in excess of the standard lengths of pipe.
4. Cast Iron Piping: Vertical - 20 foot maximum intervals, base and at each floor.

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- B. Install wall brackets where required. Provide pipe guides and anchors as required to properly control pipe movement. Method to suit job conditions.
- C. Support piping at pumps and equipment from floor, structure or walls, so that piping weight is not supported by pumps or by equipment.

Note: Provide additional hangers at couplings elbows, valves, equipment, etc., to prevent excessive stress or distortion to piping or connected equipment.

3.3 Insulation Protection Shields

- A. Install half-round galvanized sheet metal insulation shields on all insulated piping at hangers.

END OF SECTION 22 05 20

SECTION 22 05 30 - INSTALLATION OF PIPING

PART 1 - GENERAL

1.1 Scope

- A. Install piping as specified in this Section:
 - 1. Provide unions at each final connection and at each piece of equipment. Piping to be arranged and unions located to permit easy removal of parts and equipment for inspection and cleaning. Welded connections to equipment are prohibited.
 - 2. Make connections to equipment as detailed on the Drawings and per the manufacturer's installation instructions.
 - 3. Where connection size is smaller than piping, make reduction at final connection only (do not reduce size of pipe drop).
 - 4. Provide valves and specialties as required, to complete installation of each piece of equipment, for proper operation.
- B. Install piping with due consideration to other trades.
- C. Refer to other Sections of Division 22 for additional requirements.

PART 2 - PRODUCTS

2.1 Unions

- A. Unions in Copper Pipe: Bronze 150 lb. ground joint, solder end.
- B. Unions in Steel Pipe: Black malleable iron, bronze ground ball joint.

PART 3 - EXECUTION

3.1 General

- A. Install all piping parallel or perpendicular to building walls and floors. Offset lines around columns, beams and other obstructions as required. Piping shall be installed to provide 1'-0" clearance between piping systems.
- B. Install piping to provide clearance for personnel passage, headroom, operation of doors or windows, equipment, lighting outlets, or with Owner's apparatus and equipment. Coordinate pipe runs and elevations with other Contractors before installation. Where interferences develop in field, pipes may need to be offset or rerouted, at no additional cost to Owner, as required to resolve interferences.

- C. Securely support all piping from structure with approved hangers, rods, brackets and accessories.
- D. Install valves at service connections to equipment and branch lines from main lines. All valves and unions to be installed so as to be accessible through ceiling or wall access panel.
- E. Make changes in pipeline direction with fittings, rather than bending.
- F. Ream ends of pipe and clean before installing.
- G. Plug open ends of pipe lines during installation to keep dirt and foreign materials out of system.
- H. After erection and prior to putting in service, lines shall be blown or flushed free of loose materials. Clean strainer screens and aerators.
- I. Pipes run through new block and brick shall enter and leave at mortar joints.
- J. Conceal all piping except in unfinished rooms, or otherwise noted.
- K. Piping containing liquids shall not be installed over electrical equipment.
- L. On any given system, the Contractor will not be permitted to mix and join different types of pipe material. For example, if a storm or sanitary system uses plastic and cast iron, the Contractor may change from one to the other only once, the line may not be changed back to the first material further downstream.

3.2 Pipe Escutcheons

- A. Install malleable or cast iron escutcheons on piping passing through outside walls or through walls, floors, and ceilings of unfinished areas.
- B. Install brass, chromium plated, solid and/or split-type escutcheons on piping passing through finished walls, floors, or ceiling.

3.3 Unions

- A. Install unions to permit removal of parts and equipment for inspection or servicing without disconnecting any part except unions.
- B. Install dielectric unions between dissimilar metals, such as copper to steel.

3.4 Pipe Connections

- A. Welded joints shall comply with (ANSI B31.1).
- B. Solder and brazing work shall comply with (ANSI B31.1).
- C. Threaded joints shall comply with (ANSI B1.20.1).

- D. Ends of piping systems shall be reamed after cutting.
- E. Prepare and clean all joints and fittings prior to welding, soldering and/or threading.
- F. Remove scale, flux, pipe dope, etc. at completion of work.

3.5 Valves and Pipe Specialties

- A. Install valves and piping specialties where indicated on drawings.
- B. Install valves with hand wheel at or above centerline of pipe.
- C. Install drain valves at low points to provide complete drainage of systems.
- D. Install thermometer and gauges so that they may be read from floor level.

3.6 Expansion Control

- A. Install piping to permit free expansion or contraction without damage to building, equipment, or piping.
- B. Install pipe loops or anchors where indicated or required to control expansion and contraction of piping.
- C. Install branch connections to mains using a minimum of two (2) 90 degree elbows.
- D. Bullhead connections in any piping service are not acceptable.

END OF SECTION 22 05 30

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SECTION 22 07 10 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 Scope

- A. Furnish all labor, equipment, materials, and accessories necessary for the installation of all mechanical insulation.
- B. Insulate the following plumbing systems.
 - 1. Cold water piping.
 - 2. Hot water piping.

1.2 Quality Assurance

- A. All insulation shall have composite (insulation, jacket, and adhesive) fire and smoke hazard ratings as tested under procedure ASTM E-84, NFPA 255, or UL 723, and not exceed:
 - 1. Flame spread: 25.
 - 2. Smoke developed: 50.
- B. Pipe insulation shall meet or exceed the requirements of State Building Code, Mechanical Code.

PART 2- PRODUCTS

2.1 Plumbing Piping System (Below Slab)

- A. Water piping in building below floor slab shall be insulated with Armstrong AP or equal elastomeric thermal insulation. Insulation shall be 1/2" thick. All joints shall be permanently sealed with Armstrong 510 adhesive or equal. Insulation shall be covered with vinyl pipe sleeve.

2.2 Plumbing Piping System (Above Slab)

- A. Water piping, sanitary and/or storm piping in building above floor slab shall be insulated with one piece fiberglass sectional insulation (K=0.23 at 75 degrees F.) with factory applied white reinforced kraft/foil vapor barrier jacket. Longitudinal jacket laps and butt joints shall be self-sealing using 3" wide lap strips. Insulation jacket and adhesive shall have a minimum fire/smoke rating development of 25/50 in accordance with ASTM-E-84, NFPA 225 and U.L. 723. Insulation shall be one of the following:
 - 1. Johns Manville "Micro-Lok".
 - 2. Owens/Corning "Fiberglass 25 ASJ/SSL-11".
 - 3. CertainTeed "Fiberglass 500 degree Snap-On".

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B. Insulation thickness for pipe sizes shall be as follows:

Minimum Pipe Insulation (in.)								
Fluid Design Operating Temperature Range, °F	Insulation Conductivity		Nominal Pipe Diameter (in.)					
	Conductivity Range Btu • in./- (h•ft ² •°F)	Mean Rating Temperature ° F	Runouts up to 2	1 and less	1- 1¼ to 2	2½ to 4	5 & 6	8 & up
Domestic and Service Hot Water Systems								
40 – 100	-	-	0.5	0.5	0.5	1.0	1.0	1.0
105 – 140	0.24-0.28	100	0.5	1.0	1.5	2.0	2.0	2.0
160 – 180	0.24-0.28	100	0.5	1.0	1.5	2.0	2.0	2.0
Storm Piping Systems								
-	-	-	-	-	-	1.0	1.0	1.0

1. Fittings shall be insulated with pre-molded fiberglass inserts with molded PVC jacket stapled and taped.
2. Pipe insulation exposed in finished areas subject to water damage or moisture shall be covered with Zeston 2000 PVC 20 mil jacketing secured with adhesive. These areas include kitchen, in which copper water piping is exposed behind kitchen equipment.

C. Handicapped accessible lavatory "P" trap and angle supply pipes and stops shall be insulated with trap wrap protective by McGuire. This shall apply to all lavatories which have open space below lavatory and/or countertop for wheelchair access. Abrasion resistant exterior cover shall be smooth and have 1/8" wall minimum wall thickness. Fasteners shall be concealed. Equal manufacturers by Brocar, Skal + Gard or Truebro.

2.3 Exterior Pipes

- A. Expanded closed cell, flexible elastomeric insulation (K = 0.27 at 75 degrees F) furnished in 3/4" thick sheet or tube form. Insulation shall be equal to Armstrong "Armaflex". R-8 minimum (multiple layers if required.)
- B. All seams and butt joints shall be sealed with adhesive and finished with 2 coats of a vinyl-lacquered Armaflex finish.

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2.4 Jacketing for Exposed Piping

- A. Pipe insulation exposed in finished areas shall be covered with Zeston 2000 PVC 20 mill jacketing secured with adhesive. These areas include toilet rooms, kitchen areas and areas of extreme moisture.

PART 3 - EXECUTION

3.1 Installation

- A. Install all insulation, including adhesives, mastics, and coatings in strict accordance with manufacturer's installation instructions.
- B. All pipe insulation shall run continuous thru vertical and horizontal pipe hangers.
- C. All pipe insulation shall be continuous thru wall and ceiling openings and sleeves.
- D. All surface finishes are to be extended to protect all surfaces, ends, and raw edges of insulation.
- E. Insulate fittings with fiberglass wrap and cover with premolded PVC covers taped to adjacent insulation.
- F. Do not insulate heating water valves and unions. Cut back, bevel and seal all terminations.
- G. Furnish 1/2 round galvanized sheet metal insulation shields with radius formed to fit insulation, 12" long on all insulated piping at hangers. Use 18" long shields for all pipes greater than 4".

END OF SECTION 22 07 10

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SECTION 22 11 10 - DOMESTIC WATER DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.1 Scope

- A. Building water services by Site Contractor. See Site Engineer's drawings for piping layout.
- B. Furnish and install a complete water piping system for the building as shown on the drawings, and as required for a complete installation. Connect to building water service.
- C. Pay all fees and charges required for the installation of this work.

PART 2 - PRODUCTS

2.1 Materials

- A. Piping and Pipe Insulation - refer to Section 22 20 10.
- B. Piping Specialties - refer to Section 22 20 15.
- C. Water heaters shall be based on A.O. Smith electric with capacity noted on drawings. Heater shall be designed for 150 psig working pressure and equipped with high density magnesium anodes. All internal surfaces of the heater exposed to water shall be glass-lined that has been fused to steel. Jacket shall be of baked enamel finish and shall provide for complete service and maintenance and enclose the tank with fiberglass insulation. The heater tank shall have a three year limited warranty and controls and accessories shall have a one year limited warranty. Full illustrated instruction manual to be included. Heater shall be AGA approved and comply with A.S.H.R.A.E. 90.1. Provide ASME approved temperature and pressure relief valve sized for heater installed. Equal heaters by Lochinvar, Ruud, or State are acceptable.
- D. Thermal expansion tank shall be Amtrol ST Extrol thermal expansion absorber with capacities as noted on drawings. Tank shall be designed for 125 PSIG working pressure. Tank shall be A.S.M.E. code steel. Tank shall have a 1 year warranty. Equal tanks manufactured by Taco or Bell & Gossett.
- E. Thermostatic Mixing Valves shall be Bradley with capacities as noted on drawings. Equal valves manufactured by Leonard, Lawler, Powers or Symmons.
 - 1. Unit shall be three-way thermostatic type to mix 140°F and 60°F water for 120°F supply.
 - 2. Valve shall be constructed of bronze and non-ferrous materials.
 - 3. Valves shall consist of a thermostatic water controller and combination stop and check valves with removable strainers.

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- 4. Furnish units with thermometer, supply shut-off valve, and rough brass finish.
 - 5. Valve shall be able to maintain supply water temperature with 15% of design flow.
- F. Point-of-use mixing valves shall be based on Watts. Unit shall be equipped with check/stops.

PART 3 - EXECUTION**3.1 Installation**

- A. Connections between dissimilar metals shall be with dielectric protection.
- B. Water heater installation shall be as detailed on drawings and as required by manufacturer.
- C. Install assorted valving as shown and noted on the drawings.
- D. Make final connections to all equipment requiring same.
- E. Provide isolation valves on HW and CW supply pipes to each group of fixtures. Valves to be located where shown on drawings. If located above an inaccessible ceiling, provide steel access panel as specified.
- F. Provide individual shut-off valves to each fixture or piece of equipment.
- G. Water piping shall be installed for complete winterization.

END OF SECTION 22 11 10

SECTION 22 13 10 - SOIL DRAINAGE AND VENT SYSTEM

PART 1 - GENERAL

1.1 Scope

- A. Building sanitary service by Site Contractor. Refer to Site Engineer's drawings.
- B. Furnish and install a complete soil waste piping system for the buildings as shown on drawings, and as required for a complete installation. Connect to building sanitary sewer.
- C. Furnish and install a complete system of vents for the sanitary system, including branch vents, vent stack, extension through roof and roof flashing.
- D. Pay all fees and charges required for the installation of this work.

PART 2 - PRODUCTS

2.1 Materials

- A. Soil Waste Pipe - refer to Section 222010.
- B. Vent Pipe - refer to Section 222010.
- C. Piping Specialties - Refer to Section 222015.
- D. Cleanouts shall be based on Zurn as scheduled on drawings. Provide cleanouts of 4" size for pipes 4" and larger, and full size for pipes smaller than 4". Equal cleanouts as manufactured by Wade, Watts, J.R. Smith, or Josam.
- E. Floor drains and hub drains shall be based on Zurn as scheduled on drawings. Equal drains as manufactured by Wade, Watts, J. R. Smith, or Josam.

PART 3 - EXECUTION

3.1 Installation

- A. Collect waste from all plumbing fixtures, drains and equipment and extend as shown on drawings. Make connections to all fixtures, drains, equipment and Owner furnished equipment.
- B. Install a cleanout at base of each soil stack and install others as shown on drawings or required by Code. Install in floor or wall, and terminate with ferrule and cleanout plug. Provide access panels of size to give adequate space for cleanouts. Encase outside cleanouts in concrete. Tops of all floor cleanouts shall be flush with finished floor (this includes tiled areas). Provide carpet markers where installed in carpeted areas.

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- C. Trap each fixture with an approved trap, as near fixture as possible or built integral therewith. Certain fixtures are indicated to have indirect connections.
- D. Vent fixtures as shown on drawings. Collect vents and extend through roof, terminating 24" above roof. Install 3" or 4" vent pipe where it passes through roof as shown.
- E. All vent extensions shall be installed to insure leakproof installation. Installation to be in strict compliance with requirements of roofing system manufacturer. Coordinate with General Contractor.
- F. Provide flashing clamp device and flash all drains not directly on grade with a 4 lb. sheet lead flashing, extending a minimum of 18" in all directions beyond clamping ring.
- G. Pitch soil and waste piping as follows:
 - 3" and smaller: 1/4" per foot
 - 4" and larger: 1/8" per foot
- H. Minimum soil waste pipe size is 2 inches for underground waste piping.

END OF SECTION 22 13 10

SECTION 22 20 10 - PIPE AND FITTINGS

PART 1 - GENERAL

1.1 Scope

- A. Provide all piping and fittings for soil waste, vent, storm, hot and cold water, as shown on drawings.
- B. Insulate the following piping.
 - 1. All hot water piping.
 - 2. All cold water piping.
- C. Refer to Section 22 07 10 for insulation.

PART 2 - PRODUCTS

2.1 Soil Waste and Vent Piping, and Storm Piping (Cast Iron Piping System)

- A. Soil waste, vent, and storm piping inside building below slab, and to a point 5'-0" outside building:
 - 1. 2" and larger: Service weight (SV) hub and spigot cast iron soil pipe and fittings (ASTM A74) and (CISPI 301). Pipe to be joined by elastomeric rubber gaskets (ASTM C-564) and installed using gasket lubricant. Provide concrete thrust blocks at all below grade turns and off sets for all 6" and larger soil waste and storm piping.
- B. Soil waste, vent and storm piping inside building above slab:
 - 1. 3" and larger: Service weight (SV) no-hub cast iron soil pipe and fittings (ASTM A88) and (CISPI 301). Pipe to be joined by 4-band no-hub couplings, constructed of type 304 (heavy duty) stainless steel, incorporating a neoprene gasket (ASTM C-564). Couplings shall be as manufactured by Clamp-All, Mage-Connect (double screw), Mission or Huskey-4000.
 - 2. 2" and smaller: Service weight (SV) no-hub cast iron soil pipe and fittings (ASTM A88) and (CISPI 301). Pipe to be joined by no-hub couplings constructed of Type 301 stainless steel incorporating a neoprene gasket (ASTM C-564) and (CISPI 310). Couplings shall be as manufactured by Tyler, Charlotte, Mission or Huskey.
 - 3. 2" and smaller: Copper drainage tube (DWV) (ASTM B306) with wrought copper drainage fittings (ASTM B16.29).
- C. Soil waste and storm piping 5'-0" beyond building:

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1. First quality, double strength, glazed vitrified tile sewer pipe with factory-made, double-ball plastic joints (ASTM C700-78A) and (ASTM C-425-77).
 2. Under roadways and parking areas or areas where cover is less than three (3) or more than twelve (12) feet use cast iron soil pipe or encase above pipe in 8" of concrete.
- D. Pipe and fittings shall be by same manufacturer.

2.2 Soil Waste and Vent Piping, and Storm Piping (PVC Piping System)

- A. Soil waste, vent and storm piping inside building and to a point 5'-0" outside building:
1. Schedule #40 (PVC) poly vinyl chloride drain waste and vent pipe and fittings (ASTM D-2665) and (ASTM D-1785). Pipe to be joined by solvent cement per the manufacturer's requirements and installed per (ASTM D-2564) and (ASTM D-2665).
- B. Soil waste and storm piping 5'-0" beyond building:
1. SDR-35 (PVC) poly vinyl chloride type PSM, gravity drain, gasketed sewer pipe and fittings (ASTM D-3034) and (ASTM D-1785).
- C. Pipe and fittings shall be by same manufacturer.

2.3 Water Piping

- A. Hot and Cold Water Pipe - in building above slab:
1. Type "L" hard drawn copper tubing (ASTM-B42) with wrought copper solder fittings (ANSI-B16.22) and 95/5 tin/antimony solder.
- B. Hot and Cold Water Pipe - in building below slab:
1. Type "K" soft drawn copper tubing (ASTM-B42) with wrought copper soldered fittings (ANSI-B16.22) and silver solder. (No fittings below slab.)
- C. Water Supply Piping:
1. As required by local water utility.

PART 3 - EXECUTION

3.1 Piping

- A. Piping shall run parallel with building lines and other piping.
- B. Piping located in finished areas with ceilings shall be concealed above ceiling and bottom of structural members.

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- C. Piping located in finished areas without ceilings shall be installed tight to walls at bottom of structural members. Coordinate exact routing with Architect and General Contractor.
- D. Water piping located in concrete block walls shall be insulated with Armaflex A.P. pipe insulation. Water piping located in stud walls or chases shall be insulated with fiberglass insulation.
- E. All pipe penetrations through concrete block walls shall be core drilled. Coordinate all cuttings with General Contractor.
- F. Coordinate all below slab piping with footings. Verify depth of piping and depth of footings prior to installation of each. Pipe shall not undercut footings.
- G. Sanitary waste and storm piping inside building to be sloped as follows:
 - 3" and smaller: 1/4" per foot
 - 4" and smaller: 1/8" per foot
- H. Water piping shall be pitched and valved for complete drainage.
- I. Water piping shall be protected from freezing. All piping to be located on warm side of building insulation.

END OF SECTION 22 20 10

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SECTION 22 20 15 - PIPING SPECIALTIES**PART 1 - GENERAL****1.1 Scope**

- A. Furnish and install all unions, nipples, valves, supporting members, and all other specialties specified herein or noted on drawings and as required to provide complete and operating piping system.

PART 2 - PRODUCTS**2.1 Nipples**

- A. Same weight and material as pipe with which they are used.

2.2 Unions

- A. Copper Pipe - wrought copper union with copper to copper joint and solder end type equal to Grinnell Fig. #9102.
- B. Black Steel Pipe - A.A.R. malleable iron union with bronze to iron ground joint equal to Grinnell Fig. #571.
- C. Dielectric fittings shall be equal to clear flow waterway, Style 47, meeting the requirements of ASTM F-492-77 with an electro-zinc plated casing with chemically inert, NSF/FDA listed dielectric thermoplastic lining.

2.3 Valves

- A. As manufactured by Nibco-Scott. Equal manufacturers by Apollo, Crane, Grinnell, Homestead, Jenkins, Keystone, Milwaukee, Powell, Stockham or Watts. All valves to be by same manufacturer. 3" and larger valves shall be flanged.
 - 1. Gate Valve (2" and smaller) - bronze gate valve with solid wedge, rising stem, screw-in bonnet, 200 lb. W.O.G., equal to Nibco type T-111 or S-111.
 - 2. Check Valve (2" and smaller) - bronze horizontal swing check valve, regrinding type, Y-pattern, renewable discs, 200 lbs. W.O.G., equal to Nibco type T-413 or S-413.
 - 3. Ball valves - bronze two piece, 400 lb. W.O.G. equal to Nibco Type T-580 or S-580.
 - 4. Drain Valves - equal to "3" above with full sized drain line extended to nearest floor drain and with 2" air gap.

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- B. Pressure reducing valve shall be Watts, bronze body construction, renewable stainless steel seat, high temperature resisting diaphragm and complying to standard requirements of A.S.S.E. 1003, with type, size and capacity as noted on drawings. Equal valves by Wilkins.
- C. Backflow preventors shall be Watts, bronze body construction, stainless steel seats and complying to standard requirements A.S.S.E. 1013, with type, size and capacity as noted on drawings. Equal valves by Wilkins, Beeco or Febco. Provide air gap funnel and pipe to nearest drain.

2.4 Other Specialties

- A. Wall and Floor Plates - Install chrome plated plates at all pipe penetrations in finished areas. Install galvanized steel plates at all pipe penetrations in unfinished areas. Plates must completely cover pipe sleeve and be sized for pipe opening required.
- B. Shock Arrestors - Hydro-pneumatic type as manufactured by Wade, Zurn, J.R. Smith Co., Precision Plumbing Products or Sioux Chief.
- C. Thermometers - adjustable angle, red reading, mercury type thermometers with thermometer well, 3-1/2" stem, 1-1/2" extended neck, 9" scale and guaranteed 1% accuracy and a temperature range in accordance with related work. Thermometers based on Weiss. Equal manufacturers by Trerice, Weksler or Ashcroft.
- D. Gauges - 4-1/2" dial pressure gauge with a gauge cock, and having 1% accuracy. Gauges shall be pressure or compound as required and shall be as manufactured by Weiss, Trerice or Ashcroft.

PART 3 - EXECUTION

3.1 Unions

- A. Install unions at piping connections to all pieces of equipment, valves, and as required for piping.

3.2 Valves

- A. Install valves where indicated on the drawings and where necessary for proper operation and maintenance of systems. Isolation valves shall be installed on supply piping to each group of fixtures.

3.3 Other Specialties

- A. Install shock arrestors in hot and cold water piping to each bank of fixtures and where shown on the drawings. Coordinate access panels as required with General Contractor. Size and install per manufacturer's requirements based on fixture count.

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- A. Install thermometers, pressure gauges, aquastats, wall hydrants, and hose bibbs where shown on the drawings.
- B. Install other specialties where noted on the drawings.

END OF SECTION 22 20 15

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SECTION 22 40 10 - PLUMBING FIXTURES AND TRIM

PART 1 - GENERAL

1.1 Scope

- A. Furnish and install all plumbing fixtures scheduled on the drawings and specified herein. Furnish complete with all trim and accessories.

PART 2 - PRODUCTS

2.1 Manufacturers

- A. Fixtures and trim are based on the following:
 - 1. Plumbing fixtures based on Willoughby. Equal quality fixtures by Acorn and Bradley are acceptable.
 - 2. Service sinks are based on Fiat. Equal quality basins by Cutler or Stern-Williams are acceptable.
 - 3. Flush valves are based on Zurn. Equal quality valves by Moen or Sloan are acceptable.
 - 4. Plumbing fixture faucets are based on Zurn. Equal quality faucets by Chicago, Delta Commercial, Moen Commercial, Speakman, or T & S Brass faucets are acceptable.
 - 5. Plumbing fixture brass is based on McGuire. Equality brass by Kohler, Crane, E.B.C., Eljer, Eastman, and Frost are acceptable.
- B. Fixtures, faucets, drains, cleanouts, trim and equipment shall be by the same manufacturers unless otherwise noted.
- C. Any substitutions of fixtures or trim as herein specified or noted on the drawings must be approved by the Architect and Engineer.
- D. Trim shall be chromium plated. Fixtures shall be white unless otherwise specified.
- E. All exposed piping shall be chromium plated.
- F. All pipes penetrating walls shall have chromium plated escutcheons.
- G. Mounting height of fixtures shall be as noted on Architectural drawings.
- H. See schedule on drawings for plumbing fixtures.

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PART 3 - EXECUTION

3.1 Installation

- A. Field verify installation requirements of all fixtures and Owner furnished equipment. Provide all required valves and piping. Coordinate installation of all equipment with Architect.
- B. Provide backing for all wall hung fixtures and faucets.
- C. Valve all hot and cold water supplies to each fixture and each group of fixtures. Adjust all valves and test all fixtures for proper operation.
- D. Valve all hot and cold water pipe rough-ins to plumbing fixtures as specified. Valves shall be chrome plated with chrome supply tubes.
- E. Valve all hot and cold water pipe rough-ins to kitchen equipment with 1/4 turn ball valves and rigid copper supply tubes.
- F. All exposed piping to fixtures shall be chrome plated unless noted otherwise.
- G. Adjust shower valves to deliver a maximum of 110 F HW.
- H. After water piping system is flushed, remove all strainers and aerators and clean thoroughly.
- I. Caulk all wall and floor mounted fixtures with silicone. Color to be selected by Architect.

END OF SECTION 22 40 10

Division 23

Mechanical

Coffman Park Expansion

Phase 2A

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Ford & Associates Architects, Inc.

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SECTION 23 00 00 – BASIC HVAC REQUIREMENTS**PART 1 - GENERAL****1.1 Description**

- A. Refer to Instructions to Bidders, General Conditions, and Supplementary Conditions: General Requirements for specific requirements, responsibilities and methods relating to the HVAC work.
- B. Refer to Section 260500: Basic Electrical Requirements for general requirements stated therein and coordination of Mechanical and Electrical work.
- C. HVAC work shown on drawings numbered with the prefixes "H" are part of this work. Examine all other Contract Document drawings and specifications sections for additional Mechanical work.

1.2 Scope of Work

- A. Furnish all materials, labor, tools, transportation, incidentals and appurtenances to complete in every detail and leave in working order all items of work called for herein or shown on accompanying drawings.
- B. Include any minor items of work necessary to provide complete and fully operative systems whether specifically shown or not.

1.3 Quality Assurance

- A. Codes and Standards: Comply with all Local and State building codes, Life Safety Code, National Fire Protection Association (NFPA), applicable utility company requirements and applicable Federal requirements.
- B. Pressure piping systems: Comply with State Pressure Piping Systems Code, State Building Code and American Society of Mechanical Engineers. (ASME) Welding Code.
- C. Permits, fees, inspections and tests: Obtain and pay for all required permits, fees, inspections and tests. File drawings necessary to obtain permits, schedule necessary inspections and tests. Submit Certificates of Inspection and approval upon completion of the work.
- D. Material and equipment installed under this Contract shall be new, un-deteriorated, and of a quality not less than the minimum specified. All equipment shall be certified, listed and labeled by UL.
- E. Work must be performed by Licensed Contractors as required by Local and State Codes.

1.4 Contract Drawings

- A. Drawings are schematic and show approximate locations and extent of work. Exact locations and extents must be coordinate with other contractors and

verified in the field. Coordination of the final fabrication drawings and final coordination of the installation in the field is the Contractor's responsibility.

- B. The Drawings indicate required size and points of termination of pipes and suggest proper routes to conform to structure, avoid obstructions and preserve clearances. However, it is not intended that drawings indicate all necessary offsets, and it shall be the work of this Contractor to make the installation in such a manner as to conform to structure, avoid obstructions, preserve headroom and keep openings and passageways clear.
- C. Significant deviations from Drawings must be approved by the Architect.
- D. The Architect reserves the right to make minor changes in location which do not require additional labor, material or contract time up to the time of roughing-in without additional cost.
- E. If a conflict occurs between the Drawings and Specifications, the Contractor shall immediately call it to the attention of the Architect, who will determine which interpretation shall take precedence.
- F. Abbreviations:
 - 1. Refer to symbol list on the drawings and Architectural abbreviations.

1.5 Guarantee

- A. Guarantee all work executed under this Contract to be free from defective workmanship and/or materials. Should any defects develop within a period of one (1) year after final acceptance has been made, correct them and repair any damage that resulted from same at no additional cost.

1.6 Submittals

- A. Refer to Division 1 for submittal procedures and requirements.
- B. Submit shop drawings, product data and samples as required under Division 1, and as listed under Section 230290.
- C. Submit all Certificates of Inspection and Sterilization.
- D. Record Documents: Comply with applicable Section of Division 1 for record document procedures and requirements.
 - 1. Maintain a record set of prints showing exact location of and depth of bury for all below grade piping. Location notation shall be from foundation wall, center line of column, etc. Depth notation shall be from final finished floor elevation.
 - 2. Record addendum and change order items.
 - 3. Record deviations made from bid documents.

4. Upon completion of work, deliver these drawings to Architect.
 5. Drawings shall be clean and undamaged, and shall not be used for any purpose other than recording deviations from working drawings and exact locations of concealed work. Maintain drawings at the job site and current for weekly inspection.
- E. Operation and maintenance manuals: Comply with applicable Section of Division 1 for operation and maintenance procedures and requirements.
1. Submit two (2) bound copies of operation and maintenance manuals, 8-1/2" X 11" in three ring hard back binders. Submit separate manuals for each trade.
 2. Format as follows:
 - a. Title page: Title of Project, Address, Date of Submittal, Name and Address of Contractor, Name of Architect, Name of Engineer.
 - b. Second page: Index of manual contents.
 - c. A tabbed section for each specification section with a list of all equipment furnished under that section together with suppliers' names and addresses and a copy of each approved shop drawing. Also provide the following in each section as applicable:
 - 1) Description of systems
 - 2) Operating instructions
 - 3) Maintenance and lubrication instructions
 - 4) Servicing instructions
 - 5) Manufacturer's information and parts lists, including sources of supply.
 - 6) Equipment warranties
 - 7) Control diagrams
 - 8) Wiring diagrams
 - 9) Routine and 24 hour emergency information:
 - a) Name, address and telephone number of servicing agency
 - b) Include names of personnel to be contacted for service arrangements.
- F. Personnel Instruction:
1. After placing systems in operation, thoroughly instruct designated Owner's personnel on operation and maintenance of all equipment and systems.
 2. Provide a minimum of (8) hours total instruction.
 - a) Location of equipment and explanation of function.
 - b) Reference to operating instruction manuals for record and clarity.
 - c) Coordination of written and verbal instructions so that each is understood by personnel.
 - d) Explanation of control system, including panel.

- e) Specify maintenance performed by Owner.

1.7 Product Delivery

- A. Comply with applicable Section of Division 1 for product delivery, storage and handling procedures and requirements.

1.8 Job Conditions

- A. Locate existing utilities prior to beginning work. Reroute or replace existing utilities where necessary to permit installation of work. Provide adequate means of protection during work operations. Repair existing utilities damaged during work operations to the satisfaction of the Utility Owner and at Contractor's expense.
- B. Should uncharted or incorrectly charted piping or other utilities be encountered during work operations, notify the Architect immediately for procedure directions. Cooperate with utility companies in maintaining active services and facilities in operation.

PART 2 - PRODUCTS**2.1 Design Base Manufacturers**

- A. The Drawings and Specifications are based on the requirements and layouts of the equipment of the Design Base Manufacturers. Design coordination of equipment with the building and with other Trades has been made for these specific models and manufacturers of equipment. Whenever the Contractor furnishes equipment or material other than the Design Base Manufacturer specified, he is responsible for the cost and coordination of all modifications required not only for his work, but also for the work of all other Trades affected.

2.2 Approved Equal

- A. Equal components by manufacturers not listed but meeting the specifications may be submitted to the Architect and Engineer for approval in accordance with Division 1 and subsequent inclusion into the bidding documents. Submission must be received no later than 7 working days before bid date.

2.3 Substitutions

- A. Contractor may submit substitutes of his choice, without prior approval, on the "Substitution Sheet" included in the Bid Schedule. Such substitutes will not form basis of award and may be considered only after selection of lowest bidder furnishing "Base Design" as specified.

2.4 Quantities

- A. Items may be referred to as singular or plural on the drawings and in the specifications. Contractor is responsible for determining quantity of each item required.

PART 3 - EXECUTION**3.1 Temporary Facilities**

- A. Comply with applicable Section of Division 1 for specific requirements, responsibilities and methods for temporary facilities and controls.

3.2 Excavating and Backfilling

- A. Do all excavating and backfilling required for execution of this work. Dig excavations to exact grade and depth. Provide adequate shoring or sheet piling to prevent caving or endangering workers, work of others, or existing structures.
- B. No pipe shall be laid in water. Furnish pumping equipment, power, temporary connections, etc., and pump to remove ground or casual water.
- C. All piping shall be laid on firm undisturbed sub-grade with minimum 6" pipe bedding. Should excavation be extended to below required pipe elevation, backfill to proper elevation with compacted shot sand.
- D. Fill immediately around pipes and to an elevation of 1"-0" above the top of pipes with shot sand, lightly vibrated, unless noted otherwise on the drawings. Encase piping in concrete if noted on the drawings.
- E. Fill remaining trench with pit run gravel.
- F. Patch all concrete and/or paved areas cut by excavating and refinish to match adjacent surfaces.
- G. Protect all trenches with suitable barricades and bridges. Adequately protect trenches with signs or flags during the day and with lights at night.
- H. Determine the locations of all existing underground utilities and protect same from damage. Damage to any utility shall be promptly replaced or repaired to the full satisfaction of Utility Company. All costs for repair of damage to such services shall be paid by Contractor causing the damage.
- I. Remove surplus earth from premises or dispose of it on premises as directed by the Architect.

3.3 Cutting and Patching

- A. Avoid cutting of concrete, masonry and other new work by use of sleeves and inserts. Inform the General Contractor of the locations of all sleeves and inserts required and deliver sleeves and inserts to the General Contractor for installation.
- B. Perform cutting and patching when required for installation of new work in existing construction. Methods and procedures shall be acceptable to the Architect.
- C. Cut holes through concrete, brick, tiles etc., when necessary by rotary core drilling. Methods and procedures shall be acceptable to the Architect.

- D. Patching shall match adjacent materials and shall be accomplished only by tradesmen skilled in the respective craft required. Materials and equipment used in the patching work shall comply with requirements of those Sections of the Specifications relating to material to be used in new construction.
- E. Cutting of reinforced concrete suspended floor system and precast structural concrete prohibited unless approved by Structural Engineer. Cutting and drilling, when approved in advance, shall be work of the General Contractor.

3.4 Cleaning and Painting

- A. Spot prime factory finished equipment which has rusted or been damaged with zinc chromate primer. Repaint entire item matching original color.
- B. Division 23 exposed support steel and bare ferrous metal shall be cleaned, rust removed, primed, and painted.
- C. Upon completion of work, all material, fixtures and equipment furnished in this Contract shall be thoroughly cleaned of dirt, stickers, grease, rust, oil and other foreign matter. Prepare for finish painting, where painting is specified.
- D. Clean insulation coverings, size if necessary, and provide ready for finish painting.
- E. Clean and prime ferrous metals which are not provided with rust inhibitive and finish with zinc chromate primer and provide ready for finish painting.
- F. Clean ducts, piping and equipment. Remove dirt, grease, dust and oil; prime where necessary with zinc chromate primer and provide ready for finish painting.
 - 1. Clean galvanized piping and ductwork in exposed areas with diluted acetic acid.
 - 2. Clean copper piping in exposed areas with emery cloth and solvent.
- G. Clean all gauges, thermometers, traps, strainers and fittings.
- H. All insulation coverings shall be cleaned. If pre-sized insulation is not used, insulation coverings shall be sized, if finish painting is required.
- I. Maintain all areas as clean as possible during construction.

3.5 Protection and Finishing

- A. Protect equipment and materials during construction from damage from water, dirt, welding and cutting, spatters paint droppings, etc. by use of shields and drop cloths. Repair or replace as directed any materials damaged during construction operations.
- B. Protect floors from soiling and damage caused by chips and cutting oil.

- C. Cover all site stored motors, bearings, fans, pumps, etc. Protect from soiling and water and weather damage.
- D. All materials or equipment stored outside shall be elevated and protectively covered.
- E. Materials and equipment sensitive to weather or construction conditions shall be stored inside. Where necessary, sensitive equipment shall be stored in a heated area.
- F. Damaged equipment or materials must immediately be repaired or replaced by this Contractor, to the satisfaction of the Architect and at no additional cost to the Owner.

3.6 Tests and Balancing

- A. Perform tests in connection with this work in the presence of the Architect. Furnish all tools, equipment and connections necessary for testing. Notify the Architect at least seventy-two (72) hours in advance of any test. Failure to notify the Architect shall require the test to be performed a second time.
- B. Test piping systems and make tight before any work is concealed, covered or painted. Repair leaks which develop under test in piping by replacement of the pipe, the fitting, or both. Caulking will not be permitted. Material or workmanship found defective in any way, shall be replaced at this Contractor's expense and again tested until approved by the Architect.
- C. Piping shall be tested according to the following schedule:

Line	Test Pressure Medium	Minimum	Test Time Minimum	Notes
Refrigerant	Nitrogen	125 lbs.	24 Hrs.	No Drop

- D. Air balance and tests shall be as specified in Section 230593.
- E. Deliver all performance and inspection certificates to the Architect.

3.7 Electrical Coordination

- A. Electrical Contractor to provide conduit and wiring for devices as indicated on Electrical Drawings and in Specifications. Additional wiring required for equipment furnished under this Division to be a responsibility of this Contractor.
- B. All wiring to be installed in metal conduit and to comply with latest edition of National Electric Code, NFPA 70, and with the Electrical Division of these Specifications, Division 26.

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- C. Furnish to the Electrical Contractor approved wiring diagrams required for equipment furnished in this Contract. This Contractor will be responsible for the successful operation of systems.
- D. This Contractor shall reimburse the Electrical Contractor for any changes, caused by installation of other than base equipment, in wiring and devices required to provide proper connections to equipment furnished. Wiring changes to be submitted to the Architect for review, prior to installation.
- E. Furnish motors for motor driven equipment. Motor horsepower requirements are, in general, specified with equipment. In no instance shall nameplate motor horsepower rating be less than the brake horsepower requirements of the equipment at startup and at specified operating conditions, or less than that shown. Motor service factor to be 1.15.
- F. Motor sizes shown on Drawings are for base Specification equipment. Equipment manufacturers to be responsible for electrical changes required for installation of their equipment.
- G. Motor starters, where specifically noted to be furnished with equipment specified herein, to be magnetic type, NEMA design with hot leg overload protection complete with properly sized heater elements.
- H. Unless otherwise specified, 3 phase motors 1/2 HP and larger to be open drip-proof, NEMA Design B; single phase motors to be permanent-split capacitor or capacitor-start type. Insulation Class "B", "F", or "H".

END OF SECTION 23 00 00

SECTION 23 02 40 - SLEEVES

PART 1 - GENERAL

1.1 Scope

- A. This Contractor shall furnish sleeves for his work to the General Contractor, who installs where directed by this Contractor.
- B. Furnish sleeves for louvers through exterior walls.

PART 2 - PRODUCTS

2.1 Sleeve Material

- A. In wood framed wall and floor openings: Galvanized sheet metal.

PART 3 - EXECUTION

3.1 Installation

- A. Furnish sleeves sized to provide an annular space of 1/4" between the sleeve and duct. Use 1/2" annular space for pipes less than 1".
- B. Sleeves through walls and roofs shall be cut flush with each surface, except where clamping flanges are use.
- C. In sleeves through exterior wall, pack annular space with insulating material, seal and make waterproof.
- D. Seal off all spaces around rectangular ducts through walls with sheet metal flanged collars.

END OF SECTION 23 02 40

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SECTION 23 02 90 – HVAC SHOP DRAWINGS

PART 1 - GENERAL

1.1 Scope

- A. Submit six (6) copies of shop drawings for review of the following equipment. Submittals shall include, but not limited to the following:

- | | |
|-----------------|-------------------------|
| 1. Exhaust Fans | 4. Temperature Controls |
| 2. Air Devices | 5. Air Balance Reports |
| 3. Louvers | 6. Sleeves |

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.1 Procedures

- A. Check, sign and approve all shop drawings. Drawings not signed and approved by the Contractor will be returned.
- B. Submit shop drawings for all items of equipment, piping, and insulation for review before construction. Prepare required drawings at sufficient scale to clearly show details of construction, physical dimensions and related work of others. Review of shop drawings shall not relieve the Contractor of responsibility for accuracy of shop drawings or of full requirements of the Contract drawings.

END OF SECTION 23 02 90

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SECTION 23 05 48 - VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 Scope

- A. Furnish and install vibration and noise isolation for equipment as herein specified.
 - 1. Install ceiling spring isolators for all suspended fans.

PART 2 - PRODUCTS

2.1 General

- A. All vibration isolation materials specified herein shall be provided by a single manufacturer to assure single source responsibility for the proper performance of materials used.
- B. Vibration isolation materials are based on Peabody Noise Control. Optional manufacturers: Mason.

2.2 Spring Isolators, Suspended Equipment

- A. Combination Spring and Fiberglass Hangers, incorporating pre-compressed molded fiberglass noise and vibration isolation pads, coated with a moisture impervious elastomeric membrane in series with springs, all encased in welded steel brackets. Springs shall be as specified in 2.03A above. Isolators shall be designed for 50% overload capacity, and shall accommodate rod misalignment over a 30 degree arc. Brackets shall be designed to carry 500% overload without failure.
- B. Spring isolators are based on Kinetics type SFH springs.

PART 3 - EXECUTION

3.1 Installation

- A. Install vibration and noise isolation products in accordance with manufacturer's installation instructions.

END OF SECTION 23 05 48

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SECTION 23 05 93 – TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 Scope

- A. Balance shall include all air systems.
- B. Balance shall be performed by an independent contractor certified by the Associated Air Balance Council or National Environmental Balancing Bureau. Acceptable contractors must be listed in the latest directory of the certifying agency.

PART 2 - MATERIALS

2.1 Equipment

- A. Furnish all tools, equipment, connections and labor necessary for testing and balancing all systems.

PART 3 - EXECUTION

3.1 Air Balance

- A. All air systems shall be put in operation and mechanical adjustments to equipment shall be made to insure proper functioning. Adjust drives to run at proper speeds to deliver required amount of air or water.
- B. Balance all air supply, return and exhaust systems to quantities specified and balance systems to maintain uniform temperature throughout each space, free of objectionable draft. Lock volume dampers in position. Test all motor operated dampers and valves for proper operation.
- C. Adjust system controls so each component performs and delivers its capacity. Record balance readings and test data, and submit three (3) copies of test results to Architect for approval.
- D. Testing and balancing shall be performed in complete accordance with certifying agency's standards.
- E. After all equipment and systems have been tested, adjusted and balanced, demonstrate to the Owner and Architect that heating and ventilating systems are operating and performing to meet requirements of this Contract. The demonstration shall include all areas of building for "spot-check" of air quantities, velocity, temperature and operation and performance of equipment and controls.
- F. Report shall include starter element size and rating for each motor.

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- G. Air quantities at individual registers or diffusers shall be adjusted to within 10% of quantities shown on the Drawings and total air quantity handled by each system to within 5% of the quantity shown or specified.

END OF SECTION 23 05 93

SECTION 23 30 00 – HVAC AIR DISTRIBUTION

PART 1 - GENERAL

1.1 SCOPE

- A. Furnish and install a complete air distribution system for the exhaust systems for the building as shown on the drawings and as herein specified.
- B. Include cleaning, testing, balancing and adjusting the air systems for proper air circulation to each area of the building.

1.2 QUALITY ASSURANCE

- A. Ductwork shall meet the requirements of:
 - 1. SMACNA - HVAC Duct Construction Standards, Metal and Flexible (latest edition), except as noted:
 - a. All ductwork must comply with any applicable local, state, and federal code requirements.
 - 2. NFPA 90A Standard for the Installation of Air Conditioning and Ventilating Systems.
 - 3. State Mechanical Code.
 - 4. The contractor must comply with the enclosed specifications in its entirety. If on inspection, the engineer of record finds changes have been made without prior written approval, the contractor will make the applicable changes to comply with this specification at the contractor's expense.
 - 5. At the discretion of the engineer of record, sheet metal gauges and reinforcing may be randomly checked to verify all duct construction is in compliance.
 - 6. All ductwork and fittings must have a computer generated label affixed to each section detailing all applicable information including the duct dimensions, gage, reinforcement type/class, and connector type of systems manufacturer. In addition, galvanizing thickness and country of origin must be clearly stenciled on each duct section.

1.3 GUARANTEE

- A. Contractor will guarantee all work for one year from the date of acceptance against all defects in material, equipment and workmanship. This guarantee shall include repair of damage to any part of the premises resulting from leaks or other defects in material equipment or workmanship.

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PART 2 - PRODUCTS**2.1 METAL DUCTWORK**

- A. All interior ducts shall be constructed with G-60 or better galvanized steel conforming to ASTM A653/A653M and A924/A924M Standards.
- B. Deflection Limits: Shall conform to the SMACNA Manual (Latest Edition).

2.2 RECTANGULAR AND ROUND DUCTWORK (MAX. 1" W.G. OPERATING PRESSURE)

- A. Rectangular ducts shall be constructed and reinforced per SMACNA Duct Construction Standards (latest edition), except as follows:

- 1. Minimum duct gauges shall be as follows:

<u>Largest Dimension</u>	<u>Gauge</u>
Thru 12"	26
13" to 30"	24
31" to 54"	22
55" to 84"	20

- 2. Hangers and Supports:

- a. Hang and support ductwork as defined in SMACNA Manual (latest edition) or as defined within.
- b. Aircraft cable hanging system with easy lightweight mechanical adjustment system shall have a 5 to 1 safety factor.

Approved Manufacturer: Ductmate Industries "Clutcher" Cable Hanging System or approved equal.

- c. Support, bar/angle reinforcements, and other products that are not part of the duct that are manufactured of uncoated mild steel shall either be painted with two coats or primer or shall be manufactured of a galvanized equivalent material.

- 3. Fittings and other construction:

- a. All duct fittings and other duct constructions shall be in accordance with the latest SMACNA standards.

B. Round and oval ducts shall be constructed and reinforced per SMACNA Duct Construction Standards, (latest edition) except as follows:

1. Minimum duct gauges shall be as follows:

<u>Diameter</u>	<u>Spiral Seam Gauge</u>	<u>Longitudinal Seam Gauge</u>
Thru 12"	28	26
13 to 18"	26	24
19 to 28"	24	22
29 to 36"	22	20
37 to 52"	20	18

2. Hangers and Supports:

a. Hang and support ductwork as defined in SMACNA Manual (latest edition) or as defined within.

b. Aircraft cable hanging system with easy lightweight mechanical adjustment system shall have a 5 to 1 safety factor.

Approved Manufacturer: Ductmate Industries "Clutcher" Cable Hanging System or approved equal.

c. Support, bar/angle reinforcements, and other products that are not part of the duct that are manufactured of uncoated mild steel shall either be painted with two coats or primer or shall be manufactured of a galvanized equivalent material.

3. Fittings and other construction:

a. All duct fittings and other duct constructions shall be in accordance with the SMACNA Manual (latest edition).

C. Duct sealing

1. All ductwork shall be sealed in accordance with S.M.A.C.N.A. (latest edition) "C" Class or better.

2. Duct systems operating in excess of 3" static pressure shall be leak tested in accordance with S.M.A.C.N.A. HVAC Duct Leakage Test Manual (latest edition).

3. Pressure sensitive tape shall not be used as the primary sealant for duct systems operating greater than 1.0" W.C.

4. Sealants

- a. Joint & Seam Sealant: Shall be flexible, water-based, adhesive sealant designed for use in all pressure duct systems. After curing, it shall be resistant to ultraviolet light and shall prevent the entry of water, air, and moisture into the duct system. Sealer shall be UL 723 listed and meet NFPA requirements for Class 1 ductwork. Sealant shall contain no V.O.C.

Approved Manufacturer: Ductmate Industries PROseal or approved equal.

- b. Joint & Seam Sealant (Solvent): Solvent based sealant designed in all pressure duct systems for use at low temperature applications below 32 degrees F. Shall be resistant to ultraviolet light and shall prevent entry of water and moisture into the duct system. Sealant shall be UL 723 listed and meet NFPA requirements for Class 1 ductwork.
- c. "T" Type Flange Gasket: A butyl rubber gasket which complies with UL 723 and meets Mil-C 18969B and TTS-S-001657. This material, in addition to the above, shall not contain vegetable oils, fish oils, or any other type vehicle that will support fungal and/or bacterial growth.

2.3 FLEXIBLE DUCT CONNECTIONS (EQUIPMENT)

- A. Flexible duct connections shall be Duro-Dyne "Thermafab" Ductmate "Proflex" or equal (UL listed). Flexible connectors shall be pre-assembled with 24 gauge, 3-inch wide metal edges on both sides of the fabric secured by means of double lock seam.
1. Flexible duct connector shall be used where ductwork connects to fans of apparatus, or apparatus casing to fans to isolate vibration transfer. Connectors shall be attached in such a manner as to provide an airtight and waterproof seal.
 2. Connectors will comply with NFPA 90A, "Installation of Air Conditioning & Ventilation Systems" and NFPA 90B, "Installation of Warm Air Heating & Air Conditioning Systems".
 3. Indoor installations shall be of UL 214 listed, fire retardant Vinyl coated woven nylon or Neoprene coated woven fiberglass fabric. Minimum density of Vinyl is 20 oz./sq. yd. and rated to 200 F. Minimum density of Neoprene 30 oz./sq. yd. and rated to 200 F.

2.4 VOLUME BALANCING DAMPERS

- A. Single blade and multi-blade dampers: Galvanized steel dampers with locking quadrant operators and linkage per SMACNA Fig's. 2-14 and 2-15. Maximum single blade size: 12" high x 18" wide.

- B. Spin-in taps: Galvanized steel construction with 45 degree extractor and locking quadrant operator.
- C. Remote adjustment of round dampers above drywall ceilings. Young Regulator No. 270 rack and pinion operator with mounting bracket in ceiling and cable and wire to damper. Furnish one socket wrench for control of all dampers.

PART 3 - EXECUTION

3.1 DUCTWORK

- A. All ductwork shall be constructed, joined, braced and supported in accordance with the latest standards of SMACNA.
- B. All duct runs shall be coordinated with building conditions (structural, piping, etc.) and work by other contractors. Provide off-sets or duct size modifications as required for clearance. All changes must be approved by the Architect prior to installation.
- C. Run all ductwork concealed in finished areas.

3.2 BALANCING DAMPERS

- A. Furnish and install manual balancing dampers in all ducts as required for balancing. Provide access to quadrant through externally insulated ducts.

END OF SECTION 23 30 00

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SECTION 23 34 00 - HVAC FANS

PART 1 - GENERAL

1.1 Scope

- A. Furnish and install cabinet exhaust fans as noted on the drawings and specified herein.
- B. Furnish prefabricated insulated roof caps compatible with equipment furnished.

PART 2 - PRODUCTS

2.1 Ceiling Mounted Fans

- A. Ceiling mounted fans shall be Greenheck as scheduled on the drawings or equal by Cook, Penn, Jenco-Fan or ACME.
- B. Fans shall have insulated housings, integral plastic grille, disconnect, back draft damper, motor with thermal overload protection, and be furnished with controls as specified in exhaust fan schedule.

PART 3 - EXECUTION

3.1 Installation

- A. Coordinate location of all equipment with Architect in field.
- B. Bolt or weld all roof mounted equipment to curbs.
- C. Coordinate electrical requirements of all fans with Electrical Contractor.
- D. All roof openings and curb mounting for fans shall be by the General Contractor.
- E. All roof patching and flashing shall be by the Roofing Contractor.

END OF SECTION 23 34 00

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SECTION 23 37 13 – DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 Scope

- A. Furnish and install air devices and louvers as noted on the drawings or specified herein.

PART 2 - MATERIALS

2.1 Diffusers, registers and grilles

- A. Diffusers, registers and grilles shall be by Titus as scheduled on the drawings or equal by Anemostat, Metal-aire, Tuttle and Bailey, Krueger, Price, or Carnes.
- B. All devices shall mount flush in the ceiling or as noted on the drawings.
- C. Linear supply air and return air devices shall have alignment and trim strips to provide a continuous appearance. Air devices shall be furnished with pattern adjustment and equalizing grids.
- D. All devices shall have a factory baked enamel finish as scheduled on the drawings. Finish shall be selected by Architect.
- E. For air device capacities, sizes and type, refer to Schedule on drawings.

2.2 Stationary Louvers

- A. Airolite K6776 extruded aluminum stationary louver type with minimum 12 gauge blades and frame and 1/2" aluminum mesh screen inside. Baked enamel finish, color as selected by Architect.
- B. Optional manufacturers: Louvers and Dampers, Ruskin, American Warming and Ventilating.

2.3 Louver Finishes

- A. Finish: Exposed aluminum shall receive factory applied baked fluorocarbon coating system equal to "Duramar" by PPG, a 2 coat system with total minimum dry film thickness of 1.2 mils. Coating system to comply with the published specifications by PPG and meet requirements of AAMA 605.2.
- B. All finishes shall be colors selected by Architect.

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2.4 Louver Manufacturers

- A. Louvers based on products manufactured by Airolite. Provide conforming products from one of the following:
 - 1. Airolite.
 - 2. Airstream.
 - 3. American Warming and Ventilating.
 - 4. Construction Specialties.
 - 5. Ruskin.

PART 3 - EXECUTION

3.1 Diffusers, Registers and Grilles

- A. Verify final locations of air devices as shown on the drawings with Architect or architectural reflected ceiling plan.
- B. Support air devices in suspended ceilings by the use of independent hangers or rigid duct connections.
- C. Air devices in lay-in type ceilings may be supported by the ceiling system.
- D. Use flexible ducts when making duct connections to lay-in outlets.

3.2 Louvers

- A. Louvers shall be furnished to the General Contractor with mounting sleeve for installation. This Contractor shall locate opening for General Contractor with approval by Architect.

END OF SECTION 23 37 13

Division 26

Electrical

Coffman Park Expansion

Phase 2A

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SECTION 26 05 00 - BASIC ELECTRICAL REQUIREMENTS

PART1 - GENERAL

1.1 Reference

- A. The Contractor for this work is referred to Instructions to Bidders, General Conditions and Special Conditions, temporary power and other pertinent sections of Architectural Specifications, as though written herein full. They shall be a part of this Contract.

1.2 Scope of Work

- A. The Contractor shall furnish all materials, labor, tools, transportation, incidentals and appurtenances to complete in every detail and leave in working order all items of work called for herein or shown on the accompanying drawings.
- B. Include all minor items of work necessary to provide complete and fully operative lighting and power systems.

1.3 Permits, Inspections and Codes

- A. This Contractor shall file all drawings, pay all fees, and obtain all permits and certificates of inspection relative to his work.
- B. Complete installation shall conform with all applicable Federal, State and Local Laws, Codes and Ordinances, including but not limited to the latest editions of the following:
 - 1. National Electrical Code (NFPA-70)
 - 2. Life Safety Code (NFPA-101)
 - 3. State building code
 - 4. Occupational Safety and Health Act (OSHA)
 - 5. State Energy Code
- C. Nothing contained in the drawings and specifications shall be construed to conflict with these laws, codes, and ordinances and they are hereby included in these specifications.
- D. This Contractor shall arrange for and include in his bid, fees for inspection of this work per requirements of Section 26 0510.
- E. A copy of final inspection certificate shall also be turned over to the Architect before final payment will be made.

1.4 Operating and Maintenance Instructions

- A. Contractor shall instruct Owner's representative in all matters pertaining to the proper operation and maintenance of the systems and equipment which he furnishes under this Contract.

- B. Submit three (3) sets of instructions in hard bound three-ring notebooks, including installation, maintenance and operating instructions, pamphlets or brochures and warranties obtained from each manufacturer of principal items of equipment, and all approved shop drawings. Manual shall be completely indexed with similar equipment properly grouped in sections. Reference Architectural Specifications.
- C. Copies of warranties on all equipment shall be included with this data.
- D. Copies of all tests shall be included with this data.

1.5 Drawings

- A. Drawings are schematic, and show approximate locations of conduit and equipment. Exact locations shall be coordinated by Contractor and verified in field.
- B. Significant deviations from drawings must be approved by Engineer.
- C. The layout shown on the drawings is based on a particular make of equipment. If another make of equipment is used which requires modification or changes of any description from the drawings or specifications, the Contractor shall be responsible as a part of this work, for making all such modifications and changes, including those involving other trades, with the cost thereof included in his bid. In such case, Contractor shall submit drawings and specifications prior to starting work showing all such modifications and changes. His proposal shall be subject to the approval of the Architect.
- D. Engineer reserves the right to make minor changes in location of conduit and equipment, up to the time of rough-in, without additional cost.
- E. If a conflict occurs between the drawings and specifications, the discrepancies must be called to the Engineer's attention immediately before bid date.
- F. Contractor is responsible to review architectural and structural drawings to make sure he has all work complete. No later applications for increased cost will be allowed.

1.6 Guarantee

- A. Contractor is responsible for all defects, repairs and replacements in materials and workmanship, for a period of one (1) year after final payment is approved.

1.7 Record Drawings

- A. Record any change in location of equipment, of concealed conduit, and underground services on a set of prints and deliver them to the Architect upon completion of work. Reference Architectural Specifications.
- B. Record exact location and depth of exterior work carefully for future reference. All referenced shall be permanent landmarks.

PART 2 - PRODUCTS**2.1 Materials**

- A. All materials shall be new and undeteriorated and of a quality not less than the minimum specified.
- B. It is the intent of this article to make the specifications open in every respect to all available brands of material of equal quality during the period of bidding.
- C. Manufacturer's directions shall be followed in all cases where manufacturers of articles used in the Contract furnish directions covering points not shown on the drawings or specifications.

2.2 Equipment Selection and Approval

- A. The selection of materials and equipment to be furnished under this Contract shall be governed by the following:
 - 1. Where several trade names, brands, or manufacturers of equipment or materials are listed, the Contractor shall have the option of selecting any one of the several brands specified.
 - 2. Where the term "approved equal" is used, this shall be construed to require approval in writing from the Architect and Engineer prior to bid.

2.3 Substitutions

- A. The Contractor shall base his bid on furnishing the brands of material and equipment specifically mentioned in the specifications. He is also invited to bid on any other equal or similar brands of material and equipment he may desire to furnish or substitute, stating the difference in cost if any. These other brands must be clearly listed on a substitution sheet. Reference Architectural Specifications.
- B. Substitutions which are accepted shall be written into the Contract and no changes of brands shall be made after the Contract is signed, unless in writing by the Architect.
- C. Refer to Architectural Specifications for other requirements regarding substitutions.

2.4 Manufacturer's Drawings

- A. This Contractor shall submit to the Architect for review copies of manufacturer's drawings, wiring diagrams, or other data for the items listed. Refer to Architectural Specifications for submittal requirements.
- B. All shop drawings shall be reviewed and clearly stamped and signed by the Contractor prior to submittal.

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- C. All catalog cuts shall be either originals or high quality and totally legible first generation copies.
- D. All cut sheets shall contain the name of the manufacturer of the item submitted.
- E. Clearly identify on each cut sheet submitted, the item to which it pertains with the proper designation or use, the catalog number and other pertinent information marked.
- F. Furnish detailed drawings or catalog cuts of the following:
 - 1. Wiring Devices
 - 2. Panelboards
 - 3. Contactors
 - 4. Transformers
 - 5. Lighting Fixtures
 - 6. Ballasts
 - 7. Lamps
 - 8. Time Clocks
 - 9. Electric Heaters

PART 3 - EXECUTION

3.1 Protection and Cleaning

- A. Protect all fixtures against damage from any cause whatsoever, and pay the cost of replacing and repairing fixtures made necessary by failure to provide suitable protection.
- B. After all fixtures have been installed, thoroughly clean all fixtures, removing all stickers and other foreign matter and leave every fixture in acceptable condition, clean and ready for use. Install all new lamps and check (at Contractor's expense) for satisfactory operation.
- C. Repair all dents and scratches in factory prime or finish on all electrical equipment to the satisfaction of the Architect. If damage is excessive, replacement will be required.

3.2 Cutting and Patching

- A. In new construction, this Contractor shall plan his work ahead and place sleeves in walls, floors, and ceilings and anticipate during initial stages of construction, such openings as will be required to accommodate his equipment. This Contractor shall coordinate his work closely with the General Contractor to conceal his work in the finished portion of the building.
- B. Avoid cutting concrete, masonry and other work by inserts and sleeves.
- C. Patching shall match existing surfaces in kind and finish and shall be done by the General Contractor at this Contractor's expense.
- D. Give the General Contractor locations and sizes of all openings required for the installation of electrical equipment, before walls, etc., are started. If it becomes necessary to cut into new work because of failure of this Contractor to notify the

General Contractor, then the General Contractor shall do any necessary cutting and patching at this Contractor's expense.

- E. Sleeves through fire-rated construction shall be packed with sodium silicate or other approved packing. Reference Section 26 0530 of Specification.

3.3 Excavation and Backfill

- A. Provide all trenching required to install underground wiring. Remove forms and debris before backfilling. Tamp and compact backfill to bring level with existing grade. Replace surface to match existing sod, gravel, blacktop or concrete. Reference Architectural Specifications for earth work requirements.

3.4 Concrete Bases

- A. Coordinate installation with General Contractor. Installation of concrete pads for electrical items is provided in the General Contract. Reference Architectural Specifications, cast in place concrete.
- B. Installation of concrete encasements around conduits and concrete bases for site fixtures are the responsibility of the Electrical Contractor.

3.5 Identification Nameplates

- A. Each piece of distribution equipment and individual switches, all disconnects, starters, all exhaust fan manual starting switches, all power and lighting panels, all cabinets and pull boxes for auxiliary systems, such as telephone, sound systems, fire alarm, and emergency exit lights etc., shall be identified on the front cover or trim with it's name and/or designation number or letter as shown on the drawings and with the voltage available within the panel. Nameplates shall be laminated plastic lagged to enclosure. White letters on black for normal power, white letters on red for emergency systems as indicated on the following examples:

Panel L1
120/208 V. 3ph 4 w.

Tele. Cab.
TC-1

Toilet Exh. Fan

3.6 Specific Prohibitions

- A. Ceiling grid systems shall not be used to support lighting fixtures, electrical conduit or other electrical items. New electrical work and the ceiling grid system shall be separate installations and each shall be independently supported. The Contractor must install trapeze type hangers or supports which shall not be located where they interfere with access to fire dampers, valves, light fixtures and other mechanical or electrical equipment items.

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- B. Provide a minimum of two (2) hanger wires similar to ceiling grid hanger wires from opposite corners of recessed lay-in lighting fixtures.

END OF SECTION 26 05 00

SECTION 26 05 10 - ELECTRICAL TESTS, ADJUSTMENTS & INSPECTIONS**PART 1 - GENERAL****1.1 Scope**

- A. Contractor shall conduct such tests and adjustments of equipment as necessary to verify performance requirements. Submit data taken during such tests to Engineer. Pay all professional engineering fees involved in required testing of equipment.
- B. Provide necessary electrical personnel and testing instruments as required in testing of installation.
- C. All signaling systems, such as fire alarm systems, shall be checked out and tested by qualified representative of equipment vendor. A report shall be submitted by vendor representative indicating results of such final check out and test.
- D. Upon completion of electrical work, test the full load lighting and appliance phase balance of the service and distribution feeders. Tests to be witnessed by the Engineer and these results recorded and reported in writing and included in Maintenance Manuals.
- E. Optimum phase balance under full load condition to be obtained by reconnection of panelboard feeders at the main switchboard. Any panelboards requiring circuit changes for balance shall reflect those changes in the panel directory and wire identification.
- F. Special attention to be made to preserve rotation of motors during load balance and adjustments.
- G. Test lines before burying or covering with new construction.
- H. Tests shall include:
 - 1. Proper operation of lights and equipment
 - 2. Continuity of conduit system
 - 3. Insulation leakage and impedances
 - 4. Ground system resistance
 - 5. Any sub-system tests described in other Sections of these specifications
- I. Adjustments shall include:
 - 1. Load balancing of all electrical phases, at device and panels.

1.2 Arrangements for Inspection

- A. Provide electrical inspection of all work by legal Public Inspection Authorities

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having jurisdiction over this project.

- B. Contractor shall include cost of any fees in his bid.

1.3 Certificate

- A. Furnish to Architect in triplicate, a certification of inspection and approval for inspection authority before final payment on Contract will be made.

END OF SECTION 26 05 10

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SECTION 26 05 13 - SCHEDULING OF WORK

PART 1 - GENERAL

1.1 Scope

- A. Contractor shall reference the General Conditions prior to his bid for a clarification as to how the building addition, demolition and new work will be scheduled and the specific requirements for working in the occupied areas of the facility and any special requirements for prime time labor.

1.2 Interruptions of Electric Service

- A. Schedule work such that when power outages are required, they shall be of minimal duration. Length not to exceed time dictated by Owner and during hours when facility is closed.
- B. Schedule all power outages with Owner at least seven (7) days prior to outage.

END OF SECTION 26 05 13

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SECTION 26 05 20 - CONDUCTORS AND GROUNDING

PART 1 - GENERAL

1.1 Scope

- A. All wiring required under the Electrical Contract to connect a complete lighting and power distribution system as shown on the drawings, complete with any and all auxiliary system and control wiring, shall conform to the following.

1.2 Related Work Described Elsewhere

- A. Section 26 0530 - Conduit and Wireway Systems

PART 2 - PRODUCTS

2.1 Wiring

- A. All conductors shall be stranded and of the AWG size and type shown on the Drawings. Where no size and/or type is shown, conductors shall not be less than #12 type THHN or XHHW and shall be sized for the overcurrent device ampere rating per NEC Article 310. All conductors shall be copper and have 600 volt 90 degrees C rated insulation; be U.L. labeled.
- B. All conductors shall be stranded and conform to the latest edition of the Underwriter's Laboratories, Inc., "Standard for Rubber Covered Wires and Cables" and the National Electrical Code.
- C. Aluminum conductors are not acceptable and will not be permitted.
- D. Manufacturers of wire and cable shall be Triangle, General Wire and Cable, Anaconda, National Electric, Olonite, G.E. or equal.
- E. All make-up connections to fluorescent lighting fixtures shall be rated 90 degrees C.
- F. All wiring shall be color coded:

	<u>120/208 Volt</u>	<u>277/480 Volt</u>
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Grey
Equip. Ground	Green	Green
Isolated Ground	Green w/ White	
	Tracer	

PART 3 - EXECUTION**3.1 General Installation**

- A. Only use of powdered soapstone or "Y-er-eas" is permitted in pulling in conductors. Install Thomas & Betts type WM vinyl markers to identify branch circuits where they enter panelboards, and in all raceways and at J-boxes.

3.2 Exit Light and Emergency Circuit Wiring

- A. All exit light and emergency circuit wiring shall be as shown on the drawings and shall be run in conduit and separate from any other circuits. Branch circuit wiring shall be #10 minimum.
- B. Wire insulation shall be color coded the same as the respective voltage building wiring, and identified with 1/2" wide red tape wrapped twice around at not more than 12" intervals at all access points.

3.3 Grounding

- A. Provide code required grounding of the service and service entrance equipment. All feeders and branch circuits over 100 volts shall include a grounding conductor. Size in accordance with NEC Table 250-66 and/or table 250-122 except not smaller than #12 for power and lighting circuits and #14 for control circuits. All ground conductors shall be green.
- B. All enclosures, boxes, fixtures, receptacles, etc., shall be grounded by being securely bonded to the grounding conductor. Boxes, conduit, etc., shall not be used as part of the grounding "conductor" system.
- C. All panels shall be furnished with a copper ground bar similar to the neutral bar and having the same number, size and type of lugs. Enclosures, junction and pull boxes shall utilize a "panel" type ground bar or UL listed grounding lugs or screws, as the number of ground conductors dictates.
- D. Enclosures not requiring a ground bar shall have all ground conductors connected together and pigtail the size of the largest conductor bonded to the enclosure with a single ground connector used for no other purpose.
- E. At each receptacle box, the ground conductor shall enter and connect, with normal wiring connector, to: (1) the ground pigtail to receptacle; (2) the ground pigtail to box clip or screw ground; (3) the outgoing ground conductor to next device, if not at end of run. Metal-to-metal contact between the device yoke and the outlet box is not acceptable as a bond for either surface-mounted boxes or flush-type boxes.
- F. Motor terminal boxes shall be grounded by the use of a manufacturer supplied ground lug or by drilling and tapping a hole for a ground screw. Remove paint prior to making the connection.

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- G. Lighting fixtures shall be grounded by the use of manufacturer supplied ground lug or pigtail or by the use of ground clips fastened on bare metal that is free of paint.
- H. Grouping of multiple branch circuits into a single larger conduit is not permitted. Circuits to be installed on basis of one (1) multiwire single phase (A,B,C,N) or one (1) 3 phase (A, B, C) circuit per conduit run unless shown otherwise.
- I. For general power, not more than three (3) 120 volt circuit wires (3 phase, 4 wire) may be served with a single neutral and in no instance may a single neutral be used when two (2) circuit wires are connected to the same phase bus of the panelboard.
- J. All lighting circuits shall be run with dedicated neutral.
- K. All wiring to be in conduit or an approved raceway.
- L. Joints and splices to be located only at accessible boxes.
- M. Electrical tape to be pressure sensitive plastic same or equal to 3-M Company "Scotch No. 88", all temperature type.
- N. Joints in wire No. 10 AWG and smaller to be made with plastic or nylon screw on type connectors. 3-M Company "Scotch Locks", Ideal Co. "Wing-Nut", or Thomas and Betts Co. "Piggy". Bakelite insulated wirenuts shall not be used.
- O. Joints in wire No. 8 AWG and larger to be made by crimp type mechanical connectors insulated with electrical tape to 150% of the insulating value of the conductor insulation.
- P. No. 4 AWG conductors and larger in conduit terminals 1-1/2" and smaller with non-insulating end bushing to have "insuliners" installed around the conductors at the conduit end bushings. (Note that 1-1/2" and larger end bushings are specified as insulating type in the "Installation of Conduit and EMT" section of these specifications.
- Q. Stranded wire #10 and smaller to be terminated with compression type self-insulating spade terminals where they connect to devices or equipment under screw or bolt heads or under bolt and nut.

END OF SECTION 26 05 20

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SECTION 26 05 21 - METAL CLAD CABLE

PART 1 - GENERAL

1.1 Scope

- A. The Contractor, at his option, may use metal clad cable type "MC" (no BX or Type AC acceptable) for branch circuits when following conditions are met:
 - 1. Approved by local code jurisdiction.
 - 2. Maximum 20 AMP branch circuits.
 - 3. #12 or #10 stranded copper conductors with THHN insulation including an insulated ground.
 - 4. Installed concealed above ceilings or in interior walls in dry locations only. (Exposed 'MC' cable will not be allowed.)
 - 5. Installed in strict compliance with latest edition of National Electric Code and as described herein.
 - 6. MC cable for wiring in patient care areas shall be "hospital rated" cable.

1.2 Related Work Described Elsewhere

- A. Section 26 0530 - Conduit and Wireway Systems
- B. Section 26 0520 - Conductors and Grounding

PART 2 - PRODUCTS

2.1 Metal Clad Cable

- A. Metal clad cable shall be interlocking or continuous galvanized steel sheath type with continuous ground wire (using sheath as ground is unacceptable), #12 or #10 stranded copper conductor, 600 volt THHN insulation rated at 90 degrees C., U.L. labeled.
- B. References and Ratings for Cable:
 - 1. U.L. 83, 1479, 1569 and 1581.
 - 2. Shall meet all applicable OSHA and HUD requirements.
 - 3. Shall be U.L. rated for installation in environmental air handling space.
 - 4. Shall be rated for 3 hour fire wall penetration.
- D. Connectors shall be those specifically designed for use with MC cable (Romex and BX connectors are not acceptable).

PART 3 - EXECUTION**3.1 Installation**

- A. 'MC' cable shall be installed in strict compliance with all applicable articles of the National Electric Code and as described herein.
- B. 'MC' cable shall be installed in a neat and orderly manner, perpendicular and parallel to building lines.
- C. Cable shall be installed in building concealed above ceiling or in interior walls only. No exposed 'MC' cable will be allowed.
- D. In any room, including mechanical, electrical, service rooms, stairwells, etc., where wiring cannot be concealed, it must be installed in conduit.
- E. Where 'MC' cable is installed in accessible attic spaces and run across the top of joists, studs or rafters, the cable shall be protected by guard strips in accordance with the National Electric Code. Guard strips are not required if the 'MC' cable is installed parallel to the sides rafters, studs, or joists.
- F. Where 'MC' cable is installed above accessible ceilings, the cable must be supported at code required intervals.
- G. 'MC' cable may be supported from conduit supports or provide independent support wires from structure with clips to secure cable. Clips shall be designed and manufactured for this use.
- H. 'MC' cable shall not be supported from conduits, piping, ductwork, ceiling grid wires, etc.
- I. DO NOT allow 'MC' cable to lay on ceiling grid system or be in contact with any piping or ductwork.
- J. DO NOT expose 'MC' cable on wall at surface mounted panelboard. Where 'MC' cable is used for homerun circuit(s) to a surface mounted panelboards, one of the two following methods shall be used and shall be consistent throughout the building.
 - 1. Provide 'EMT' conduits from panelboard to above ceiling. Install 'MC' cable in these conduits from above ceiling to panel.
 - 2. Provide wire in 'EMT' conduit from panel to above ceiling, extend to first splice point in circuit. At that location 'EMT' conduit with wire may be converted to 'MC' cable.
- K. Where 'MC' cable penetrates fire rated construction, provide fire stopping per code and as approved by the local authority having jurisdiction.

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- L. At lighting fixture, device or equipment being fed by 'MC' cable, provide an appropriate junction or outlet box for wiring connections and mounting. 'MC' cable punched thru wall, ceiling or into cabinetry is unacceptable.

END OF SECTION 26 05 21

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SECTION 26 05 30 - CONDUIT AND WIREWAY SYSTEMS

PART 1 - GENERAL

1.1 Scope

- A. Unless specifically noted otherwise, all wiring shall be run in and protected by a conduit system. Minimum conduit size to be 3/4" for homeruns to panelboards, 1/2" for branch circuit wiring, 1" minimum when in concrete slab or below grade.
- B. Leave pull wire in all empty conduits.

1.2 Related Work Described Elsewhere

- A. Section 26 0520, Conductors & Grounding.
- B. Section 26 0521, Metal Clad Cable.

PART 2 - PRODUCTS

2.1 Conduit

- A. Furnish UL labeled, galvanized rigid steel or EMT (thinwall) conduit as manufactured by LTV, Pittsburgh Standard Conduit Co., National Electric, Youngstown Sheet and Tube Co., ETP or Allied.
- B. PVC Conduit to be schedule 40 minimum as manufactured by Carlon or equal.
- C. Use flexible neoprene-clad galvanized steel conduit for short "make-up" connections to mechanical equipment and transformers. Fittings shall be Midwest type LT-5 or #405.
- D. Use flexible galvanized steel conduit for connections to lighting fixtures, length not to exceed 6'-0".

2.2 Boxes

- A. Flush outlet, junction and pull boxes to be pressed steel, galvanized or sherardized, minimum 4" square.
- B. Flush wall boxes in tile, marble, block or other finished masonry wall to be Steel City GW-135 Series or Raco 695 Series. Floor boxes to be fully adjustable Hubbell #B-2537 with flush round coverplate suitable for final floor finish. Use Hubbell SC series service fittings where noted on the drawings.
- C. Boxes for exposed work in finished areas to be Type FS or FD with threaded hubs and rigid conduit risers.
- D. All electrical boxes including outlet boxes, junction boxes, etc. shall be installed flush in all new construction.

2.3 Conduit Fittings - Metallic

- A. All EMT connectors and fittings shall be the die cast set screw type by Thomas and Betts, Raco, Steel City or Midwest.
- B. All rigid conduit shall have threaded connections.
- C. Liquid tight flexible metallic fittings shall be similar to Steel City XC-241. Contractor may use equal by Midwest, Kalo or Thomas and Betts.

PART 3 - EXECUTION**3.1 Conduit Installation**

- A. Conduit types to be used are as follows:
 - 1. Use rigid galvanized steel conduit when;
 - a. Exposed below 8'.
 - b. In exterior masonry walls.
 - c. In tunnels.
 - 2. Use electric metallic tubing (EMT) when;
 - a. Exposed above 8'.
 - b. Concealed in interior walls.
 - 3. Use Schedule 40 PVC conduit when;
 - a. Run below slab or grade (convert to rigid galvanized steel prior to exiting slab).
 - 4. Seal-tite flex conduit;
 - a. Make up to all motorized equipment.
 - b. Connections to transformers.
 - 5. Flex conduit;
 - a. Make up to recessed lighting fixtures, length not to exceed 6'.
- B. Conduit must be concealed in all finished areas.
- C. Secure rigid conduit at cabinets with double lock nuts with bushed end. Use insulated throat connectors. Run conduit parallel or perpendicular to building lines and support by pipe straps or hangers attached rigidly to the building structure. Keep conduit runs close to underside of structure as possible. Do not support conduits from ceiling system.
- D. Exposed conduits rising from floor to surface-mounted panelboards shall have a 3" high concrete curb with chamfered edges by General Contractor.

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- E. Do not run conduit in slabs under boilers, hot water heaters or other heat-producing equipment and maintain minimum of 6" clearance from hot water piping.
- F. Install boxes rigidly on the building structure and support independently of the conduit system.
- G. Rigid galvanized conduits shall be joined with threaded, galvanized couplings or threaded, galvanized unions only. Set-screw couplings will be permitted only on EMT conduits.
- H. Maximum conduit hanger spacing shall be as follows:

CONDUIT	SPACING
1/2" - 1-1/4"	8 feet
1-1/2" - 4"	10 feet

- I. Leave a #12 AWG pull wire in all empty conduits.
- J. Conduit run underground and in slabs may be run at angles to building lines. Identify location on final "as-built" drawings. All exposed conduits and conduits above drop ceilings shall be run parallel and perpendicular to building lines.
- K. Furnish galvanized sleeves for all openings through new masonry construction and all fire-rated walls and floors.
 - 1. Sleeves shall be installed and shall be cut flush with underside of floor and shall extend 1" above the top side of the floor.
 - 2. Sleeves installed through fire rated floor slabs and walls or partitions shall be packed with U.L. listed firestopping materials (as manufactured by Dow Corning, 3 M or Hilti) to fill annular space around the conduit.
 - 3. Sleeves through wall and roofs shall be machine cut flush with each surface.
 - 4. Plug unused sleeves and finish to match adjacent surfaces.

END OF SECTION 26 05 30

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SECTION 26 20 90 - BUILDING SERVICES

PART 1 - GENERAL

1.1 Electric

- A. The Electrical Contractor shall coordinate his work with local power company with respect to specific requirements relative to the installation of service conductors.
- B. Secondary service voltages are 277/480 volt, 3 phase, 4 wire.
- C. In general, the Power Company shall provide the following:
 - 1. Extension of primary feeders to new pad mounted transformer as located on the drawings.
 - 2. 277/480 volt, 3 phase, pad mount transformer.
 - 3. C.T.'s and meters.
 - 4. Primary and secondary connections.
- D. The Contractor shall provide the following:
 - 1. Primary conduit, concrete encasement, trenching and backfill.
 - 2. Secondary conduit, cable and connectors, trenching and backfill.
 - 3. C.T. cabinet and meter base.
 - 4. Installation of all meters and conduit.

PART 2 - MATERIALS

2.1 Service Conduits

- A. Refer to Section 26 0530 – Conduit and Wireway System.
- B. Refer to Division 2 of Specifications for Excavation.

2.2 Secondary Wiring and Conduit

- A. Refer to:
 - 1. Section 26 0530 – Conduit and Wireway System.
 - 2. Section 26 0520 - Conductors and Grounding.

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PART 3 - EXECUTION

3.1 Electrical Service

- A. Size and configuration of Service Entrances shall be as shown on the drawings.
- B. All conductors shall extend 5' beyond conduit where connection is to be made by the Power Company.
- C. Coordinate work with the Power Company prior to bid and prior to installation.

END OF SECTION 26 20 90

SECTION 26 23 00 - POWER DISTRIBUTION EQUIPMENT

PART 1 - GENERAL

1.1 Scope

- A. Electrical system is to provide electrical power for all lighting and equipment requiring same.

1.2 Reference

- A. Refer to other sections of this Division for other equipment items that require electric power for operation.
- B. Section 26 2090, Building Services

1.3 Manufacturers

- A. Distribution equipment shall all be by same manufacturer, Square D, ITE, General Electric or Cutler Hammer.

PART 2 - PRODUCTS

2.1 Panelboards (Circuit Breaker)

- A. Panelboards shall be UL labeled dead front type factory assembled complete with 5" wide gutters and copper bussing equal to Square D type NQOD and/or NF. All panels used shall be by the same manufacturer. Doors shall be hinged with concealed hinges and provided with trim clamps and trim angle supports and with flush type combination latches and locks keyed alike. Door shall include a directory name on face of front panel, interior and directory card faced with transparent plastic. All circuits clearly and permanently identified on the directory. All boxes fabricated of galvanized steel. Panel back adjustable.
- B. Panelboards shall be listed by Underwriter's Laboratories and carry the U.L. label.
- C. Panelboards shall be of the voltage, phase, wires and amperage as scheduled on the drawings.
- D. Panelboards shall be 20" wide minimum and installed flush or surface as shown on the drawings with top at 6'-0" above finished floor. Flush mounted panels shall have 3 spare 1" conduits stubbed into ceiling space.
- E. Panelboards as indicated on plan shall have up to 84 circuit breaker spaces in a single 20" wide enclosure.
- F. Panel bus structure shall be of sufficient capacity to feed the connected load and shall be braced to withstand short circuits listed on the schedule. Scheduled lock-on device for certain branch circuit shall be furnished and installed. Blank filler plates to be installed in blank spaces.

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- G. The branch breakers shall be molded case, quick-make, quick-break, with thermal magnetic trip and permanently bolted to bus bars. Short circuit ratings shall be minimum 10,000 amps RMS system for 208 volt system, 14,000 on 480 volt system, unless otherwise stated on the drawings. Only full rated ACB's permitted, no duplex. Breakers to be 1, 2 or 3 pole as listed on the drawings.
- H. Multiple pole breakers must be the common trip type. NO TIE HANDLES PERMITTED WITH SINGLE POLE BREAKERS.
- I. All lighting circuit breakers for use on high intensity discharge lighting systems must be HID rated Square D Type QOD-HID.
- J. All circuit breakers less than 250 volt serving refrigeration air conditioning and/or ventilation equipment such as condensing units and air handling units shall be 'HACR' rated.
- K. Provide blank filler plates in all blank spaces.
- L. Provide type written circuit directory cards with complete description of load served by each breaker at all panels.
- M. Provide laminated nameplates as described in Section 26 05 00.

2.2 Contactors

- A. Furnish and install magnetically held remotely controlled contactors to control panelboards and lighting circuits indicated and scheduled on the drawings. Contactors shall be installed in NEMA 1 enclosures.
- B. Provide laminated nameplates on contactor enclosures as described in Section 26 05 00.

END OF SECTION 26 23 00

SECTION 26 23 21 - DRY TYPE TRANSFORMERS

PART I - GENERAL

1.1 Scope

- A. Furnish and install dry type transformers as described herein and as shown on the Drawings.

1.2 Manufacturers

- A. Transformers shall be as manufactured by Square D, ITE, Heavy Duty, General Electric or Cutler Hammer.

PART 2 - PRODUCTS

2.1 Components

- A. Transformers shall be a 60 Hertz, air cooled, two winding, insulated dry type with ventilated enclosure.
- B. The coils shall be wound with copper or aluminum, shall be insulated with UL recognized Class 220 insulation system with 115 degrees C maximum coil rise with a maximum case rise of 35 degrees C when in an ambient of 40 degrees C. The above temperature shall be measured in accordance with UL specifications #UL506.
- C. The following high-voltage full-capacity taps shall be used:
 - 3- 15 KVA - 2- 2-1/2% AN & BN or 2 - 5% BN
 - 25 - 500 KVA - 2- 2-1/2% AN & 4- 2-1/2% BN
- D. Sound power levels shall be below the latest revisions of ANSI Standard C89.
- E. Transformers shall be constructed and rated in accordance with all applicable ANSI, NEMA, IEEE, and UL standards and must meet NEC requirements. The transformers shall bear a UL label.

2.2 Vibration Isolation

- A. Mount all transformers on double deflection neoprene with a minimum static deflection of 0.35". All metal surfaces shall be neoprene covered to avoid corrosion and have friction pads both top and bottom to avoid the need for floor bolts.
- B. The following are acceptable, subject to the above:

Type ND mounts from Mason Industries, Hauppauge, New York

Type RD mounts from Vibration Mountings & Controls, Bloomingdale,
New Jersey

Type RVD mounts from Amber/Booth Company, Houston, TX.

PART 3 - EXECUTION

3.1 Installation

- A. Mount Transformers where shown on Drawing.
- B. All connections to transformers shall be with flexible conduit.

END OF SECTION 26 23 21

SECTION 26 27 20 - WIRING DEVICES AND PLATES

PART 1 - GENERAL

1.1 Scope

- A. Furnish and install all devices called for on the plans, complete with coverplates.
- B. Special heavy duty outlets are indicated on the drawings. Verify outlet configuration and capacity required to accommodate equipment being served.

PART 2 - PRODUCTS

2.1 Manufacturers

- A. Devices as listed below are based on Hubbell unless specifically noted otherwise. Other approved manufacturers are Arrow Hart, Bryant, Leviton, Pass & Seymour or Eagle.

2.2 Materials

- A. Light switches shall be toggle quiet AC type, 120/277 volts, 20 amp specification grade, contacts shall be silver alloy and switch shall have one piece Lexan lever and cam. Terminals shall be spring loaded, color coded and suitable for side and back wiring. Hubbell #CSB120 or equal.
- B. General purpose duplex receptacles shall be automatic grounding type, NEMA 5-20R configuration, finger-groove face, 20 amp, specification grade, with provisions for back wiring by means of spring-staked screwed or side wiring with captive held binding screws, shall be constructed of arc-resistant material. Hubbell #BR20 series or equal.
- C. Ground fault interrupting (GFI) type receptacles shall be self contained, automatic grounding type, NEMA 5-20R configuration, specification grade, with test and reset buttons. Device shall meet all UL943 and UL498 requirements for GFI receptacles. Trip threshold shall be 4-6 milliamperes and trip within .025 seconds of fault detection. Hubbell #GFR-5362 or equal.
- D. All non-locking 15 amp and 20 amp, 125 volt and 250 volt receptacles in damp or wet locations shall be listed as weather resistant.
- E. All devices shall be color per Owner/Architect in color unless on emergency system or isolated ground type. Emergency system outlets shall be red, IG outlets shall be orange.
- F. All outlets shall have a standard plate, blank, receptacle, switch, or cord hole as required by outlet symbol. Multiple devices shall be mounted on a one piece gangplate of appropriate design. No sectionalized plates will be permitted. All plates throughout building shall be of the same manufacture and design.

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- G. All wall outlet plates to be smooth stainless steel 302/304 unless noted otherwise. Standard in drywall and jumbo in masonry construction.
- H. Exterior outlets shall be complete with weatherproof plate with hinged cover or covers in accordance with NEC 410-57(b) and a neoprene gasket between the plate, box and mounting surface. Red Dot CKM series or equal.

PART 3 - EXECUTION**3.1 Installation**

- A. The Architect reserves the right to change location of any outlet a distance of six (6) feet in any direction from plan location, before work is actually roughed-in, at no extra charge.
- B. All devices must be installed plumb.
- C. Devices located in same vicinity, but at a different mounting height shall be aligned vertically along the same centerline.
- D. The coverplate for all devices shall fit tight against the finished wall surface.

END OF SECTION 26 27 20

SECTION 26 51 00 - LIGHTING SYSTEMS

PART 1 - GENERAL

1.1 Description

- A. Furnish and install all lighting fixtures per drawings and as herein specified. Fixtures are specified as "standard" for design quality and appearance and all bids to be based on these "standards" as specified.

PART 2 - PRODUCTS

2.1 Manufacturers

- A. Lighting fixtures shall be by the manufacturer or an "approved equal" if listed in the Lighting Fixture Schedule.
- B. The listing of a manufacturer as an "approved equal" does not imply automatic approval. It is the sole responsibility of the Electrical Contractor to ensure that any price quotations received and submittals made are for fixtures that meet or exceed the listed fixture in appearance, quality and performance.

2.2 Materials

- A. All lighting fixtures are indicated on the drawings with an identifying letter and/or number. Refer to the Fixture Schedule on the drawings which identifies the fixture in accordance with letter and/or number and indicates the type of mounting of the fixture in accordance with the Schedule.
- B. High intensity discharge (HID) ballasts shall be core and coil type, high power factor, constant wattage autotransformer (CWA) type capable of starting at minus 20 degrees Fahrenheit. Ballasts other than 480 volt input shall be multi-tap. Encased and potted ballasts shall have a class "B" sound rating and thermal protection unless noted otherwise.
- C. Furnish all installation accessories for all fixtures as required for the specific location. Such accessories to include plaster frames, rings, and flanges, canopies, stem hangers, suspension straps, etc. Refer to Architectural drawings for room finishes. Coordinate fixture type and mounting methods with type of ceiling furnished under General Contract and install per the fixture manufacturer's installation instructions and the National Electrical Code.
- D. Fluorescent lighting fixtures shall be equipped with electronic ballasts as supplied by lighting fixture manufacturer, but limited to the following ballast manufacturers: Advance, Universal Lighting Technologies, Osram Sylvania and General Electric.
- E. Electronic ballasts shall meet the following criteria:
 - 1. Minimum power factor of 95% minimum ballast factor of 87%
 - 2. UL listed class "P", CSA certified

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3. Class "A" sound rating or better
 4. Current crest factor <1.6
 5. Input total harmonic distortion (THD) <20%
 6. Series/Parallel wire lamp connection
 7. High frequency operation: 20 KHZ or greater
 8. Integrated circuit design
 9. 50 degree Fahrenheit starting temperature for indoor use
 10. -20 degree Fahrenheit starting temperature for outdoor use
 11. Operate without a visible flicker in the lamps
 12. Meet all the applicable minimum efficacy standards
 13. Equipped with internal automatic resetting the thermal protection
 14. Meet all requirements of the FCC rules and regulations for non-consumer equipment
- F. Provide lamps as indicated on the drawings or as recommended by fixture manufacturer. If there is a discrepancy between the lamp listed on the drawings and the lamp recommended by the manufacturer, the Contractor shall advise the Engineer prior to purchasing the lamps.
- G. All fluorescent and H.I.D. fixtures shall be equipped with internal fusing.
- H. All lamps shall be in working order at the time of final acceptance.
- I. All linear fluorescent fixtures shall include a factory installed integral UL listed ballast disconnect to simultaneously break line and neutral connection to the ballast.

PART 3 - EXECUTION

3.1 Installation

- A. Wherever lighting systems are supported and fastened to a ceiling suspension system of the grid type, the following method shall be followed:
1. Lay-in fixtures shall be clipped to the tee-bar per code requirements. Also furnish two (2) support wires equal to the ceiling suspension wires, one each from opposite corners of fixture.
 2. Surface-mounted fluorescent fixtures shall be fastened at both ends and fit tight to the ceiling suspension system.
 3. Surface-mounted fixture on low density ceilings shall have suitable spacers to comply with Code requirements.
 4. On suspended fixtures, an additional wire is to be added at each stem location from the structural floor above, providing there are no wires within six (6) inches of the stem clip.
- B. All poles for parking lot or street lighting shall be:
1. Secured to concrete bases as detailed.
 2. Installed absolutely vertical.
 3. Have bolt-base covers.

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4. Have hand-hole for access to wiring.
 5. Have independent fusing for each fixture or head.
 6. Individually ground each pole to 10' ground rod.
- C. Furnish all incidental mounting hardware as required for the fixture's specific location or mounting arrangement.
- D. Field aim all adjustable flood lights at night in presence of the Architect.
- E. Set all time clocks as directed by the Owner.

END OF SECTION 26 51 00

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SECTION 26 60 00 - MISCELLANEOUS ELECTRIC HEATING

PART 1 - GENERAL

1.1 Scope

- A. Furnish and install miscellaneous electric heating units as shown on the drawings and specified herein.
- B. Capacities, voltage and accessories as noted on the drawings.

PART 2 - PRODUCTS

2.1 Wall Heaters

- A. Wall heaters shall be Q-Mark #AWH - Series or equal by Markel, with unit mounted thermostat and disconnect. Size and type as noted on drawings.

PART 3 - EXECUTION

3.1 Installation

- A. Install equipment in accordance with manufacturer's recommendations.
- B. Submit shop drawings for approval.

END OF SECTION 26 60 00

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