SPECIFICATIONS

FOR:

Twin Falls County Jail

Twin Falls, IDAHO

Laughlin Ricks Architecture

architecture/planning

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SECTION 010010 - BASIC REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Summary of Work: Contract, work by owner, contractor use of premises, future work.

B. Contract Considerations: Cash allowances, contingency allowance, inspection and testing allowances, schedule of values, applications for payment, change procedures, alternates.

C. Coordination and Meetings: Coordination, field engineering, cutting and patching, meetings, progress meetings, equipment electrical characteristics and components, examination, preparation, cutting and patching.

D. Submittals: Submittal procedures, construction progress schedules, proposed products list, shop drawings, product data, samples, manufacturers' installation instructions, manufacturers' certificates.

E. Quality Control: Quality assurance - control of installation, tolerances, references, mock-ups, inspection and testing laboratory services, manufacturers' field services and reports.

F. Construction Facilities and Temporary Controls: Temporary electricity, temporary lighting for construction purposes, temporary heat, temporary ventilation, telephone service, temporary water service, temporary sanitary facilities, barriers and fencing, water control, exterior enclosures, interior enclosures, protection of installed work, security, access roads, parking, progress cleaning and waste removal, project identification, field offices and sheds, removal of utilities, facilities, and controls.

G. Material and Equipment: Products, transportation, handling, storage, and protection, products options, substitutions.

H. Starting of Systems: Starting systems, demonstration and instructions, testing, adjusting and balancing.

I. Contract Closeout: Contract closeout procedures, final cleaning, adjusting, project record documents, operation and maintenance data, spare parts and maintenance materials, warranties.

1.2 CASH ALLOWANCES

A. None

1.3 SCHEDULE OF VALUES

A. Submit schedule on AIA Form G703, or as approved by Architect.

B. Submit Schedule of Values in duplicate within fifteen (15) days after date of Owner-Contractor Agreement.

1.4 APPLICATIONS FOR PAYMENT

A. Submit three copies of each application on AIA Form G702 and G703 or as approved by Architect.

B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.

C. Payment Period: Monthly. Pay request to be submitted by the 25th day of the month and payment to be made within 30 days of approval of the pay request.

1.5 CHANGE PROCEDURES

A. Stipulated Sum/Price Change Order: Based on Proposal Request and Contractor's fixed price quotation or Contractor's request for a Change Order as approved by Architect.

B. Change Order Forms: AIA G701, or as approved by Architect.

1.6 COORDINATION

A. Coordinate scheduling, submittals, and Work of the various sections of specifications to ensure efficient and orderly sequence of installation of interdependent construction elements.

B. Verify utility requirement characteristics of operating equipment are compatible with building utilities.

C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable.

D. In finished areas, conceal pipes, ducts, and wiring within the construction.

1.7 FIELD ENGINEERING

A. Establish elevations, lines, and levels and certify that elevations and locations of the Work conform with the Contract Documents.

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

1.8 CUTTING AND PATCHING

A. Employ a skilled and experienced installer to perform cutting and patching new Work; restore Work with new Products.

B. Submit written request in advance of cutting or altering structural or building enclosure elements.

C. Execute cutting, fitting, and patching [including excavation and fill,] to complete Work, and to:

1. Fit the several parts together, to integrate with other Work.

2. Uncover Work to install or correct ill-timed Work.

3. Remove and replace defective and non-conforming Work.

4. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

D. Cut masonry and concrete materials using masonry saw or core drill. Restore Work with new Products in accordance with requirements of Contract Documents.

E. Fit Work tight to adjacent elements. Maintain integrity of wall, ceiling, or floor construction; completely seal voids. Provide all required protection including, but not necessarily limited to shoring, bracing, and support to maintain structural integrity of the Work. Provide proper dust abatement materials and/or procedures to protect persons and property.

F. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

G. Refinish surfaces to match adjacent finishes.

H. Remove and properly replace defective or damaged Work in place.

I. Restoration of existing and/or newly installed surfaces, assemblies, systems, etc.

J. Thoroughly clean and restore areas, finishes and spaces where work is performed or used to access the Work.

1.9 SUBMITTAL PROCEDURES

A. Submittal form to identify Project, Contractor, Subcontractor or supplier; and pertinent Contract Document references.

B. The General Contractor shall review all submittals prior to submitting to Owner. The responsibility to properly review and coordinate the submittals is solely the Contractor's and is the means by which the Contractor can confirm that the products, materials, systems, etc., by his Subcontractors will be constructed in accordance with the Contract Documents. Review of each submittal by the Architect and the Engineer shall not be construed as a complete or comprehensive check. The Architect/Engineer review shall not relieve the Contractor from responsibility for errors which may exist in the submittal.

C. Apply Contractor's stamp, signed or initialed, certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

D. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.

E. Revise and resubmit submittals as required; identify all changes made since previous submittal.

F. No extension of time will be authorized because of the Contractor's failure to transmit submittals which have not been adequately checked or properly coordinated by the Contractor.

1.10 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial progress schedule in duplicate within fifteen (15) days after date of Owner-Contractor Agreement for Architect review.

B. Submit revised schedules with each Application for Payment, identifying changes since previous version. Indicate estimated percentage of completion for each item of Work at each submission.

C. Submit a horizontal bar chart with separate line for each major section of Work or operation, or section of Work, identifying first work day of each week.

1.11 PROPOSED PRODUCTS LIST

A. Within fifteen (15) days after date of Owner-Contractor Agreement, submit list of major Products proposed for use, with name of manufacturer, trade name, and model number of each product.

1.12 PRODUCT DATA

A. Product Data for Review:

1. Submitted to Owner for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

2. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents.

B. Product Data for Information:

1. Submitted for the Architect's benefit as contract administrator or for the Owner.

C. Product Data for Project Close-out:

1. Submitted for the Owner's benefit during and after project completion.

D. Submit the number of copies which the Contractor requires, plus two copies which will be retained by the Architect.

E. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this project.

1.13 SHOP DRAWINGS

A. Shop Drawings for Review:

1. Submitted to Owner for review for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

2. After review, produce copies and distribute in accordance with the SUBMITTAL PROCEDURES article above and for record documents.

B. Shop Drawings for Information:

1. Submitted for the Architect's benefit as contract administrator or for the Owner.

C. Submit the number of opaque reproductions which Contractor requires, plus two copies which will be retained by Owner.

1.14 SAMPLES

A. Samples for Review:

1. Submitted to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

2. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents.

B. Samples for Selection:

1. Submitted to Owner for aesthetic, color, or finish selection.

C. Submit samples to illustrate functional and aesthetic characteristics of the Product.

D. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for Architect's selection.

1.15 MANUFACTURER INSTALLATION INSTRUCTIONS

A. When specified in individual specification sections, submit manufacturer printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

1.16 MANUFACTURER CERTIFICATES

A. When specified in individual specification sections, submit certifications by manufacturer to Architect, in quantities specified for Product Data.

B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

1.17 QUALITY ASSURANCE - CONTROL OF INSTALLATION

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

B. Comply with manufacturers' instructions.

C. Comply with specified standards as minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

D. Defective work deemed to be unsatisfactory due to quality workmanship or installation shall be removed from project at the contractor’s expense.

1.18 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify that utility services are available, of the correct characteristics, and in the correct location.

1.19 PREPARATION

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

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

1.20 TOLERANCES

A. Monitor fabrication and installation tolerance control of installed Products over suppliers, manufacturers, Products, site conditions, and workmanship, to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply fully with manufacturers' tolerances.

1.21 REFERENCES

A. Conform to reference standards by date of issue current as of date of Contract Documents or date for receiving bids.

B. Should specified reference standard conflict with Contract Documents, request clarification from Architect before proceeding.

1.22 INSPECTION AND TESTING LABORATORY SERVICES

A. Owner will appoint, employ, and pay for specified services of an independent firm to perform inspection and testing.

B. Cooperate with independent firm; furnish samples as requested.

C. Re-testing required because of non-conformance to specified requirements will be charged to the contractor.

D. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing and inspection.

1.23 TEMPORARY ELECTRICITY

A. Cost: Contractor to provide and pay for power service required from source.

B. Provide power outlets for construction operations, branch wiring, distribution boxes, and flexible power cords as required.

1.24 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain temporary lighting for construction operations. Contractor may use owner's lighting as available.

B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

C. Permanent building lighting may be utilized during construction

1.25 TEMPORARY HEAT

A. Provide temporary heat required by construction activities for curing or drying of complete installations or for protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect of completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.

1. Do not use heating equipment that will introduce moisture within enclosed or finished spaces.

B. The Contractor shall pay for temporary heating equipment and fuel, necessary accessories and to protect the operating equipment of the building.

C. The Contractor shall be responsible for utility expenses of heating and/or air conditioning, including operating of heating system. Contractor shall be responsible for expenses related to maintenance and operation during construction.

1.26 TEMPORARY VENTILATION

A. Contractor shall provide ventilation of enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases for the health and safety of the facility residents.

1.27 TELEPHONE SERVICE

A. Contractor shall provide, maintain and pay for telephone and telephone facsimile service to field office at time of project mobilization.

1.28 TEMPORARY WATER SERVICE

A. Contractor shall provide, maintain and pay for suitable quality water service required.

B. At the telephone, post a list of important telephone numbers, including the following:

1. Local police and fire department

2. Doctor/emergency room.
3. Ambulance service.
4. Contractor's office.
5. Architects office.
6. Engineers' offices.
7. Owner's office.
8. Principal sub-contractor's offices.

1.29 TEMPORARY SANITARY FACILITIES

A. Contractor shall provide and maintain restroom facilities for contractor use.

B. Contractor shall maintain in clean and sanitary condition.

1.30 WATER CONTROL

A. Contractor shall provide water to control dust.

1.31 INTERIOR ENCLOSURES

A. Provide temporary closures or barriers as required to limit debris, dust and noise control for acceptable conditions and protection of the areas of work.

B. Temporary Enclosures: At the earliest practical time provide temporary enclosure of materials, equipment, work in progress and completed parts of the work for compliance with OSHA safety regulations. Provide for safe access, exiting and circulation for occupants to, from, and between the various occupied areas of the facility as required for safety and as approved by authorities. Construction aids and miscellaneous general services and facilities include, but are not limited to the following:

1. Guardrails, barriers, fencing, etc.
2. Scaffolding.
3. Temporary access and exit and enclosures.

1.32 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual specification sections.

B. Prohibit traffic or storage upon waterproofed or roofed surfaces.

1.33 SECURITY

A. Contractor shall coordinate to maintain building from unauthorized entry due to contractors accessing work areas.

B. Contractor shall establish work schedules and work hours that comply with local jurisdiction.

C. Contractor shall provide an emergency contact number, with a local contact available 24 hours a day, 7 days a weed, for Police/Fire/Owner contact. An answering service must have access to the Contractor at ALL times.

D. General: Provide a reasonably neat and uniform appearance in security and protection facilities acceptable to the Owner.

E. Fire Protection: Provide fire protection equipment. Comply with the applicable recommendations of NFPA Standard 10 “Standard for Portable Fire Extinguishers”. Locate fire extinguishers where they are most convenient and effective for their intended purpose. Store combustible materials in containers in recognized fire-safe locations.

1. Develop and supervise an overall fire prevention and first-aid fire protection program for personnel at the project site. Review needs with the local fire department officials and establish procedures to be followed. Instruct personnel in methods and procedures to be followed. Post warnings and information and enforce strict discipline. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, and access routes for fighting fires. Prohibit smoking. Provide supervision of welding operations, combustible type temporary heating units, and similar sources of ignition for possible fires.

1.34 PROGRESS CLEANING AND WASTE REMOVAL

A. Collect and maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition. All waste material shall be disposed of in strict accordance with all current federal, state, and local requirements and regulations.

1.35 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion review.

B. Remove underground installations to a minimum depth of 2 feet.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

1.36 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work, but does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work.

B. Owner or Tenant Supplied Products. – referred to as Owner hereafter

1. Owner shall arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.

2. Arrange and pay for product delivery to site.

3. Submit claims for transportation damage and replace damaged, defective, or deficient items.

4. Arrange for manufacturers' warranties, inspections, and service.

C. Contractor's Responsibilities.

1. Review Owner reviewed shop drawings, product data, and samples.

2. Receive and unload products at site; inspect for completeness or damage and report damaged, defective, or deficient items to Owner.

3. Handle and store finished products. Install finished products as indicated in Contract Documents.

4. Repair or replace items damaged after receipt.

1.37 TRANSPORTATION, HANDLING, STORAGE AND PROTECTION

A. Transport, handle, store, and protect Products in accordance with manufacturer's instructions.

1.38 PRODUCT OPTIONS

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

1.39 SUBSTITUTIONS

A. Owner will consider requests for Substitutions only within fifteen (15) days after date of Owner-Contractor Agreement.

B. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

C. In making request for Substitution, the Bidder/Contractor represents:

1. They have personally investigated proposed product and determined that it is equal or superior in all respects to that specified.

2. They will provide the same guarantee for the substitute as for the product specified.

3. They will coordinate installation of the accepted substitution into work, making such changes as may be required for work to be complete in all respect.

4. They waive all claims for additional costs related to substitution(s) which consequently becomes apparent.

5. Cost data is complete and includes all related costs under this Contract.

6. Project Schedule will not be altered.

1.40 STARTING SYSTEMS

A. Provide seven days notification prior to start-up of each item.

B. Ensure that each piece of equipment or system is ready for operation.

C. Execute start-up under supervision of responsible persons in accordance with manufacturers' instructions.

1.41 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Products to Owner's personnel two weeks prior to date of Substantial Completion.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at designated location.

1.42 TESTING, ADJUSTING, AND BALANCING

A. General Contractor shall employ and pay for services of an independent engineering firm to perform testing, adjusting, and balancing and certification of such for the building HVAC to the owner and the mechanical inspector.

1.43 OPPERATIONS, TERMINATION AND REMOVAL:

A. Supervision: Do not allow hazardous, dangerous or unsanitary conditions to develop or persist on the project site.

B. Maintenance: Operate and maintain temporary services and facilities in good operating condition throughout the time of use and until removal. Protect from damage by freezing temperatures and similar elements.

C. Termination and Removal: Remove each temporary service and facility promptly when the need for it has ended. Complete and restore permanent and existing work which may have been damaged because of the temporary service or facility.

1. Materials and facilities that constitute temporary services and facilities are and remain the property of the Contractor.

2. Prior to Substantial Completion, Clean and renovate or restore permanent services, facilities and assemblies that have been used to provide temporary services and facilities during the construction period to original condition. Replace “construction” filters in the mechanical system.

1.44 CONTRACT CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect's inspection.

B. In ordered to achieve Substantial Completion:

1. Contractor shall prepare a comprehensive list of items to be completed or corrected. Proceed with the completion and correction of the listed items.

2. Provide approvals from the Building and the Fire Authority allowing for occupancy of the building.

3. Provide the following:

a. Operation and maintenance manuals for the Owner’s use.
b. Complete startup testing procedures and provide documentation.

c. Complete instruction for proper use, maintenance, and operation of all systems in the building for the Owner’s designated personnel.

d. Submit brief written documentation for type of training undertaken and sign-in sheet showing personnel in attendance for instruction.

1) Complete final cleanup requirements including finishing of flooring.

C. Architect's Review Procedures

1. Following completion of the provisions listed above, Contractor shall submit a written request for the Architect's inspection. Further, Contractor shall include documentation with the written request for inspection that each of the provisions listed above have been complied with and have been completed. After the above information is received, the Architect will proceed with the requested inspection within a reasonable time or will advise Contractor in writing of unfulfilled requirements.

2. If the Work or designated portion of the Work is Substantially Complete in the opinion of the Architect, the Architect will prepare the Certificate of Substantial Completion which shall establish the date of Substantial Completion and other information. If the Work or designated portion of the Work is not complete in the opinion of the Architect, the Architect shall notify Contractor in writing. Contractor shall then complete the work and shall again request, in writing, a second inspection by the Architect.

a. The number of inspections the Architect will make to determine Substantial Completion before costs will be incurred by Contractor is specified.

3. The Architect shall attach any listing of punch list items to be corrected by the Contractor to the Certificate of Substantial Completion, which shall indicate the time period in which Final Completion shall be achieved. The punch list shall be completed, with documentation by Contractor showing the date of correction, the party making the correction, and certification by Contractor that all items on the punch list have been completed prior to the request for final inspection.

4. Following the completion of the punch list and on receipt of the above information and Contractor's certification that the punch list items have been completed, Contractor shall request, in writing, the Architect's final inspection.

D. Submit final Application for Payment identifying total adjusted Contract Sum/Price, previous payments, and amount remaining due.

1.45 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Clean interior and exterior surfaces exposed to view. Vacuum carpeted and soft surfaces.

C. Clean debris from site, roofs, gutters, downspouts, and drainage systems.

D. Replace filters of operating equipment.

E. Remove waste and surplus materials, rubbish, and construction facilities from the site.

F. Glass: Clean all glass inside and outside.

G. For all resilient flooring finishes, just prior to Architect's inspection for Substantial Completion, Contractor shall thoroughly clean all flooring materials and apply commercial floor polish, per the manufacturer's directions and will apply proper type of materials and buffing procedures in strict compliance with the manufacture's instructions for each type of flooring. Coordinate with Owner for product used and include instructions for flooring maintenance in Operations and Maintenance Manual.

1.46 ADJUSTING

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

1.47 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of Contract Documents to be utilized for record documents. Indicate all utility location and/or changes to original construction documents.

B. Record actual revisions to the Work. Record information concurrent with construction progress.

C. Making Entries of Record Documents: Using and erasable colored pencil (not ink or indelible pencil), clearly describe the change by note and by graphic line, as required. Date all entries. Call attention to the entry by a "cloud" around the area or areas affected. In the event of overlapping changes, different colors may be used for each of the changes. Make entries in the pertinent Documents as approved by the Architect.

1. Documents with unclear or unintelligible markings will be rejected and will be required to be resubmitted.

D. Tape addenda, revisions, and changes on drawings and/or in specifications and schedules.

1.48 OPERATION AND MAINTENANCE DATA

A. Submit two sets prior to final inspection, bound in 8-1/2 x 11-inch text pages, three D side ring or capacity expansion binders with durable plastic or cloth covers.

B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS" and title of project.

C. Internally subdivide the binder contents with permanent page dividers, logically organized, with tab titles clearly printed under reinforced laminated plastic tabs.

D. Contents: Include at least the following:

1. Neatly typewritten index near the front of the Manual, giving immediate information as to location within the Manual of all emergency data regarding the installation.

2. Copy of all guarantees and warranties issued.

3. Complete instructions regarding operation and maintenance of all equipment involved, including lubrication, disassembly, and reassembly.

a. For each product, provide the following in list or "spread sheet: format (organized in order by Division and Section):

1) Division and Section name/number.
2) Subcontractor name; address, telephone number; fax number; contact person.
3) Name of product(s); model number(s); part number(s); etc.
4) Name of manufacturer(s); address; telephone number; fax number.
5) Supplier name; address; telephone number; fax number; contact person.
6)

4. Complete nomenclature of all parts of all equipment.
5. Manufacturers' bulletins, cuts, and descriptive data, where pertinent, clearly indicating the precise items included in this installation and deleting, or otherwise clearly indicating, all manufacturers' data with which this installation is not concerned.

1.49 WARRANTIES

A. Provide duplicate notarized copies.

B. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.

C. Submit prior to final Application for Payment.

D. The starting date of each and every warranty begins at the date of Substantial Completion, Whether or not the warranty is dated otherwise.

E. Provide certification that all materials and products used in the construction are asbestos (ACM) free.

1.50 NOISE, LANGUAGE, TOBACCO AND FIREARMS

A. Proper conduct on project shall be maintained at all times. No loud sound systems, no loud music, no loud shouting, no loud language, no smoking or other disruptive noise shall be allowed or generated at any place on the project site. Contractor shall be responsible to maintain a quality work environment that is not disruptive to workers, employees, and others associated with the Work.

B. Loud or abusive language will not be tolerated by any person on the project site. In the event that any person generates such language and fails to conduct themselves in a proper manner or practices loud and/or abusive language, they shall be informed by the Contractor of these provisions and if repeated, shall be dismissed from the site by the Contractor. Contractor shall have the responsibility to see that such behavior is not tolerated or allowed on site and be responsible for removal of those not in compliance with the above requirements.

C. Uphold Owner's Policy of no firearms allowed, in any form, on the property.

2 PART 2 - PRODUCTS
Not Used.

3 PART 3 - EXECUTION
Not Used.

END OF SECTION

Section 013500 – PROJECT ALTERATION PROCEDURES

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. General: Procedural requirements and established standards for coordination and provision of interfaces between existing construction to remain and new Work, include, but are not limited to:

1. Restoration of existing Work, areas, surfaces, conditions, systems, etc., as applicable.

2. Restoration and/or correction of existing Work removed or damaged as a result of Work on this Contract or Work that has been rejected, as applicable.

B. Requirements for demolition of existing Work in preparation of new Work are specified in other Divisions of this specification.

C. Refer to Technical Specification sections and drawings and schedules for other requirements.

1.2 QUALITY ASSURANCE

A. Comply with applicable referenced codes, rules, regulations and required approvals by local authorities for each occurrence and condition of Work described in this section.

1.3 SUBMITTALS

A. Submit notifications of unusual conditions, requests for interpretations, proposals for alternate methods and other communications and requests regarding alteration procedures in writing to the Architect.

PART 2 - PRODUCTS

2.1 GENERAL

A. Compatibility: Provide new materials which are compatible with existing materials and/or substrates to which they are to be applied or attached.

1. Full restoration of site and site Work and full replacement and restoration of rejected Work is the obligation and responsibility of the Contractor.

2.2 PRODUCTS FOR PATCHING WORK

A. Match existing products and Work for patching where indicated.

1. Match existing products for areas of non-conforming Work that will be removed and replaced that have been rejected or as a result of a correction notice issued by the Owner or Architect.

PART 3 - EXECUTIONS

3.1 PREPARATION

A. Cut, move or remove all items and existing Work for restoration Work; replace and fully restore all aspects of area(s) to prime condition at completion.

B. Remove and properly dispose of all debris and abandoned items from area and from concealed spaces.

C. Prepare surfaces and remove surface finishes to provide for proper installation of new Work and new finishes.

3.2 INSTALLATION

A. Coordinate Work to expedite completion sequentially and to accommodate Owner occupancy. Sequence and schedule Work to minimize construction traffic in Owner occupied spaces.

B. Remove, cut, and patch Work in a manner to minimize damage and to provide means of restoring products, finishes, surfaces, systems, etc. to match original conditions as acceptable to Owner and Architect.

1. Do not overload or apply excessive forces to existing structures and assemblies.

2. Restore all systems to working condition acceptable to Owner.

C. Provide products and materials as indicated to result in finished appearance and function acceptable to Owner and Architect.

1. Verify and coordinate exact existing conditions and with details if drawn.

2. If no detail is drawn for a specific condition, verify a similar detail with Architect. Adjust to fit the condition at no extra cost to the contract.

3.3 REPAIR OF DAMAGED SURFACES

A. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections which are the result of work of the contract.

1. Patching procedure must result in a surface or finish that exactly matches existing work. Non-matching work will be the basis for rejection.

3.4 FINISHES

A. Finish patchings to produce uniform finish and texture over entire area. When textures or colors cannot be matched, retexture or repaint entire surface to nearest intersection(s).

3.5 CLEANING

A. In addition to cleaning specified in other Division 1 sections and for specific Work specified in Divisions 2 through 33, expertly clean Owner-occupied areas of construction debris daily.

END OF SECTION

SECTION 017000 - SELECTIVE DEMOLITION

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. This Section includes but is not limited to:

1. Demolition and removal of all portions of the building in preparation for the provision of new work; Typical above and below grade elements.
2. Patching and repairs

1.2 DEFINITIONS

A. Remove: Remove and legally dispose of items except those to be reinstalled, salvaged, or to remain the Owner's property. Removal of existing work shall be in preparation for the provision of new work. The Owner will turn the buildings over to the Contractor and anything left behind is Contractor's option to salvage, save or dispose.

B. Remove and Salvage: Items to be removed and salvaged remain the Owner's property prior to turning building over to Contractor. Remove, clean, and pack or crate items to protect against damage that are indicated. Otherwise, it is the responsibility of the Owner. Identify contents of containers and deliver to Owner's designated storage area.

C. Remove and Reinstall: Remove and reinstall items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage/ Reinstall items in the same locations or in locations indicated.

D. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.3 MATERIALS OWNERSHIP

A. All items remain the ownership of the Owner until building is turned over to the Contractor. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property and shall be removed from the site with further disposition at the Contractor's option.

END OF SECTION

SECTION 02230 – SITE CLEARING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Removal of surface debris and deleterious matter.

B. Removal of topsoil, rough grading and site contouring.

C. Removal of asphalt and concrete.

1.2 REGULATORY REQUIREMENTS

A. Conform to all applicable codes for disposal of debris and burning debris on site.

B. Coordinate clearing Work with utility companies.

PART 2 PRODUCTS

2.1 MATERIALS

None specified.

PART 3 EXECUTION

3.1 PROTECTION

A. Identify and protect utilities from damage.

B. Protect trees, plant growth, and features designated to remain as final landscaping. Identify and tag.

C. Verify that survey benchmark and intended elevations for the Work are as indicated.

3.2 CLEARING

A. Clear areas required for execution of Work to a minimum depth of 6 inches.

B. Remove surface rock.

3.3 ROUGH GRADING

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

B. Identify known underground, above ground and aerial utilities. Stake and flag locations.

C. Notify utility company to remove and relocate utilities.

D. Excavate topsoil and subsoil from areas to be further excavated, re-landscaped or regraded.

E. Stockpile topsoil and subsoil in area designated on site.

3.4 CLEAN UP

A. Remove debris and rock from site.

END OF SECTION

SECTION 023000 – EARTHWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Site grading, removal of topsoil and subsoil, building excavating and trenching, backfilling, and compacting.

PART 2 PRODUCTS

1.2 SOIL MATERIALS

A. Topsoil: Reusable excavated and/or imported friable loam; free of subsoil, roots, grass, excessive amount of weeds, large stone, and foreign matter.

B. Subsoil: Imported and/or excavated material, graded free of lumps larger than 6 inches, rocks larger than 3 inches, and debris.

1.3 FILL MATERIALS

A. Type A - ¾ inch gravel: no clay soils, free of organic material and debris; graded within the following limits:

1. 100% passing through ¾ inch sieve.

2. Not more than 10 -12% passing through 200 sieve.

B. Type B – Pea Gravel: Natural stone; washed, free of clay, shale, organic matter;

1. Minimum Size: ¼ inch

2. Maximum Size: 5/8 inch

C. Type C – Sand: Natural river or bank sand; washed; free of silt, clay, loam. Friable or soluble materials, and organic matter.

D. Type D – Subsoil: Reused, and/or imported, free of rock larger than 3-inch size, no clay soil, and free from organic material & debris.

E. Type E – Building pad: Imported fill ASTMD 2487 soil classification groups GW, GP, GM, SP, or a combination of these group symbols, depth as required, free of rock larger than 3-inch size, no clay soils, free from organic materials, frozen materials & debris, 95% compaction of standard proctor & near optimum moisture, maximum 8-inch lifts of loose material.

F. Type F – Rock: 1 ½ inch to 3-inch washed river rock (decorative landscape.)

PART 3 – EXECUTION

1.4 EXAMINATION AND PREPARATION

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

B. Notify Architect of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

C. Identify and flag known utility locations. Notify utility company to remove and relocate utilities.

D. Maintain and protect existing utilities to remain.

E. Verify foundation walls are braced to support surcharge forces imposed by backfilling operations.

1.5 PROTECTION OF ADJACENT WORK

A. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.

B. Grade excavation top perimeter to prevent surface water run-off into excavation or to adjacent properties.

1.6 TOPSOIL EXCAVATING

A. Do not excavate wet topsoil.

B. Excavate topsoil and stockpile in area designated on site. Remove excess topsoil not being reused from site.

1.7 SUBSOIL EXCAVATING

A. Excavate subsoil from marked areas required for building foundations, construction operations, and other Work.

B. Slope banks to angle of repose or less, until shored.

C. Excavation shall not interfere with 45 degree bearing splay of any foundation.

D. Correct unauthorized excavation at no cost to Owner.

E. Fill over-excavated areas under structure bearing surfaces in accordance with direction by Architect.

F. Stockpile soil in area designated on site. Remove excess subsoil not being reused from site.

1.8 Trenching

A. Excavate for sanitary sewer, water and gas piping to municipal utilities.

B. Cut trenches sufficiently wide to enable installation of utilities and allow inspections.

C. Hand trim excavate and leave free of loose matter.

D. Support pipe and conduit during placement and compaction of bedding fill.

E. Backfill trenches required contours and elevations.

F. Place and compact fill materials as for backfilling.

1.9 BACKFILLING

A. Backfill areas to contours and elevations. Use unfrozen and unsaturated materials.

B. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surface.

C. Place and compact fill materials in continuous layers not exceeding 8 inches loose depth.

D. Place and compact soil material in continuous layers not exceeding 8 inches depth.

E. Employ a placement method so not to disturb or damage foundations, and foundation damp proofing, or utilities in trenches.

F. Maintain optimum moisture content of backfill materials to attain required compaction density.

G. Backfill against supported foundation walls. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

H. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise.

1.10 PLACING BUILDING PAD

A. The entire area on which the building pad is to be constructed shall be striped of existing topsoil.

B. Native subgrade shall be proof-rolled to identify wet or soft areas. Any soft or wet areas shall be over excavated to competent subgrade soils and back-filled with type E structural fill compacted to 95% of maximum dry density (ASTMD 698 standard proctor.)

C. Backfill building pad areas to contours and elevation indicated on drawings with type E fill soils in maximum lifts of 8-inch depth (loose material) in compact to 95% of maximum dry density (ASTDM D 698 standard proctor.)

D. Each lift shall be tested for compaction at the rate of one test per each approximately 1,500 square feet of building pad area. Test locations shall be uniformly distributed over the pad area. Actual test locations to be determined by filled condition.

3.8 PLACING STOCKPILED TOP SOIL

A. Place top soil uniformly to within 1/10 of a foot in areas where seeding, sodding, and planting is scheduled.

B. Find grade top soil eliminating rough or low areas. Maintain levels, profiles, and contours of sub-grade.

C. Remove large stone, roots, grass, weeds, debris, and foreign material while spreading.

D. Lightly compact and roll placed topsoil.

E. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.9 TESTS

A. Tests and analysis of fill material will be performed in accordance with ASTM D 698 and ASTM D 1557.

3.10 TOLERANCES

A. Top surface of exposed subgrade: Plus or minus 1 inch.

B. Top of Topsoil: Plus or minus ½ inch.

3.11 SCHEDULE

A. Exterior Slab-On-Grade: Type A fill, 4 inches thick, compacted to 95 % compaction of standard proctor and near optimum moisture.

B. Under building slab: 10 mil black polyethyene sheet vapor barrier tape all joints with minimum 6” overlap. Provide minimum 2” of type B fill over vapor barrier.

C. Exterior side of foundation walls and retaining walls over granular filter material and foundation perimeter drainage: Type D fill, to sub-grade elevation, each lift compacted to 90%.

D. Fill under landscaped areas: Type D fill, to 4 inches below finish grade, compacted to 85%.

E. Fill under asphalt paving: Type A fill below finish paving elevation, compacted to 95%.

F. Building pad/building footings: Type e fill (on undisturbed soils).

G. 3” of type “F” fill – Install over weed barrier by Dewitt or approved equal. Needle punch woven 4.1 ounce shall be placed under all landscape rock areas.

END OF SECTION

SECTION 024113 - SELECTIVE SITE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Demolish and remove portions of existing site facilities as described in Contract Documents.

B. Related Requirements:
   1. New and replacement work specified in appropriate specification Sections.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Scheduling: Include on Construction Schedule detailed sequence of individual site demolition operations.

1.3 SUBMITTALS

A. Closeout Submittals:
   1. Record Documentation: Identify abandoned utility and service lines and capping locations on record drawings.

PART 2 PRODUCTS: Not Used

PART 3 EXECUTION

3.1 PREPARATION

A. Notify corporations, companies, individuals, and local authorities owning conduits running to property.

   1. Protect and maintain conduits, drains, sewers, pipes, and wires that are to remain on the property.

   2. Arrange for removal of wires running to and on property. Remove pipes and sewers in accordance with instructions of above owners.

3.2 PERFORMANCE

A. Execute work in an orderly and careful manner, with due consideration for neighbors and the public.

B. Carefully remove, disassemble, or dismantle as required, and store in approved location on site, existing items to be reused in completed work. Coordinate with Owner for equipment and materials to be removed by Owner.

C. Concrete And Paving Removal:

1. Saw cut joints between material to be removed and material to remain to full depth.

2. Hand-excavate trench 12 inches wide and 16 inches deep along concrete or paving to be removed. Cut roots encountered with saw, axe, or pruner. Do not cut roots with excavating equipment. Remove roots under concrete and paving to be replaced down to 12 inches below finish grade.

3.3 CLEANING

A. Keep streets and roads reasonably clean, and sweep daily.

B. Sprinkle demolition rubbish and debris as necessary to lay dust.

C. Promptly remove demolition materials, rubbish, and debris from property.

END OF SECTION

SECTION 033000 - CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes but is not limited to the following:

1. Cast-in place concrete, including formwork, reinforcing, mix design, placement procedures, curing, and finishes

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. w/cm: The ratio by mass of water to cementitious materials.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Submit shop drawings for reinforcement steel: Indicate reinforcement sizes, spacing, diagrams of bent bars, wire fabric, bending and cutting schedules, splicing, supporting and spacing devices and arrangement of concrete reinforcement. Include special reinforcement required for openings.

C. Material suppliers test reports for concrete materials and mix design.

1.4 PREINSTALLATION MEETING

A. Preinstallation Conference: Conduct conference at Project site

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mixed concrete manufacturer.
   d. Concrete Subcontractor.
   e. Special Concrete finish Subcontractor
2. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction joints, control joints, isolation joints, and joint-filler strips.
c. Semirigid joint fillers.
d. Vapor-retarder installation.
e. Anchor rod and anchorage device installation tolerances.
f. Cold and hot weather concreting procedures.
g. Concrete finishes and finishing.
h. Curing procedures.
i. Forms and form-removal limitations.
j. Shoring and reshoring procedures.
k. Methods for achieving specified floor and slab flatness and levelness.
l. Floor and slab flatness and levelness measurements.
m. Concrete repair procedures.
n. Concrete protection.
o. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
p. Protection of field cured field test cylinders.

1.5 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. ACI 301, “Specification of Structural Concrete for Buildings” and ACI 302.1R “Guide for Concrete Floor and Slab Construction,” Current Edition.

2. ACI 305R, “Hot Weather Concreting,” Current Edition.

3. ACI 306R, “Cold Weather Concreting,” Current Edition

4. ACI 308, “Standard Practice for Curing Concrete,” Current Edition.

5. ACI 309, “Standard Practice for Consolidation of Concrete,” Current Edition.

6. ACI 318, “Building Code Requirements for Reinforced Concrete,” Current Edition.

7. ACI 347, “Recommended Practice for Concrete Formwork,” Current Edition.

8. ACI 360R, “Design of Slabs on Grade,” Current Edition.

9. Concrete Reinforcing Steel Institute (CRSI), “Manual of Standard Practice,” Current Edition.

B. TESTING

1. Tests: Testing for moisture control and the results of the tests will be required prior to installation of finish floor surfaces. The tests include the following:

2. ASTM F 710: "Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring." Schedule the referenced tests to be taken after the space to receive flooring is brought to "in-use" conditions through the use and operation of the permanent HVAC system.

3. ASTM F 1869 "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydros Calcium Chloride."

4. Alkalinity Tests: Alkalinity of the concrete surface shall not be less than pH 7.5, minimum, and shall not exceed pH 8.5, maximum. The test for alkalinity shall be taken at the floor surface only following completion of all abrasive removal operations (shot blasting, sanding, or grinding).

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.

1. Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete Form," Class I.

B. Form Ties: Factory-fabricated snap-off metal form ties.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed, unless otherwise indicated.

B. Fiber Reinforcing at polished concrete: Product: Green Umbrella, FiberLite.

a. Monofilament acrylic fiber compliant with ASTM C1116/C1116M, Section 4.1.3, and Note 3, and ICC ES AC 32, Sections 4.1.1 and 4.1.2.
b. Flexural Strength: 60 psi at 2/3 lbs/yd.
c. Specific Gravity: 1.17.
d. Fiber Length: 6 mm.

2.3 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, for cast-in-place and pre-cast concrete.

B. Fly Ash: Fly ash is not allowed in any concrete mixes used for slabs-on-grade or slabs on metal deck.

C. Welded Steel Wire Fabric: ASTM A185 Plain type, fabricated into flat sheets, coiled rolls prohibited.

D. Chairs, Bolters, Bar Supports, and Spacer: Sized and shaped for support of reinforcing, conforming to CRSI.

E. Fabricate concrete reinforcing in accordance with ACI 315.

1. Use one brand of cement throughout project unless otherwise acceptable to Architect.

a. Portland Cement ASTM C 150, Type II Preferred

b. Use cement that exhibits low shrinkage characteristics.

c. Type of cement (Type I, Type I/II, Type II, etc.) used will be at discretion of the batching plant in order to meet the specified criteria for low shrinkage, low alkalinity, low permeability, etc.

F. Aggregates: ASTM C 33 and as herein specified.

1. Local aggregates not complying with ASTM C 33 but that special tests or actual service have shown to produce concrete of adequate strength and durability may be used when acceptable to Architect.

2. Provide aggregates that test low in alkalinity.

3. Aggregate size shall be as indicated in ACI 301 for structural concrete and as indicated in ACI 302.1R and ACI 360R.

a. For structural concrete, maximum aggregate size shall not exceed 2/3 the spacing distance of the reinforcement, but not to exceed 1 1/2”.

b. For slab-on-grade construction and for concrete pavements, maximum aggregate sizing shall equal approximately 1/3 of the slab section but shall not exceed 1 1/2”. (Example: For 4” slabs, maximum aggregate size equals $\pm$ 1 1/2”; for 2” topping, maximum aggregate size equals $\pm$ 5/8”.)

G. Water: Drinkable with low alkaline characteristics.

H. Admixtures, General: Provide admixtures for concrete that contain not more than 0.1 percent chloride ions.

I. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include:

a. “Air-Tite,” Cormix.

b. “Air-Mix” or “Perma-Air,” Euclid Chemical Co.

c. “Darex AEA” or “Daravair,” W.R. Grace & Co.

d. “MB-VR” or “Micro-Air,” Master Builders, Inc.

e. “Sealtight AEA,” W.R. Meadows, Inc.

f. “Sika AER,” Sika Corp.

g. or Approved.

2.4 RELATED MATERIALS

A. Moisture-Retaining Cover for Interior Slabs-On-Grade: The following complies with ASTM C 171.

1. Polyethylene film per ACI 302.1R.

B. Vapor Retarder: Provide 15 mil vapor retarder cover over prepared base material directly below all slabs on grade.

C. Underlayment Compound: Free-flowing, self-leveling, pumpable, cement-based compound for applications from feathered edge to 1/2-inch or from feathered edge to 4-inch thick with sand extension.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a. “LevelLayer II,” Dayton Superior Corp. (Design Standard).

b. “Flo-Top,” Euclid Chemical Co.

c. “Pourcrete,” Master Builders, Inc.

d. “Thoro Underlayment Self-Leveling,” Thoro System Products.

e. "Raeco Self-Leveling Underlayment (SLU)," Raeco, Seattle, WA.
f. or Approved.

D. Bonding Compound: Polyvinyl acetate or acrylic base.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include:

a. Acrylic or Styrene Butadiene:

1) "Day-Chem Ad Bond," Dayton Superior Corp. (Design Standard)

2) "SBR Latex," Euclid Chemical Co.

3) "Daraweld C," W.R. Grace & Co.

4) "Hornweld," A.C. Horn, Inc.

5) "Acryl-Set," Master Builders Inc.

6) "Intralok," W.R. Meadows, Inc.

7) or Approved.

2. Use recommended bonding compound for bonding new to new or new to old concrete.

E. Non-Shrink Grout: Premixed compound with non-metallic aggregate cement, water reducing and plasticizing agents; capable of minimum compressive strength of 6,000 psi. Master Builders "Embeco" or approved.

2.5 PROPORTIONING AND DESIGNING CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete by using methods as specified in ACI 301. Proportions shall be as necessary to obtain indicated strengths.

1. Note requirements for low alkaline component materials for concrete slabs-on-grade.

2. No fly-ash will be allowed in the mix design for slabs on grade or slab on deck.

B. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until proposed mix designs have been reviewed and approved.

C. Design mixes to provide normal weight concrete with the properties as indicated on drawings and schedules. Light weight concrete is required at slab on metal deck as indicated on the drawings and schedules.

D. Water-Cement Ratio for Low Shrink Concrete: Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:

1. Interior Slabs: W/C: 0.48 or higher [air entrainment: not allowed].

a. Advise, confer with and coordinate these W/C ratios with the entity contracted to perform the concrete polishing work.

2. Exterior Slabs subject to de-icers: W/C 0.45- [259 lbs. water/564 lbs. cement; air-entrainment: 6% (+/- 1%)].

E. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Interior Slabs: 4 inches maximum. (Slump limit prior to introduction of water-reducing admixture).

a. Advise, confer with and coordinate these slump limits with the entity contracted to perform the concrete polishing work.

2. Reinforced foundation systems: 4 inches maximum.

3. Other concrete and exterior flat work: Not more than 4 inches maximum.

2.6 ADMIXTURES

A. Provide high-range or medium range water-reducing admixture in interior slab-on-grade concrete for workability. Submit mix design with manufacturer's product information and specifications for review and approval.

B. Provide accelerating admixture in concrete slabs placed at ambient temperatures below 50° F (10° C).

C. Where used, admixtures for water reduction and set control shall be provided in strict compliance with manufacturer's directions.

D. C-500 by Xypex shall be provided in the concrete for the swimming pool deck and splash pad
a. Approved: Penetron Admix

2.7 CONCRETE MIXING

A. Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as specified.

1. When air temperature is between 85° F (30° C) and 90° F (32°C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90° F (32° C), reduce mixing and delivery time to 60 minutes.

2. Verify with Architect the procedures to be taken to comply with referenced standards regarding hot or cold weather delivery and placement of concrete.

PART 3 EXECUTION

3.1 GENERAL

A. Coordinate the installation of joint materials insulation and vapor retarders with placement of forms and reinforcing steel.

B. Comply with requirements of ACI 301, “Standard Specification for Structural Concrete.”

3.2 FORMS

A. General: Design, erect, support, brace, and maintain formwork to support vertical and lateral, static and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACI 347.

B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, etc., required in work. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.

C. Fabricate forms for easy removal without hammering or prying against concrete surfaces.

D. Chamfer exposed corners and edges using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

E. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and coordinate location of openings, recesses, locker bases and chases from trades providing such items. Accurately place and securely support items built into forms.

F. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retighten forms and bracing before concrete placement as required to prevent mortar leaks and maintain proper alignment.

3.3 PLACING REINFORCEMENT

A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as herein specified.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that could reduce or destroy bond with concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved.

D. Place reinforcement to obtain at least minimum coverage for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

3.4 JOINTS

A. Construction Joints: Locate and install construction joints as acceptable to Architect, unless indicated on drawings.

B. Isolation Joints in Slabs-on-Ground: Construct isolation joints in slabs-on-ground at points of contact between slabs-on-ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated.

C. Contraction (Control) Joints in Slabs-on-Grade: Construct contraction joints in slabs-on-grade to form panels of patterns as shown. Use saw cuts 1/8-inch-wide on interior slabs as shown on drawings.

1. Contraction joints in exposed floor slabs should be formed as soon as possible after slab finishing as may be safely done without dislodging aggregate to minimize shrinkage cracking.

2. For joint patterns not shown, provide joints not exceeding 12 feet in either direction and located to conform to bay spacing wherever possible (at wall lines or column centerlines, half bays, third bays, etc.). Verify joint layout with Architect.

3. Joint sealant material is specified in Division 7 Sections of these specifications.

3.5 INSTALLATION OF EMBEDDED ITEMS

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.

B. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to obtain required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

3.6 PREPARATION OF FORM SURFACES

A. General: Coat contact surfaces of forms with an approved, non-residual, low-VOC, form-coating compound before reinforcement is placed.

B. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

C. Coat steel forms with a non-staining, rust-preventative material. Rust-stained steel formwork is not acceptable.

D. Install expansion joint material when abutting to other construction.

3.7 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Notify Building Official and Architect prior to placement of concrete.

B. General: Comply with ACI 304, "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete," and as herein specified.

C. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete that has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints. Deposit concrete to avoid segregation at its final location.

D. Placing Concrete in Forms: Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.

1. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine.

E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

1. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Bring slab surfaces to correct level with straightedge and strike off. Use appropriate equipment to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

3. Maintain reinforcing in proper position during concrete placement.

4. Place expansion joint material.

5. Apply water and moisture retaining cover. Keep continuously wet for 7 to 10 days, depending on conditions.

F. Cold-Weather Placing: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

G. When air temperature has fallen to or is expected to fall below 40° F (4° C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50° F (10° C) and not more than 80° F (27° C) at point of placement.

1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

H. Hot-Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90° F (32° C).

2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embodiment in concrete.

3. Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.

I. Slab Tolerances:

1. Interior flat slabs shall be plus or minus a maximum of 3/16” in 10’-0”, without excessive changes in slope.

2. Interior slabs that slope to drain shall be formed and the concrete shall be placed to conform to the indicated elevations for top of slope and at the drain. Finish the sloping planes to tolerances for flat slabs by minimizing surface variations.

3.8 FINISH OF FORMED SURFACES

A. Rough Form Finish: For formed concrete surfaces not exposed to view in the finish work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.

B. Smooth Form Finish: For formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, damp proofing, veneer plaster, painting, or other similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.

1. Perform “smooth rubbed finish” or “grout cleaned finish” (sack finish) per ACI 301 depending on timing when rubbed finish is applied.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.9 MONOLITHIC SLAB FINISHES

A. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, Portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.

1. After placing slabs, plane surface so that depressions between high spots do not exceed 1/2” under a 10’ straightedge. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set, with stiff brushes, brooms or rakes.

B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and to slab surfaces which are to be covered with membrane or elastic waterproofing, such as sub-slabs for wood gymnasium floors, and as otherwise indicated.

1. After screening and consolidating concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of hand floats or power- driven floats, or both. Consolidate surface with power- driven floats or by hand-floating if area is small or inaccessible to power units. Check and level surface tolerances. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

C. Hard Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, thinset ceramic tile, paint or other thin film finish coating system and to slabs used as substrates for wood flooring systems.

1. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over

surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance. Grind smooth surface defects which would telegraph through applied floor covering system.

a. Texture of concrete slabs-on-grade to receive adhesive applied finish. Finish of concrete shall be similar to 60 grit sandpaper.

b. Provide slab “soft-cuts” not to exceed 12’-0” in each direction or as indicated.

D. Finish: Apply nonslip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated. Refer to Division 32 section “Concrete Walks” for finishing requirements for exterior concrete flatwork.

1. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades after work of other trades is in place. Provide other miscellaneous concrete filling required to complete work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

3.11 CONCRETE CURING AND PROTECTION

A. General: Concrete Cure Finishing System

1. Product System: Green Umbrella, "GreenIce Cure System":

a. Curative / FinishAid / Fixative / Densifier System: Clear, penetrating, reactive VOC compliant compound designed to promote proper cure as well as mechanically, and chemically densified power troweled concrete surfaces.

a) Product: Green Umbrella, IceStart & IceStop.
b) Cure.
c) Fixative.
d) pH neutral.

2) Mechanical:

a) Integral Mechanical Densification Finishing Trowel.

b) Black Pad High-Speed Propane Burnished.

1. Concrete with shrinkage cracks will be assumed to have been improperly cured and will not be accepted. Before forming, advise Architect of detailing or restraints that Contractor believes may cause shrinkage cracking.

B. Provide curing and sealing compound to exposed exterior slabs, walks, parking lot light standard bases, and curbs as follows:

1. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

2. Do not use membrane curing compounds that will affect surfaces to be covered with Division 9 specified finish materials applied directly to concrete. Curing compounds are not acceptable for use on interior slabs-on-grade.

C. Provide moisture-retaining cover curing for interior slabs as follows:

1. Follow GreenIce Manufacturer installation procedure.

E. Curing Formed Surfaces: Cure formed concrete surfaces by moist curing with forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

3.12 SHORES AND SUPPORTS

A. General: Comply with ACI 347 for shoring concrete construction.

B. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to support work without excessive stress or deflection.

3.13 REMOVAL OF FORMS

A. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50° F (10° C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete and other structural elements, may not be removed in less than 14 days and until concrete has attained at least 75 percent of design minimum compressive strength at 28 days.

3.14 REUSE OF FORMS

A. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form- coating compound as specified for new formwork.

3.15 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms as acceptable to Architect.

B. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness.

1. Repair finished unformed surfaces that contain defects that affect durability of concrete. Surface defects, as such, include crazing and cracks, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.

3. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with patching compound. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Architect.

C. Perform structural repairs with prior approval of Architect for method and procedure, using specified epoxy adhesive and mortar.

D. Repair methods not specified above may be used, subject to acceptance of Architect.

3.16 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. General: The Owner may employ a testing laboratory to perform tests and to submit test reports.

B. Sampling and testing for quality control will occur during placement of concrete. Cooperate with the testing laboratory to provide cylinders for compressive tests, samples of the

materials for slump tests, air content and temperature, and access to the work. Test results will be reported in writing to the Architect and the Contract Officer for distribution.

C. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing 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.

3.17 STANDARD FF/FL SPECIFICATION

A. Designation: The floor area bounded by the exterior foundation is designated the Random Traffic Floor. Any floor slab which comprises a portion of the Random Traffic Floor is designated a Random Traffic Slab.

B. Local Flatness/Levelness: Except as set forth in Paragraph D below, the Random Traffic Floor shall conform to the following minimum F-number requirements:

1. Specified Overall Values (resilient flooring areas): OAFF:35/OAFL25
2. Specified Overall Values (carpeted areas): OAFF:21/OAFL15

C. General Conformity to Design Grade: Except as set forth in Paragraph D below, the entire Random Traffic Floor shall fall within plus or minus 1/4” of its specified (matching existing floor) elevation.

1. Floor level tolerance at base cabinets shall not exceed 1/4” along entire length of cabinet with no exception for elevation slab construction.

D. Exception: Both the overall and minimum local FL levelness tolerances set forth in Paragraph B above shall not apply to any Random Traffic Slab that is to be inclined or cambered.

E. Testing: All floor flatness, levelness, and grade conformity tests shall be made at the Owner’s expense on each newly installed Random Traffic Slab within 72 hours after completion of the final troweling operation. FF and FL tests shall be conducted in accordance with ASTM E1155. Grade conformity tests shall be made using either an optical or laser level. Results of all floor tolerance tests (including a formal notice of acceptance or rejection of the work) shall be provided to the Contractor within 24 hours after data collection. Failure to adhere to the testing and reporting requirements set forth in this paragraph shall constitute *de facto* acceptance of the work. (Note: Weekends and holidays shall be ignored when computing specified testing and reporting deadlines.)

F. Remedy for Out-of-Tolerance Work: The entire Random Traffic Floor shall be subdivided into Minimum Local Floor Sections bounded either by the column and half-column lines, or the construction and control joints, whichever subdivision yields the smaller areas.

1. All Minimum Local Floor Sections measuring at or above both the specified MLFF and MLFL numbers shall be accepted for F-number compliance as constructed. All Minimum Local Floor Section slabs-on-grade which fail to meet or exceed both specified minimum local F-numbers shall be ground and/or retopped, or in extreme cases, removed and replaced.

3.18 REMEDY FOR OUT-OF-TOLERANCE WORK FOR SLAB-ON-GRADE CONDITIONS

A. Grind areas of slab-on-grade construction that have curled to out-of-tolerance condition. Bring the work into tolerance (or replace as indicated) at no cost to the Owner.

1. Grind high points at construction joints to meet specified tolerance.

2. Areas of slab-on-grade construction that have curled to being out-of-tolerance shall be ground to bring the work into tolerance.

B. Fill low points in slabs that have finished flooring to a level that will properly meet the specified tolerance at no cost to the Owner.

1. Slab areas that are excessively low that do not have finished flooring shall be removed and replaced.

C. Repair shrinkage cracks by grinding cracks in a “vee groove” and fill with epoxy-based repair materials and grind the filled areas smooth at no cost to the Owner.

END OF SECTION 033000

SECTION 033509 – CONCRETE CURE AND FINISHING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete floor slab finishing including floating, troweling, curing, and sealing.

2. Protecting finished concrete floor slab until Substantial Completion.

1.2 RELATED REQUIREMENTS

A. Concrete for polished concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, initial finishing and curing. Additional requirements are specified in Section 033000 "Concrete."

1. Coordinate with sections:

   a. Section 033000 - Concrete.
   b. Section 079000 - Joint Sealants.

2. Coordinate with finishing manufacturer for system "products" for sections above.

1.3 REFERENCES

A. ASTM International (ASTM):

1. ASTM C94/C94M: Standard Specification for Ready-Mixed Concrete
2. ASTM C156: Standard Test Method for Water Loss (from a Mortar Specimen) Through Liquid Membrane–Forming Curing Compounds for Concrete.
3. ASTM C779/C779M: Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
4. ASTM C805/C805M: Standard Test Method for Rebound Number of Hardened Concrete.
5. ASTM C944/C944M: Standard Test Method for Abrasion Resistance of Concrete or Mortar Surfaces by the Rotating–Cutter Method.
6. ASTM C979/C979M: Standard Specification for Pigments for Integrally Colored Concrete.
7. ASTM C1077: Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.
8. ASTM C1116/C1116M: Standard Specification for Fiber-Reinforced Concrete.

9. ASTM C1583/C1583M: Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method).
10. ASTM C1895 - Standard Test Method for Determination of Mohs Scratch Hardness.
11. ASTM E96/E96M–10: Standard Test Method for Water Vapor Transmission of Materials.
12. ASTM E329: Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
13. ASTM E1155: Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.
14. ASTM G152: Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials.

B. American National Standards Institute (ANSI):

1. ANSI/NFSI B101.1-2009: Test Method for Measuring Wet SCOF of Common Hard-Surface Floor Materials.
2. ANSI/NFSI B101.3-2012: Test Method for Measuring Wet DCOF of Common Hard-Surface Floor Materials

C. American Concrete Institute (ACI):

1. ACl 302.1R-89-15: Guide to Concrete Floor and Slab Construction.
2. ACI 305.1-14(20) Specification for Hot Weather Concreting (Reapproved 2020).
3. ACI 306.1-90: Standard Specification for Cold Weather Concreting (Reapproved 2002).
4. ACI 310R-19: Guide to Decorative Concrete.

D. British Standard (BS):

1. BS EN 13892-4:2002: Methods of Test for Screed Materials. Determination of Wear Resistance BCA.

E. Concrete Sawing and Drilling Association, Inc. (CSDA):

1. CSDA ST-115: Measuring Concrete Micro Surface Texture.

F. International Code Council Evaluation Service (ICC ES):

1. ICC ES AC 32: Concrete with Synthetic Fibers.

1.4 PREINSTALLATION MEETING

A. Preinstallation Conference: Conduct conference at project site or video conference.

1. Schedule meeting between 7 and 14 days prior to first concrete slab placement of 10,000 SF or greater and after placement of test slab and after concrete submittals have been approved.
2. Obtain Pre-slab Installation Meeting Agenda from Green Umbrella, (844) 200-7336.

3. Require responsible representatives of each party involved with the interior concrete slab work to attend the meeting. Representatives to be present shall include personnel who are directly involved in overseeing the work for each placement and who have authority to control the concreting work.
4. Before submitting design mixtures, review concrete design mixture and review quality procedures for concrete materials, installation procedures, and compatibility with concrete densification and finish materials.
5. Require representatives of each entity directly concerned with concrete. Attendees shall include, but not be limited to the following:

    a. Owner's Construction Manager.
    b. Owner's Concrete Consultant.
    c. Contractor:

        1) Project Manager.
        2) Superintendent.

    d. Green Umbrella Certified Place/Finish Concrete Subcontractor:

        1) Green Umbrella Master Craftsman/Project Manager.
        2) Green Umbrella Craftsman/Finish Foreman.

    e. Concrete Producer:

        1) Quality Control Representative.

    f. Base Fine Grading Contractor.
    g. Owner's Construction Testing Laboratory.
    h. Independent testing agency responsible for concrete design mixtures.
    i. Concrete architectural concrete system manufacturer.

1.5 SCHEDULING

A. Give preference to Thursday or Friday placement and finishing to reduce interference and expedite project release to other trades.

1.6 ACTION SUBMITTALS

A. General: Provide submittals as required by this Specification in accordance with Contract Documents. No work shall be performed relating to a submittal until the submittal is approved by the Architect/Engineer in writing.

B. Submit submittal items concurrently for submittals shown with the same submittal date specified in the Concrete Submittal Register included at the end of this Section. Do not submit submittals of this section together with submittals in any other Section. Identify submittals explicitly in accordance with the requirements of Section 010010.

C. Green Umbrella Certified Place/Finish Concrete Subcontractor Qualification Statement: Submit Green Umbrella Certification Form including Floor Finisher Qualifications as required in Quality Assurance paragraph.
   1. Provide ACI certification documents for at least three finishers who will install all interior slab placements.

D. Slab Joint and Placement Plan:

   1. Develop and submit slab joint and placement plan. Plan shall identify the following:

      a. Exterior walls and column grid locations.
      b. Truck access location.
      c. Extent of pours including width, length, slab placement area and volume.
      d. Sequence of placement.
      e. Location of test slab placement.
      f. Locations of construction joints.
      a. Location of sawn contraction joints when locations differ from those shown on the structural drawings.

E. Product Data: Material and Technical Data for all materials including, but not limited to:

   1. Concrete: Provide concrete plant record of concrete mix, including additives and on-site water quantity compensation, reviewed by architect and floor system manufacturer.

   2. Fiber reinforcement material.

   3. Concrete cure treatment(s).

   4. Repair materials.

      a. Surface Defect Repairs: The Owner's Representative shall submit map of locations where surface defects are to be repaired. Map shall be referenced to the building column line locations.
      b. Crack Repair: The Owner's Representative shall submit a map of locations where cracking is to be repaired. Map shall be referenced to the building column line locations.

   5. Interior slab protection materials.

   6. Exterior slab protection materials.

F. System Data: Technical data, testing and surface profile requirements for completed concrete finish system.

G. Concrete Floor Protection Plan: Submit concrete floor protection plan addressing procedures specified in Part 3 of this Section.

H. Equipment Data: Technical and performance data on all types of equipment to be used in the processing of concrete and application of finish systems. Mandatory documentation that indicates the number of and compliance of propane equipment with finishing and treatment manufacturer's written requirements and recommendations.

1. Integral Mechanical Densification Finishing Trowel:

a. Ride-on Trowel:

1) Provide minimum of three units per 10,000 sq. ft. min six for greater areas.
2) Provide minimum of one 10 foot unit for areas greater than 15,000 sq. ft.
3) On-board retardant tank, flushed and inspected.
4) Propane required for sustainable projects.
5) Maximum 90 dBA measured 3 feet from sound source per ISO 11201.

b. Walk-behind Trowel:

1) Provide minimum of six units for initial 10,000 sq. ft.
2) Additional two units per 10,000 sq. ft. thereafter.
3) 46 inch unit preferred.
4)

c. Edger Trowel:

1) Provide minimum of three units per 10,000 sq. ft.
2) 24 inch, 30/36 inch unit.
3) Rotating guard-rings required.

2. Walk Behind Concrete Slurry Recovery:

a. Manufactured by Green Umbrella.
b. 40 gallon recovery.
c. Vacuum Motors: Two, 24V DC 3-stage, 140 CFM.
d. Environmentally preferable gel batteries.

3. Floor Auto Scrubber Machine:

a. Water application and minimum 30 gallon recovery tank.
b. Variable Head Pressure: 0-350 psi.
c. Provide minimum of two units per 10,000 sq. ft.
d. Battery-powered equipment is equipped with environmentally preferable gel batteries.

4. Concrete Weighted Ultra High Speed Burnisher:

a. Manufactured by Green Umbrella.
b. Weighted pad driver.
c. CARB/EPA certified.

d. Width: 27 inch.
e. Maximum 90 dBA measured 3 feet from sound source per ISO 11201.
f. No substitute accepted.
g. Ergonomically designed to minimize vibration, noise, and user fatigue.

I. Shop Drawings: Application area plans to show expansion joints and layout of colorant(s), indication of topical or integral (if specified). Indicate locations and schedule of concrete placement, integral troweled cure and abrasive profile.

J. Sustainable Design Submittals:

1. Laboratory Test Reports: For [**colorants**] [**and**] [**liquid concrete treatments**], indicating compliance with requirements for low-emitting materials.
2. Products shall comply with the requirements of the California Department of Public Health's (CDPH) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

K. Pre-Slab Installation Meeting Documents:

1. Record of notification of pre-slab meeting including company name, persons contacted, date, and method of contact.
2. Meeting Agenda
3. Meeting Minutes. Submit meeting minutes including attendance record to participants and Owner’s Construction Manager. Minutes of the meeting shall be distributed to partied in attendance by the Contractor within 5 days of the meeting. One copy of the minutes shall also be transmitted to Green Umbrella for informational purposes.

L. Delivery Tickets:

1. Submit delivery tickets for each load of concrete delivered to site.
2. Indicate information required by ASTM C 94 on each ticket including additional information required for slabs.
3. Information on ticket shall include quantities of all material batched including the amount of free water in the aggregate and the quantity of water that can be added at the site without exceeding the maximum water cement ratio of the approved mix design. Aggregate moisture corrections shall be based on ASTM definitions of aggregate moisture content and absorption.
4. Mix identification number on ticket shall match number on submitted and approved mix design.

1.7 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Provide testing reports for each product. Indicate entity performing the testing, testing standards and results and the qualified testing agency that approves or certifies the testing and results.

B. Provide manufacturer’s written installation instructions and recommendations.

C. Field quality control reports.

D. Testing agency qualifications.

E. Installer qualifications.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: Manufacturer's written recommendations for protecting, cleaning, and maintaining concrete finishes.

1.9 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency qualified to perform specified or required testing in accordance with ASTM C1077 and ASTM E329.

B. Placement and Finisher Qualifications: A firm currently certified by Green Umbrella as a Craftsman or Master Craftsman approved by polished concrete finish manufacturer prior to project award. Installer must provide written documentation from the manufacturer confirming the Installer's current accreditation and training from Green Umbrella on installation of the Green Umbrella GreenIce System and related equipment and processes. Failure to provide current accreditation will void any warranty implied or otherwise associated with the Green Umbrella Architectural Concrete System.

1. Acceptable Green Umbrella Master Craftsman: (www.greenumbrellasystems.com)

a. Contact Info.

C. Green Umbrella Certified Qualifications: A firm currently certified as a Green Umbrella Craftsman or Master Craftsman approved by polished concrete finish manufacturer prior to project award.

1. Acceptable Green Umbrella Craftsman: (www.greenumbrellasystems.com)

a. Contact Info.

D. Manufacturer's Representative: Provide oversight and inspection by concrete finish manufacturer in accordance with manufacturer's requirements.

1. Green Umbrella Representative: (www.greenumbrellasystems.com)

a. Contact Info. tom@greenumbrellasystems.com , 716-771-6352

E. Mockups: Construct mockups **as directed by Architect**, [**minimum 20x20 feet**] for each finish to verify selections made and to demonstrate typical joints, surface profile and gloss, tolerances, and

standard of workmanship. Build mockups using materials specified for the completed Work, and in compliance with recommendations of manufacturer.

1. Obtain **Architect's** approval of mockups prior to starting construction.
2. Viewed in light similar to project completion.
3. Mock-up construction performance should demonstrate actual construction methodology to the extent possible. Differences in equipment and actual methodology will cause variations and differences between mock-up and finished floor.
4. Demonstrate curing, finishing, and choice of protection of architectural concrete.
5. Maintain mockups, marked and undisturbed during construction to provide a baseline standard for assessing completed Work.
6. Remove mockup when directed.

7. Approved, undisturbed, and undamaged mockups may remain as a part of the Work.

F. Protection of Concrete Finishes: Provide protection for concrete slab finishes as indicated in manufacturer's written instructions, 310R-19, and as follows:

1. Provide protection of concrete finishes from any contact with any substance that contains petroleum, acids or detergents.

    a. Prohibit vehicle transit and parking on concrete surfaces without providing protection.
    b. Prohibit storage, transit or use of hydraulic equipment on concrete surfaces without providing protection.
    c. Prohibit construction operations that include the use of substances listed above without providing approved protection.

2. Provide protection to finished concrete surface from any materials placed and/or stored on the surface, including but not limited to:

    a. Steel and iron.
    b. Petroleum based products.
    c. Vehicles and machinery.
    d. Hydraulic fluid.
    e. Paints and coatings.
    f. Paper and plastic packaging.
    g. Aggregates.
    h. Food and beverages.

3. Surface Contaminant Cleaning Procedure:

    a. Provided by system manufacturer.
    b. On-site spill kits:

        1) Solid removal.
        2) Liquid removal.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver material in original containers with unbroken seals, bearing manufacturer labels indicating brand name and directions for storage.

B. Protect materials from weather and elements. Do not allow liquid products to freeze.

1.11 PROJECT CONDITIONS

A. Maintain environmental conditions on day of placement as recommended by treatment manufacturer and certified installer.

B. Changes to placement schedule for environmental conditions from certified installer recommendations shall be approved in writing by Owner's Construction Manager prior to implementation.

C. Hot and cold weather concreting shall be in accordance with ACI 305.1 (hot weather) and ACI 306.1 (cold weather) except as otherwise specified herein. In case of conflict, provisions stated herein shall prevail over ACI standard specifications.

D. Concreting in Hot, Dry or Windy Weather:

1. Determine rate of evaporation in accordance with ACI 305.1.
2. Employ precautions as required to protect fresh concrete before and during finishing when the concrete rate of evaporation exceeds 0.1 pounds per square foot per hour or when any combination of concrete materials and weather conditions are favorable for the formation of plastic shrinkage cracks.

    a. Cool ingredients before mixing to reduce concrete temperature at time of placement. Mixing water may be chilled, or chopped ice may be used to control the concrete temperature provided the water equivalent of the ice is calculated to the total amount of mixing water.
    b. Dampen subgrade and forms.
    c. Cover reinforcing steel with water-soaked burlap so the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

3. Maintain an accurate reading thermometer at the Site to check temperature of concrete
4. Temperature of concrete at time of placing: Not to exceed 85 degrees F.
5. Reject concrete if more than one slump adjustment, as defined in ASTM C 94, is required.
6. Do not place concrete when forms, subgrade, aggregate base or reinforcing bars are more than 120 degrees F or the temperature differential between the forms, aggregate base, or reinforcing bars and concrete will create conditions favorable for settlement cracks or thermal cracking.

E. Concreting in Cold Weather:

1. Minimum base surface temperature and ambient building air temperature shall be 55 degrees F during placement and throughout curing period except as otherwise specified herein. In case of conflict, provisions stated herein shall prevail over the ACI standard specifications.
2. Measure and record concrete temperature during protection period at regular time intervals, but not less than 3 times per 24 hours.
3. Do not place slabs on subgrade, or base that is more than 20 degrees F cooler than concrete. Warm subgrade, or base to decrease temperature differential to 20 degrees F or less.
4. Minimum concrete temperature as measured at the point of discharge shall be 60 F.(65 F for approved SCM mix)
5. Do not use unvented combustion heaters during concrete placement so as to prevent exposure of concrete to excessive exhaust gases containing carbon dioxide (CO_2) or carbon monoxide (CO). During slab placement and curing periods, maximum CO_2 levels shall be 4,500 parts per million and maximum CO levels shall be 15 parts per million at concrete surface within 5 feet of any source of exhaust gases to minimize potential damage to concrete.

F. Placing Environment:

1. Architectural exposed concrete that will be profiled (PHP), shall be placed within a completely enclosed structure after the roof membrane is completely installed and watertight

    a. Roof construction, skylight installation, overhead painting, and roof drainage system shall be complete and weather tight prior to placement of sales floor slabs.
    b. Lighting: Permanent lighting or equivalent temporary lighting shall be operational during all slab placements.

G. Ff/Fl 60/40 on slab on grade and Ff/40 for slab on deck.

1.12 MANUFACTURER SPECIAL WARRANTY

A. Provide manufacturer’s 10-year warranty providing coverage that architectural concrete will remain water resistant, non-off-dusting, hardened and abrasion resistant throughout warranty period. Must accompany a time of installation report by certified installer, verified by manufacturer’s consultant and/or Corporate Office.

B. Must be installed by manufacturer’s certified installer. Certified Craftsman Warranty: 1 year for installation defect.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Subject to compliance with requirements, provide products by the following:

1. Green Umbrella Architectural Concrete Systems, Inc. 20 Jetview Dr. Rochester, NY 14624, basis of design manufacturer. Technical and Architectural Support:(844) 200-7336, info@greenumbrellasystems.com
2. No substitutions.

2.2 PERFORMANCE REQUIREMENTS

A. Abrasion Resistance: Special/WS, per BS EN 13892-4.

B. Abrasion Resistance: ASTM C944/C944M of 0.038 mm.

C. Fiber: ASTM C1116/C1116M.

D. Burnished Concrete: per ACI 310R-19, 7.2.7.

E. Slip Resistance: Minimum Dynamic Coefficient of Friction of 0.42, per ANSI/NFSI B101.3.

F. Abrasion Resistance: Abrasion resistance of 0.25 mm at 30 minutes and 0.5 mm at 60 minutes, per ASTM C779/C779M.

G. Abrasion Resistance: Special/DF, per BS EN 13892-4.

H. Water Vapor Transmission of Materials: ASTM E96/E96M of 0.34 g/h/m2.

I. Ultra-Violet Light and Water Spray: No adverse effects to ultra-violet and water spray, per ASTM G152.

2.3 MATERIALS

A. Concrete: Provide ready-mixed concrete from a single design mix and single batch plant for the entire Project specified herein. Provide concrete in conformance with Division 03 Section "Concrete" and ASTM C94/C94M.

1. Admixtures: Use only admixtures designed for use with concrete colorants and compatible with finish system. Do not use admixtures containing chlorides.

2. Product System: Green Umbrella

a. Product: Green Umbrella, FiberLite.

1) Monofilament acrylic fiber compliant with ASTM C1116/C1116M, Section 4.1.3, and Note 3, and ICC ES AC 32, Sections 4.1.1 and 4.1.2.
2) Flexural Strength: 60 psi at 2/3 lbs/yd.
3) Specific Gravity: 1.17.
4) Fiber Length: 6 mm.

B. Concrete Cure Finishing System:

1. Product System: Green Umbrella, "GreenIce Cure System":

a. Curative / FinishAid / Fixative / Densifier System: Clear, penetrating, reactive VOC compliant compound designed to promote proper cure as well as mechanically, and chemically densified power troweled concrete surfaces.

a) Product: Green Umbrella, IceStart & IceStop.
b) Cure.
c) Fixative.
d) pH neutral.

2) Mechanical:

a) Integral Mechanical Densification Finishing Trowel.
b) Black Pad High-Speed Propane Burnished.

C. Interior Slab In Dry Protection Materials:

1. Product: Green Umbrella Ramboard:

a. Forest Stewardship Council (FSC) certified. Recycled and recyclable materials.
b. Roll Dimensions (W x L): 38 inches x 100 feet (965 mm x 30.5 m). 317 sq ft. Rolls per Pallet: 16.
c. Green Umbrella Ramboard Vapor-Cure Tape: Vapor-Cure used to cover seams which prevents tape lines. Allows vapors and moisture to escape from concrete.
d. Roll Dimensions (WxL): 3 inches x108 feet (76 mm x 32.9 m) Rolls per Box: 16.
e. Or Pre-Approved Equal.

2. Product: Green Umbrella GreenGuard:

a. Roll Dimensions (W x L): 38 inches x 180 feet 10 mil.
b. Or Equal To.

c. Interior, dry conditions only.

D. Cleaning Agent:

1. Product: GreenClean with Slip Resist:

a. Slip resistance enhancing.
b. pH neutral.

2. Product: GreenClean and Degreaser:

a. Enzyme degreaser.
b. pH neutral.
c. Water treatment friendly.

3. Product: GreenClean Spill Kit:

a. Solid spill kit.
b. Liquid spill kit.
c. 72-hour recovery.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine architectural concrete substrates with polisher, for conditions that may affect the Work.

B. Verify preparations and placement of concrete is in accordance with ACI standards and manufacturer's written instructions.

1. Verify coordination with concrete mix plant, use of correct dosage, and proper mixing per ASTM C94/C94M.

C. Verify ambient and surface temperatures to be in accordance with manufacturer's requirements for all products for the work.

D. Verify concrete compressive strengths are in accordance with Contract Documents.

E. Verify that the owner's testing agency results for Mohs Hardness test per ASTM C1895 are in accordance with this specification.

3.2 PREPARATION

A. Site Conditions

1. The building shell shall be completed sufficiently to keep out wind, rain, snow or other adverse weather affects that could damage the polishing work.
2. Provide suitable water, power, lighting and ventilation.

a. Provide minimum lighting of 40-foot candles (440 lux) measured at floor surface.

3. Provide and maintain minimum floor slab temperature of 50 degrees F.

B. All penetrations, drains, floor embeds, or conduit shall be cut, capped, clearly identified and made safe prior to any polishing work.

C. Prepare equipment to be used in application of finish system materials according to finish system manufacturer's written instructions.

D. Completely clean liquid treatment application sprayers free of any potential contaminating material and make ready for application.

E. Prepare power trowels per finish system manufacturer's written instructions, cleaned and ready to trowel with accompanying spray of finish system materials. (Recommended to keep Finish Trowel dedicated for final Combo Blade finish process.)

3.3 APPLICATION

A. Concrete finish system is incorporated into the processing of newly placed concrete slabs. Proceed with placement of concrete under the supervision of finish system manufacturer's representative.

B. All concrete placement and finishing is to be performed in accordance with finishing system manufacturer's written instructions.

1. Troweled Finish: Provide troweled finish as indicated herein and according to manufacturer's written instructions.

C. Installation of Curative / Fixative / Densifier (GreenIce IceStart) in three applications as follows:

1. Apply Green Umbrella, lceStart through high volume, low pressure sprayers prior to the first bull float process. Spray-apply at a rate 1200 Square Feet per gallon. Perform bull float process as recommended by manufacturer and ACI standard.
2. Apply second application at a rate of 1200 Square feet per gallon, either by sprayers or through sprayers on power trowels. Pan material into the surface of the concrete. Power trowel with pans to ACI standard.
3. Apply third application prior to Combo Blade finishing at an application rate of 1200 Square Feet per gallon. Perform Combi Blade finishing as recommended by manufacturer and ACI standard.
4. Be prepared to apply setting/curing catalyst immediately upon completion of finishing operations.

D. Installation of Setting/Curing Catalyst:

1. Apply Green Umbrella, IceStop using high-volume, low-pressure (pump or battery powered) sprayers at a rate of 400 Square Feet per gallon..
2. Allow setting/curing/catalyst to remain on the slab for a minimum of 30 minutes wet dwell time and allow to dry. If necessary spray additional Ice Stop to maintain wet, not water.
3. Verify that the treatment has completely dried, indicating that curing system installation is complete.

E. Thoroughly sweep floor. Auto scrub with manufacturer's cleaning agent, neutral pH Green Clean and Degreaser.

3.4 EQUIPMENT

A. Refer to manufacturer's written instructions for requirements of installation equipment, including but not limited to: sprayers, power trowels, burnishers, auto scrubbers, saws, profiling, honing and polishing abrasives and dust collection system.

3.5 FIELD QUALITY CONTROL

A. Measure concrete micro surface RA texture as specified herein, re-polish if required to achieve specified requirements.

B. Measure slip resistance using certified slip-test method; verify compliance with specified slip resistance rating. NFSI approved tribometer.

3.6 PROTECTION AND CLEANING

A. Prohibit wheeled traffic on finished surfaces for a minimum of 8 hours following application or with approval of Green Umbrella Craftsman.

B. Protect finished floor as specified above and as indicated in manufacturer's written instructions and 310R-19.

C. Provide daily scrubbing of the entire exposed concrete slab surface with riding equipment that utilizes only pads and water, Daily scrubbing shall continue from time of dried initial application of surface densifier until time of store turnover. Use white or red pads, cleaned or replaced daily, and avoid using excessive downward head pressure that may damage the slab surface

END OF SECTION 033509

SECTION 042000 – MASONRY

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes but is not limited to:

1. Provide concrete masonry unit (CMU) work.

2. Provide masonry accessories, ties, grout, and mortar.

1.2 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following installed compressive strengths (f'm) at 28 days:

1. For Concrete Unit Masonry: As follows, based on net area:

a. F'm =2000 psi.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data: Submit manufacturer's product data for each type of masonry unit.

1. After review and approval, submit to Architect.

C. Shop Drawings: Submit shop drawings for reinforcing detailing fabrication, bending, and placement of reinforcement bars. Comply with ACT 315 "Details and Detailing of Concrete Reinforcement," showing bar schedules, diagrams of bent bars, stirrup spacing, lateral ties, and other arrangements of masonry reinforcement.

1. Indicate locations of penetrations, embedments, etc.

2. After review and approval, submit to Architect.

D. Samples for initial selection purposes of the following:

1. Unit masonry samples, which are not to be painted, in small-scale form showing full range of colors and textures available for each different exposed masonry unit required.

a. After review and approval, submit to Architect.

E. Samples for verification purposes of the following:

1. Dimensioned drawings for exposed masonry units required, indicating location in Project where they are to be used.

2. Colored-masonry mortar samples for color required showing the full range of color which can be expected in the finished work. Make samples using the same sand and mortar ingredients to be used on the project. Label samples.

a. Submit to Architect

F. Material certificates for the following, certifying that each material used for this project complies with requirements:

1. Each different cement product required for mortar and grout including name of manufacturer, brand, type, and weight slips at time of delivery.

2. Each material and grade indicated for reinforcing bars.

3. Each type and size of joint reinforcement.

4. Each type and size of anchors, ties, and metal accessories.

G. Material test reports from a qualified independent testing laboratory employed and paid by Contractor or manufacturer indicating and interpreting test results relative to compliance of the following proposed masonry materials to be used for this project with requirements indicated:

1. Mortar complying with property requirements of ASTM C 270.

2. Grout mixes. Include description of type and proportions of grout ingredients.

3. Masonry units.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to Architect's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM C 1093, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

B. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

C. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one source and by a single manufacturer for each different product required.

D. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.

E. Mock-Ups: Prior to installation of unit masonry, construct sample wall panels to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mock-ups to comply with the following requirements using materials indicated for final unit of Work:

1. Locate mock-ups on site.

2. Build mock-ups for each type of masonry in sizes of approximately 4 feet long by 4 feet high by full thickness, including face and backup wythes as well as accessories.

3. Clean exposed faces of mockups with masonry cleaner indicated.

4. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.

5. Notify Architect one week in advance of the dates and times when mock-ups will be constructed.

6. Protect mock-ups from the elements with weather-resistant membrane.

7. Retain and maintain mock-ups during construction in undisturbed condition as standard for judging the completed work.

a. When directed, demolish and remove mock-ups from Project site.

b. Accepted mock-ups in undisturbed condition at time of Substantial Completion may become part of completed unit of Work.

F. Pre-Installation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry materials to project in undamaged condition.

B. Store masonry units on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not install until units are in an air-dried condition.

C. Store cementitious materials on elevated platforms, under cover, and in dry location.

D. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

E. Store masonry accessories including metal items to prevent corrosion and accumulation of dirt and oil.

1.6 PROJECT CONDITIONS

A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each 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. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. 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 come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.

2. Protect sills, ledges, and projections from mortar droppings.

3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes from mortar droppings.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit masonry damaged by frost or freezing conditions. Comply with the following requirements.

1. Cold-Weather Construction: When the ambient temperature is within the limits indicated, use the following procedures:

a. 40 to 32° F (4 to 0° C): Heat mixing water or sand to produce mortar temperatures between 40 and 120° F (4 and 49° C).

b. 32 to 25° F (0 to -4° C): Heat mixing water and sand to produce mortar temperatures between 40 and 120° F (4 and 49° C). Heat grout materials to produce grout temperatures between 40 and 120° F (4 and 49° C). Maintain mortar and grout above freezing until used in masonry.

c. 25 to 20° F (-4 to -7° C): Heat mixing water and sand to produce mortar temperatures between 40 and 120° F (4 and 49° C). Heat grout materials to produce grout temperatures between 40 and 120° F (4 and 49° C). Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40° F (4° C) if grouting. Use heat on both sides of walls under construction.

d. 20° F (-7° C) and Below: Heat mixing water and sand to produce mortar temperatures between 40 and 120° F (4 and 49° C). Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40° F (4° C). Provide enclosures and use heat on both sides of walls under construction to maintain temperatures above 32° F (0° C) within the enclosures.

2. Cold-Weather Protection: When the mean daily temperature is within the limits indicated, provide the following protections.

a. 40 to 25° F (4 to -4° C): Cover masonry with a weather-resistant membrane for 48 hours after construction.

b. 25 to 20° F (-4 to -7° C): Cover masonry with insulating blankets or provide enclosure and heat for 48 hours after construction to prevent freezing. Install wind breaks when wind velocity exceed 15 mi./h (25 km/h).

c. 20° F (-7° C) and Below: Provide enclosure and heat to maintain temperatures above 32° F (0° C) within the enclosure for 48 hours after construction.

3. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40° F (4° C) and above and will remain so until masonry has dried out, but not less than 7 days after completion of cleaning.

E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100° F (38° C) and above.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include the following:

1. Concrete Masonry Units and Ground Face Units:

a. Basalite (Design Standard).

b. Oldcastle Materials

c. Or Approved.

2. Portland Cement, Mortar Cement, Masonry Cement, and Lime:

a. Davis Colors (Design Standard).

b. Lafarge Corporation.

c. Or Approved.

3. Mortar Pigments:

a. Davis Colors (Design Standard).

b. Lafarge Corporation.

c. Or Approved.

4. Joint Reinforcement, Ties, and Anchors:
a. Dur-O-Wal, Inc. (Design Standard).

b. Heckman Building Products, Inc.
c. Or Approved.

2.2 CONCRETE MASONRY UNITS

A. General: Provide shapes indicated and as follows for each form of concrete masonry unit required.

1. Provide special shapes for sill units, lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.

B. Concrete Masonry Units: ASTM C 90 and as follows:

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength indicated below:

a. Not less than the unit compressive strengths required to produce concrete unit masonry construction of compressive strength indicated on structural drawings.

2. Weight Classification: Medium weight.

3. Aggregates: Blended normal weight concrete aggregate and lightweight pumice aggregate, 50/50.

4. Provide Type I, moisture-controlled units.

5. Size: Manufactured to the actual dimensions listed below (within tolerances specified in the applicable referenced ASTM specification) for the corresponding nominal sizes indicated on Drawings:

   a. 4 inch nominal: 3-5/8 inch actual.

   b. 6 inch nominal: 5-5/8 inch actual.

   c. 8 inch nominal: 7-5/8 inch actual.

   d. 10 inch nominal: 9-5/8 inch actual.

   e. 12 inch nominal: 11-5/8 inch actual.

   f. 16 inch nominal: 15-5/8 inch actual.

6. Color: Standard Gray.

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement, as required, to provide mortar color indicated.

   1. Color: Use premixed colored cement of formulation required for color as selected.

B. Mortar Cement: I.B.C. Section 2103.

   1. For pigmented mortars, use premixed, colored mortar cements of formulation required to produce color indicated.

      a. Color: 1% “Wheat.”

C. Ready-Mixed Mortar: Cementitious materials, water, and aggregate complying with requirements specified in this article and the structural Drawings, combined with set-controlling admixtures to produce a ready-mixed mortar complying with ASTM C 1142.

1. Mortar color: 1% “Wheat.”

D. Hydrated Lime: ASTM C 207, Type S.

E. Aggregate for Mortar: ASTM C 144, except for joints less than 1/4 inch use aggregate graded with 100 percent passing the No. 16 sieve.

F. Aggregate for Grout: ASTM C 404.

G. Water: Clean and potable.

H. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following.

1. Colored Portland Cement-Lime Mix:

a. Color Mortar Blend; Glen-Gery Corporation.

b. Centurion Colorbond PL; Lafarge Corporation.

c. Lehigh Custom Color Portland/Lime; Lehigh Portland Cement Co.

d. Riverton Portland Cement Lime Custom Color; Riverton Corporation (The).

2. Mortar Pigments:

a. True Tone Mortar Colors; Davis Colors (Complying Example).

b. Centurion Pigments; Lafarge Corporation.

c. SGS Mortar Colors; Solomon Grind-Chem Services, Inc.

2.4 REINFORCING STEEL

A. Steel Reinforcing Bars: Material and grade as follows:

1. Billet steel complying with ASTM A615 Grade 60, Deformed.

B. Deformed Reinforcing Wire: ASTM A 496.

2.5 JOINT REINFORCEMENT

A. General: Provide joint reinforcement formed from the following:

1. Galvanized carbon steel wire, coating class as follows:

a. ASTM A 153, Class B-2, for both interior and exterior walls.

2.6 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with subparagraphs below, unless otherwise indicated.

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.

2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face veneer.

1. Wire: Fabricate from 3/16-inch diameter, hot-dip galvanized steel wire.

C. Adjustable Masonry-Veneer Anchors

1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:

a. Structural Performance Characteristics: Capable of withstanding a 100-lb load in both tension and compression without deforming or developing play in excess of 0.05 inch.

2. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.

a. Available Manufacturers:

1) Dayton Superior Corporation, Dur-O-Wal Division: Anchor-14 ga D/A 210 with 2 D/A 808 screws. Tie-3/16” 700 series 4”, 7” long.

2) Heckmann Building Products Inc.: Anchor-14 ga 315-D with 2 #10-16 x 1 ½” self drilling screws. Tie-3/16” 316 series 4”, 7” long.

3) Blok-Lok “BL 210.”

2.8 MISCELLANEOUS ANCHORS

A. Anchor Bolts: Steel bolts complying with A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations:

1. Headed bolts.

B. Postinstalled Anchors:

1. Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing laboratory.

a. Type: Chemical anchors.

b. Type: Expansion anchors.

c. Corrosion Protection: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).

d. Corrosion Protection: Stainless steel components complying with ASTM F 593 and ASTM F 594, Group 1 alloy 304 or 316 for bolts and nuts; alloy 304 or 316 for anchor.

e. For postinstalled anchors in grouted concrete masonry units: Capability to sustain, without failure, a load equal to 5 times loads imposed by masonry.

2.9 EMBEDDED FLASHING MATERIALS

A. Laminated Flashing: Manufacturer's standard laminated flashing of type indicated below:

1. Copper-Fabric Laminate: Copper sheet of weight indicated below, bonded to a sheet of heavy duty Kraft paper with polyethylene.

a. Weight: 2 oz./sq. ft.

2. Application: Use where flashing is fully or partially concealed in masonry.

B. Adhesive for Flashings: Of type recommended by manufacturer of flashing material for use indicated.

C. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. Copper Laminate Flashing:

a. Copper Armored Sisal Kraft; Fortifiber Corporation.

b. York Copper Fabric Flashing.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

A. Nonmetallic Expansion Joint Strips: Premolded filler strips complying with ASTM D 1056, Type 2 (closed cell), Class A, Grade 1, compressible up to 35 percent, of width and thickness indicated, formulated from the following material:

1. Neoprene.

B. Preformed Control Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

1. Polyvinyl Chloride: ASTM D 2287, General Purpose Grade, Type PVC-65406.

C. Bond Breaker Strips: Asphalt-saturated organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Adhesive: Type recommended by insulation board manufacturer for application indicated.

E. Weepholes: Provide the following:

1. Rectangular Plastic Tubing: Clear butyrate, 3/8 by 1-1/2 by 7-1/2 inches.

2.11 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of tetrasodium phosphate (1/2-cup dry measure) and laundry detergent (1/2-cup dry measure) dissolved in one gallon of water.

B. Proprietary Acidic Cleaner: Manufacturer's standard-strength, general-purpose cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry surfaces of type indicated below without discoloring or damaging masonry surfaces; expressly approved for intended use by manufacturer of masonry units being cleaned:

1. For masonry not subject to metallic oxidation stains, use formulation consisting of a concentrated blend of surface- acting acids, chelating, and wetting agents.

2.12 MORTAR MIXES

A. General: Do not add admixtures including coloring pigments, air- entraining agents, accelerators, retarders, water repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, for types of mortar indicated below:

1. Limit cementitious materials in mortar to Portland Cement- lime.

2. For masonry below grade and in contact with earth, and where indicated, use type indicated below:

   a. Type S.

3. For reinforced masonry and where indicated, use type indicated below:

   a. Type S.

4. For other applications where another type is not indicated, use type indicated below:

   a. Type S.

C. Colored Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required.

1. Provide integral concrete masonry color system.

2. Mix to match two (2) colors as approved by Architect.

3. Mortar shall match color of the CMU units or colors as selected by Architect

D. Mortar Strength: Provide mortar having a minimum compressive strength of 2000 psi at 28 days, unless otherwise indicated.

2.13 MASONRY SEALER/WATER REPELLENT MATERIALS (NON-PAINTED SURFACES) - NOT USED

A. Sealer shall be clear penetrating aqueous silane/polysiloxane blend material containing approximately 12% active ingredients by weight and complying with the following:

1. Water Repellence: 75% min. per ASTM C642.

2. Water Permeance: 94.8% reduction of leakage per ASTM E 514- 90.
3. Moisture Vapor Transmission Rate: 49.8 grams/sq. ft./24 hrs per ASTM D 1653.

4. Flash Point: 212°F min. per ASTM D3278.

5. Volatile Organic Content (VOC): Less than 250 grams/liter.

B. Products: Subject to compliance with requirements, provide the following:

1. “Clear Double 7 for Concrete Masonry”; Hydrozo Coatings Co. (Design Standard)

2. Aqua-Trete by Degussa.

3. Or Approved.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other specific conditions, and other conditions affecting performance of concrete unit masonry.

1. For the record, as applicable, prepare written report, endorsed by Installer, listing conditions detrimental to performance of unit masonry.

B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build walls and other masonry construction to the full thickness of the masonry units, using units of nominal thickness indicated.

B. Build chases and recesses as shown or required to accommodate items specified in this and other Sections of the Specifications.

C. Leave openings for equipment to be installed before completion of masonry. After installation of equipment, complete masonry to match construction immediately adjacent to the opening.

D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting where possible.

1. Install bullnose units on all “outside” corners on interior CMU construction.

3.3 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of columns and walls, do not exceed 1/4 inch in 10 feet, nor 3/8 inch in 20 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, or more. For vertical alignment of head joints, do not exceed plus or minus 1/4 inch maximum.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or more. For top

surface of bearing walls, do not exceed 1/8 inch in 10 feet, nor 1/16 inch within width of a single unit.

C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls, and partitions, do not exceed 1/2 inch in 20 feet or more.

D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4 inch nor plus 1/4 inch.

E. Variation in Mortar-Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more than 1/8 inch. Do not vary from head-joint thickness indicated by more than plus or minus 1/8 inch. Do not vary head-joint thickness from adjacent head-joint thickness by more than 1/8 inch. Do not vary from collar-joint thickness indicated by more than minus 1/4 inch or plus 3/8 inch.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.

B. Lay up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Bond Pattern for Exposed Masonry: Lay exposed masonry in the running pattern as indicated; do not use units with less that nominal 4-inch horizontal face dimensions at corners or jambs.

D. Lay concealed masonry with all units in a wythe in running bond. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

E. Stopping and Resuming Work: In each course, rack back 1/2-unit length for running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly (if required), and remove loose masonry units and mortar prior to laying fresh masonry.

F. Built-In Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

1. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.

2. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

3. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

G. Bond beams and block cores with reinforcement shall be filled with grout.

H. Lap in reinforcement shall be 48 bar diameters unless otherwise noted. Lap splices shall be staggered.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:

1. With full mortar coverage on horizontal and vertical face shells.

2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.

3. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.

4. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 3/8-inch joints.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.

C. Cut joints flush for masonry walls that are to receive direct-applied finishes (other than paint), unless otherwise indicated.

3.6 CAVITIES

A. Keep cavities clean of mortar droppings and other materials during construction. Strike joints facing cavities flush.

B. Tie exterior wythe to back-up with individual metal ties. Stagger alternate courses.

3.7 HORIZONTAL JOINT REINFORCEMENT

A. General: Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcing a minimum of 6 inches.

B. Do not cut or interrupt joint reinforcement at control and expansion joints

C. Provide continuity at corners and wall intersections by use of prefabricated “L” and “T” sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.8 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts and faces structural members to comply with the following:

1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.

2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.

3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

4. Provide and position anchors to extend no further than 1” and no closer than 1/2” from exposed face of masonry unit.

3.9 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to wall framing with adjustable masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached anchors through sheathing to wall framing with two self drilling screws.

2. Embed tie section in masonry joints. Provide not less than 1 inches of air space between back of masonry veneer and face of sheathing.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.

B. Space anchors not more than 18 inches o.c. vertically and 16 inches o.c. horizontally, with not less than 1 anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around perimeter.

3.10 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where indicated and wherever openings of more than 1'-0" for brick size units and 2'-0" for block size units are indicated without structural steel or other supporting lintels. Provide precast or formed-in-place masonry lintels. Cure precast lintels before handling and installation. Temporarily support formed-in-place lintels.
For hollow concrete masonry unit walls, use specially formed bond beam units with reinforcement bars placed as indicated and filled with coarse grout.

C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

D. Install reglets and nailers for flashing and other related construction where indicated to be built into masonry.

3.11 FLASHING, WEEP HOLES, AND VENTS AND REGLETS.

A. General: Install embedded reglets for flashing and weep holes in masonry joints or cut-in shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated or required to provide a water tight building.

B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer before covering with mortar.

C. Install flashing as follows:

1. At composite masonry walls, including cavity walls, extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4 inches, and through the inner wythe to within 1/2 inch of the interior face of the wall in exposed masonry. Where interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2 inches, unless otherwise indicated.

2. At masonry-veneer walls, extend flashing from exterior face of veneer, through the veneer, up face of sheathing at least 8 inches, and behind air-infiltration barrier/building paper.

3. At lintels and shelf angles, extend flashing a minimum of 4 inches into masonry at each end. At heads and sills, extend flashing 4 inches at ends and turn up not less than 2 inches to form a pan.

4. Cut off flashing flush with face of wall after masonry wall construction is completed.

D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:

1. Form weep holes with product specified in Part 2 of this Section.

2. Space weep holes 32 inches o.c.

3. Place cavity drainage material immediately above flashing in cavities.

E. Install vents in vertical head joints at the top of each continuous cavity. Space vents and close off cavities vertically and horizontally with blocking in manner indicated.

1. Install through-wall flashing and weep holes above horizontal blocking.

F. Install reglets and nailers for flashing and other related construction where indicated to be built into masonry.

3.12 INSTALLATION OF REINFORCED UNIT MASONRY

A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.

1. Construct formwork to conform to shape, line, and dimensions shown. Make sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.

2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

1. Do not exceed the following pour heights for fine grout:

a. For minimum widths of grout spaces of 3/4 inch or for minimum grout space of hollow unit cells of 1-1/2 by 2 inches, pour height of 12 inches.

b. For minimum widths of grout spaces of 2 inches or for minimum grout space of hollow units cells of 2 by 3 inches, pour height of 60 inches.

c. For minimum widths of grout spaces of 2-1/2 inches or for minimum grout space of hollow units cells of 2-1/2 by 3 inches, pour height of 12 feet.

d. For minimum widths of grout spaces of 3 inches or for minimum grout space of hollow unit cells of 3 by 3 inches, pour height of 24 feet.

2. Do not exceed the following pour heights for coarse grout:

a. For minimum widths of grout spaces of 1-1/2 inches or for minimum grout space of hollow unit cells of 1-1/2 by 3 inches, pour height of 12 inches.

b. For minimum widths of grout spaces of 2 inches or for minimum grout space of hollow units cells of 2-1/2 by 3 inches, pour height of 60 inches.

c. For minimum widths of grout spaces of 2-1/2 inches or for minimum grout space of hollow units cells of 3 by 3 inches, pour height of 12 feet.

d. For minimum widths of grout spaces of 3 inches or for minimum grout space of hollow unit cells of 3 by 4 inches, pour height of 24 feet.

3. Provide cleanout holes at least 3 inches in least dimension for grout pours over 60inches in height.

a. Provide cleanout holes at each vertical reinforcing bar.

b. At solid grouted masonry, provide cleanout holes at not more than 32 inches o.c.

3.13 FIELD QUALITY CONTROL

A. The Owner will employ and pay a qualified independent testing service to perform the following testing for field quality control. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.

B. Testing Frequency: Tests and evaluations listed in this article will be performed during construction for each 5000 sq. ft. of wall area or portion thereof or as required by IBC.

1. Mortar properties will be tested per property specification of ASTM C 270.

2. Mortar composition and properties will be evaluated per ASTM C 780.

a. Cast 6-2x4 mortar samples (one set) per day of operation (three specimens tested at 7 days and the other three tested at 28 days).

3. Grout compressive strength will be sampled and tested per ASTM C 1019.

a. Cast 3-4x8 grout prisms (one set) per day of operation (1 specimen tested at 7 days and the other two specimens tested at 28 days).

C. Prism Test Method: For each type of wall construction indicated, masonry prisms will be tested per ASTM E 447, Method B, and as follows:

1. Prepare one set of prisms for testing at 7 days and one set for testing at 28 days.

D. Evaluation of Quality Control Tests: In absence of other indications of noncompliance with requirements, masonry will be considered satisfactory if results from construction quality control test comply with minimum requirements indicated.

3.14 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units and in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point- up all joints including corners, openings, and adjacent construction to provide a neat, uniform appearance, prepared for application of sealants.

C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

2. Test cleaning methods on sample wall panel; leave 1/2 panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.

3. Protect adjacent concrete precast units and non masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.

4. Saturate wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.

5. Clean concrete unit masonry to comply with by means of cleaning method indicated in masonry manufacturer's directions and applicable NCMA “TEK” bulletins and as approved by masonry special coating manufacturer.

6. Use extreme care and provide all measures necessary to prevent migration or application of cleaning materials onto other parts of the work such as metal window frames, flashings, etc. Complete correct or replace any damaged materials or assemblies.

3.15 MASONRY SEALER/WATER REPELLENT (NON-PAINTED SURFACES)

A. Apply masonry sealer in strict accordance with manufacturer's instructions over surfaces prepared, cleaned and in condition acceptable to sealer/water repellent manufacturer.

1. Verify that moisture in unit masonry is at or below recommended levels prior to applications of masonry sealer.

B. Installer and equipment used shall be as required and certified by water repellent manufacturer.

C. Apply water repellent/sealer by spray application or as otherwise approved, fully flooding surface with a minimum application rate of 1 gallon of material per 100 s.f. of masonry surface.

D. Protect all surfaces not to receive sealer by covering, masking, provision of drop cloths, etc. Fully correct all damage to satisfaction of Architect.

3.16 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to installer, which ensures unit masonry work being without damage and deterioration at time of Substantial Completion.

END OF SECTION 042000

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes structural steel and base plate grout.

1.2 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges".

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components.

C. Welding certificates.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: A fabricator that has more than 5 years documented experience in work of this section.

B. Installer Qualifications: A qualified installer that has more than 5 years documented experience in work of this section.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel".

D. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M.

B. Channels, Angles-Shapes: ASTM A 36/A 36M.

C. Plate and Bar: ASTM A 36/A 36M.

D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade C.

E. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Plain

C. Headed Anchor Rods: ASTM F 1554, Grade as indicated on drawings, straight.

D. Threaded Rods: ASTM A 36/A 36M.

2.3 PRIMER

A. Primer: SSPC-Paint 25, zinc oxide, alkyd, linseed oil primer.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.

2. Surfaces to be field welded.

3. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 3, "Power Tool Cleaning".

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Base Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.

2. Weld plate washers to top of baseplate.

3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.

4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened plus a quarter of a turn.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts".

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION 051200

SECTION 052100 - STEEL JOIST FRAMING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. K-series steel joists.
   2. Steel joist accessories.

B. Related Requirements:
   1. Section 033000 "Cast-in-Place Concrete" for installing bearing plates in concrete.
   2. Section 042000 "Unit Masonry" for installing bearing plates in unit masonry.
   3. Section 051200 "Structural Steel Framing" for field-welded shear connectors.

1.3 DEFINITIONS

A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."

1.4 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.
B. Shop Drawings:
   1. Include layout, designation, number, type, location, and spacing of joists.
   2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
   3. Indicate locations and details of bearing plates to be embedded in other construction.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.
B. Manufacturer certificates.
C. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.
D. Field quality-control reports.RELATED DOCUMENTS

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications
   1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications
B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

PART 2 – PRODUCTS

2.1 STEEL JOISTS
A. K-Series Steel Joist: Manufactured steel joists of type indicated according to "Standard Specification for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top and bottom-chord members, underslung ends, and parallel top chord.
1. Joist Type: K-series steel joists.
2. Provide holes in chord members for connecting and securing other construction to joists.
3. Camber joists according to SJI's "Specifications."
4. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

2.2 PRIMERS
A. Primer:
1. SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.3 STEEL JOIST ACCESSORIES
A. Bridging:
1. Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

B. Fabricate steel bearing plates from ASTM A36/A36M steel with integral anchorages of sizes and thicknesses indicated on Drawings. Shop prime paint.

C. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.4 CLEANING AND SHOP PAINTING
A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.

B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.

C. Shop priming of joists and joist accessories is specified in [**Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."**] [**Section 099600 "High-Performance Coatings."**]

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications joist manufacturer's written instructions, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.

C. Field weld joists to supporting steel bearing plates. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using carbon-steel bolts.

E. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections

B. Visually inspect field welds according to AWS D1.1/D1.1M.

C. Visually inspect bolted connections.

END OF SECTION

SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof deck.

2. Composite floor deck.

1.2 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

C. Welding certificates.

D. Field quality-control reports.

1.3 QUALITY ASSURANCE

A. Retain "Welding Qualifications" Paragraph below if shop or field welding is required. If retaining, also retain "Welding certificates" Paragraph in "Informational Submittals" Article. AWS states that welding qualifications remain in effect indefinitely unless welding personnel have not welded for more than six months or there is a specific reason to question their ability.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel".

C. Fire Test Response Characteristics: Where indicated, provide steel deck units identical to those steel deck units tested for fire resistance per ASTM E 119 by a testing and inspection agency acceptable to authorities having jurisdiction.
1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
2. Markings: Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members".

2.2 DECK

A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck", in SDI Publication No. 31, and with the following:

1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.

2. Deck Profile: As indicated in drawings.

3. Profile Depth: As indicated in drawings.

4. Design Uncoated-Steel Thickness: As indicated.

B. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 29, the minimum section properties indicated, and the following:

1. Galvanized and Shop-Primed Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 33, G60 zinc coating; with unpainted top and bottom surface cleaned, pretreated, and primed with manufacturer's baked-on, lead- and chromate-free rust-inhibitive primer complying with performance requirements of FS TT-P-664

2. Deck Profile: As indicated in drawings

3. Profile Depth: As indicated in drawings

4. Design Uncoated-Steel Thickness: Per plan.

5. Span Condition: Triple span or more as indicated

2.3 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359 inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

C. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

D. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

E. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

F. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

G. Mechanical fasteners may be used as specified in the structural drawings. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

H. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

I. Pour Stops and Girder Fillers: Weld steel-sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

J. Floor-Deck Closures: Weld steel-sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.3 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

END OF SECTION

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes load bearing formed steel stud wall and non-load bearing wall, and framing and formed steel purlin, for roof framing and bridging.

1.2 SYSTEM DESCRIPTION

A. Size components to withstand design loads as follows:
   1. Interior Framing: Minimum 5 psf with L/360 Deflection.

B. Maximum Allowable Deflection: 1: 360 of span.

C. Wall System:
   1. Design to AISI SG-973 - Cold-Formed Steel Design Manual.
   2. Design to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.

D. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

E. Seismic Design: Design and detail elements and connections for interior partitions to resist seismic force in accordance with 2018 IBC code requirements for Seismic Design Category B, Soil Site Class D, and Seismic Importance Factor 1.0.

1.3 SUBMITTALS

A. Shop Drawings:
   1. For typical interior wall section and bracing.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with AISI SG-973 - Cold-Formed Steel Design Manual

B. Maintain one copy of each document on site.

PART 2 PRODUCTS

2.1 ACCESSORIES

A. Bracing, Furring, Bridging, Plates, Gussets, Clips: Formed sheet steel, thickness determined by performance requirements specified; same finish as framing members.

B. Screws: Hot dip galvanized.

C. Anchorage Devices: Power actuated or drilled expansion bolts.

D. Welding: In accordance with AWS D1.1 and AWS D1.3.

E. Primer: Touch-up for galvanized or primed surfaces.

2.2 FABRICATION

A. Fabricate assemblies of sizes and profiles required; with framing members fitted, reinforced and braced.

B. Fit and assemble in largest practical sections for delivery to site, ready for installation.

2.3 FINISHES

A. Studs and Accessories: Galvanize to ASTM A955, G60 coating class.

B. Purlins: Galvanize to ASTM A955, G60 coating class.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate surfaces and building framing components are ready to receive work.

3.2 ERECTION OF STUDS

A. Align floor and ceiling tracks; locate to partition layout. Secure in place with fasteners at maximum 24inches oc.

B. Place studs at 16 inches oc; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using fastener method.

C. Construct corners using minimum three studs. Double stud wall openings, door and window jambs.

D. Erect load bearing studs one piece full length. Splicing of studs is not permitted.

E. Allow for deflection, directly below horizontal building framing for non-load bearing framing.

F. Attach cross studs and furring channels to studs for attachment of fixtures anchored to walls and for attachment of mechanical and electrical items within walls.

G. Touch-up field welds and damaged prefinished surfaces with primer.

3.3 ERECTION OF JOISTS AND PURLINS

A. Make provisions for erection stresses. Provide temporary alignment and bracing.

B. Set components parallel and level, with lateral bracing and bridging.

C. Locate component end bearing directly over load bearing studs or provide load distributing member to top of stud track.

D. Touch-up field welds and damaged prefinished surfaces with primer.

3.4 TOLERANCES

A. Maximum Variation from Vertical Alignment: 1/8 inch in 10 feet.

B. Maximum Variation of Horizontal Member from Plane: 1/8 inch in 10 feet

END OF SECTION

SECTION 055000 - METAL FABRICATIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The Work of this Section applies to the Drawings, Specifications, and provisions of the Contract. The General Conditions Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the Work of this Section.

1.02 SUMMARY

A. Provide fabricated and miscellaneous rough hardware.

B. Provide access ladders.

C. Provide loose leveling and bearing plates.

D. Provide framing and supports for overhead coiling doors, supports for other items not specified in other sections or not provided with the supplied equipment.

E. Provide miscellaneous steel trim for railings, door guard units, stops, bollards, and lintels.

F. Aluminum sun shade canopies. (NOT USED)

1.03 RELATED SECTIONS

A. Sections that are related to this Section include but are not limited to the following:

1. Division 3 Section “Concrete.”

2. Division 4 Section “Masonry.”

3. Division 5 Section “Structural Steel.”

4. Division 5 Section “Steel Joists.”

1.04 SUBMITTALS

A. Shop drawings detailing fabrication and erection of each metal fabrication as required. Show anchorage and accessory items. Provide templates as necessary for anchors and bolts.

1. After review and approval, submit to Architect.

B. Samples representative of materials and finished products as may be requested by Architect.

1.05 FIELD MEASUREMENTS

A. Verify that field measurements used for shop drawings are accurate and are complete.

B. Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delay of Work.

PART 2 PRODUCTS

2.01 FERROUS METALS

A. Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Provide hot-dipped galvanizing for all ferrous metal assemblies and fabrications to be installed in exterior locations and elsewhere as indicated. Whenever possible, galvanize units after fabrication.

1. Steel Plates, Shapes, and Bars: ASTM A 36.

2. Steel Tubing: Cold formed, ASTM A 500; or hot rolled, ASTM A 501.

3. Structural Steel Sheet: Hot-rolled, ASTM A 570; or cold- rolled ASTM A 611, Class 1; of grade required for design loading.

4. Galvanized Structural Steel Sheet: ASTM A 446, of grade required for design loading. Coating designation as indicated, or if not indicated, G90.

5. Steel Pipe: ASTM A 53.
   a. Black finish, unless otherwise indicated.

6. Gray Iron Castings: ASTM A 48, Class 30.

7. Malleable-Iron Castings: ASTM A 47, Grade 32510.

8. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers, and shims as required, hot-dip galvanized, ASTM A 153.

9. Welding Materials: Select in accordance with AWS specifications for the metal alloy to be welded.

2.02 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

1. Selection must be compatible with finish coats of paint, per Section 09900 requirements.

B. Galvanized Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, complying with ASTM A 780.

C. Provide asphaltic paint for the portion of steel fabrications that will be imbedded in concrete.

2.03 FASTENERS

A. Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use where built into exterior walls. Select fasteners for the type, grade, and class required.

1. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), with hex nuts, ASTM A 563 (ASTM A 563M), and, where indicated, flat washers.

2. Machine Screws: ANSI B18.6.3.

3. Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8M).

4. Wood Screws: Flat head, carbon steel, ANSI B18.6.1.

5. Plain Washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M).

6. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.

7. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

8. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as required.

2.04 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

B. Products that may be incorporated in the Work:

1. Nonshrink, Nonmetallic Grouts:
   a. Sure-grip High Performance Grout; Dayton Superior Corp.
   b. Euco N-S Grout; Euclid Chemical Co.
   c. Five Star Grout; Five Star Products.
   d. Masterflow 928 and 713; Master Builders Technologies, Inc.
   e. Sonogrout 14; Sonneborn Building Products-ChemRex, Inc.

2.05 CONCRETE FILL

A. Concrete Materials and Properties: Comply with requirements of Division 3 Section “Concrete” for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless higher strengths are indicated.

2.06 FABRICATION, GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated.

B. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

C. Shear and punch metals cleanly and accurately. Remove burrs.

D. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Remove sharp or rough areas.

F. Weld corners and seams continuously to comply with AWS recommendations.

G. Form exposed connections with hairline joints, flush and smooth, using concealed Phillips flat-head (counter-sunk) screw bolts. Locate joints where least conspicuous.

H. Provide for anchorage and fabricate and space anchoring devices to provide adequate support for intended use.

I. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly.

J. Cut, reinforce, drill, and tap miscellaneous metal work to receive finish hardware, screws, and similar items.

K. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.07 ROUGH HARDWARE

A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes and fasteners as required. Other stock rough hardware items are specified in Division 6 sections.

B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts that bear on wood structural connections, and furnish steel washers elsewhere.

2.08 STEEL STAIRS (ACCESS LADDER)

A. Fabricate ladders/stairs for the locations shown, with dimensions, spacing, details and anchorages as indicated. Comply with requirements of ANSI A14.3.

1. Provide 1/2-inch x 3-inch continuous structural steel flat bar side rails with eased edges, spaced 18-inches apart.

2. Provide 3/4-inch diameter solid structural steel bar rungs, spaced 12-inches apart.

3. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.

4. Support each ladder at top and bottom and at intermediate points spaced not more than 5'-0” o.c. Use welded or bolted steel brackets, designed for adequate support and anchorage, and to hold ladder clear of the wall surface with a minimum of 7-inches clearance from wall to centerline of rungs.

2.09 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of the required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.10 LOOSE STEEL LINTELS

A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
B. Weld adjoining members together to form a single unit where indicated.

C. Size loose lintels for equal bearing of 1 inch per foot (85 mm per meter) of clear span but not less than 8 inches (200 mm) bearing at each side of openings, unless otherwise indicated.

D. Galvanize loose steel lintels located in exterior walls.

2.11 MISCELLANEOUS FRAMING AND SUPPORTS

A. Provide steel framing and supports for applications indicated or which are not a part of structural steel framework, as required to complete work.

2.12 MISCELLANEOUS STEEL TRIM

A. Provide shapes and sizes indicated for profiles indicated. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Provide cutouts, fittings, and anchorages as required for coordination of assembly and installation with other work.

1. Units installed in exterior applications shall be fabricated of galvanized steel pipe and shapes.

2.13 PIPE BOLLARDS

A. Fabricate pipe bollards from Schedule 40 steel pipe.

2.14 ALUMINUM SUN SHADE CANOPIES **(NOT USED)**

A. Provide materials and accessories as required.

B. Manufacturers

1. Industrial Canopies, Inc.

2. Mapes Architectural Canopies

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.02 INSTALLATION, GENERAL

A. Provide anchorage devices and fasteners for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Perform cutting, welding, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

1. Eliminate all burrs, file sharp edges, etc., prior to primer and finish.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

D. Fit exposed connections accurately together to form hairline joints.

E. Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work.

3.03 SETTING LOOSE PLATES

A. Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

B. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.

1. Use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.

2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.04 INSTALLATION OF PIPE BOLLARDS

A. Anchor bollards in concrete. After bollards have been set, fill bollard with concrete. Provide a smooth, dense concrete top wash as the finish surface.

3.05 ADJUSTING AND CLEANING

A. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting.

B. For galvanized surfaces clean welds, bolted connections and abraded areas and apply 2 coats of galvanizing repair paint complying with ASTM A 780.

END OF SECTION

SECTION 055113 - METAL PAN STAIRS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Preassembled steel stairs with concrete-filled treads.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs.
   1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.

C. Coordinate locations of hanger rods and struts with other work so they do not encroach on required stair width and are within fire-resistance-rated stair enclosure.

1.4 ACTION SUBMITTALS

A. Product Data: For metal pan stairs and the following:
   1. Prefilled metal-pan-stair treads.

B. Shop Drawings:
   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
   3. Include plan at each level.

C. Delegated-Design Submittal: For stairs,, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification.

1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
2. Protect steel members and packaged materials from corrosion and deterioration.
3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.
   a. Repair or replace damaged materials or structures as directed.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stairs, railings and guards,, including attachment to building construction.

B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing and guard loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch (6.4 mm), whichever is less.

2.2 METALS

A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Uncoated, Cold-Rolled Steel Sheet: ASTM A1008/A1008M, either commercial steel, Type B, or structural steel, Grade 25 (Grade 170), unless another grade is required by design loads; exposed.

D. Uncoated, Hot-Rolled Steel Sheet: ASTM A1011/A1011M,[**either commercial steel, Type B, or**] structural steel, Grade 30 (Grade 205), unless another grade is required by design loads.

2.3 ABRASIVE NOSINGS

A. Cast-Metal Units: Cast [**iron**] [**aluminum**] [**bronze**] [**nickel silver**], with an integral abrasive, ascast finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in lengths necessary to accurately fit openings or conditions.

1. American Safety Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to. The following;
   a. American Safety Tread Co.
   b. Balco Inc
   c. Barry pattern & Foundry Co
   d. Granite State Casting Co
   e. Safe-T-Metal Company
   f. Wooster Products Inc

2. Configuration: Cross-hatched units, 4 inches (100 mm) wide without lip.

B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

C. Apply bituminous paint to concealed surfaces of cast-metal units set into concrete.

2.4 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls.

1. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

C. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

D. Post-Installed Anchors: [**Torque-controlled expansion anchors**] [**or**] [**chemical anchors**] capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section 099123 "Interior Painting."

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
   1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish system indicated.

D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

F. Prefilled Concrete Treads:
1. Concrete Materials and Properties: Comply with requirements in Section 033000 "Castin- Place Concrete" for normal-weight, air-entrained, ready-mix concrete with minimum 28-day compressive strength of 3000 psi (20 MPa) and maximum aggregate size of ½ inch (13 mm) unless otherwise indicated.

2. Plain Steel Welded-Wire Reinforcement: ASTM A1064/A10645M, steel, 6 by 6 inches (152 by 152 mm), W1.4 by W1.4, unless otherwise indicated on Drawings.

2.6 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.

B. Assemble stairs in shop to greatest extent possible.
1. Disassemble units only as necessary for shipping and handling limitations.
2. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately.
1. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections to comply with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld exposed corners and seams continuously unless otherwise indicated.
5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for [**Finish #1 - No evidence of welded joint**] [**Finish #2 - Completely sanded joint with some undercutting and pinholes okay**] [**Finish # 3 – Partially dressed weld with spatter removed**] [**Finish # 4 - Good quality, uniform undressed weld with minimal splatter**].

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.

2.7 FABRICATION OF STEEL-FRAMED STAIRS

A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Commercial Class, unless more stringent requirements are indicated.

B. Stair Framing:
1. Fabricate stringers of steel plates or steel channels.
a. Provide closures for exposed ends of channel and rectangular tube stringers.
2. Construct platforms of steel plate or channel headers and miscellaneous framing members as required to comply with "Performance Requirements" Article.
3. Weld stringers to headers; weld framing members to stringers and headers.

C. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.067 inch (1.7 mm).
1. Fabricate treads and landing subplatforms of exterior stairs so finished walking surfaces slope to drain.
2. Steel Sheet: Uncoated, [**cold**] [**hot**]-rolled steel sheet.
3. Directly weld metal pans to stringers; locate welds on top of subtreads where they will be concealed by concrete fill. Do not weld risers to stringers.
4. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
5. Shape metal pans to include nosing integral with riser.
6. Attach abrasive nosings to risers.
7. At Contractor's option, provide stair assemblies with metal pan subtreads filled with reinforced concrete during fabrication.
8. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.
a. Smooth Soffit Construction: Construct subplatforms with flat metal under surfaces to produce smooth soffits.

2.8 FINISHES

A. Finish metal stairs after assembly.

B. Preparation for Shop Priming: Prepare uncoated, ferrous-metal surfaces to comply with SSPCSP 3, "Power Tool Cleaning."

C. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.
1. For wall-mounted railings, verify locations of concealed reinforcement within gypsum board and plaster assemblies.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF METAL PAN STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints.
1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
2. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
3. Comply with requirements for welding in "Fabrication, General" Article.

F. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete."
1. Install abrasive nosings with anchors fully embedded in concrete.
2. Center nosings on tread width.

3.3 REPAIR

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "Interior Painting."

END OF SECTION

SECTION 055213 - PIPE AND TUBE RAILINGS

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Steel railings.

B. Related Requirements:
   1. Section 055113 "Metal Pan Stairs" for steel tube railings associated with metal pan stairs.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data:
   1. Manufacturer's product lines of mechanically connected railings.
   2. Fasteners.
   3. Post-installed anchors.
   4. Shop primer.
   5. Intermediate coats and topcoats.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:
   a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
   b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
   c. Uniform and concentrated loads need not be assumed to act concurrently.
2. Infill of Guards:
   a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
   b. Infill load and other loads need not be assumed to act concurrently.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

1. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch (38-mm) clearance from inside face of handrail to finished wall surface.

2.3 STEEL RAILINGS

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

B. Tubing: ASTM A500/A500M (cold formed).

C. Plates, Shapes, and Bars: ASTM A36/A36M.

D. Cast Iron Fittings: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

2.4 FASTENERS

A. Fastener Materials:

1. Ungalvanized-Steel Railing Components: Plated steel fasteners complying with ASTM F1941 (ASTM F1941M), Class Fe/Zn 5 for zinc coating.
2. Finish exposed fasteners to match appearance, including color and texture, of railings.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:
1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
2. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.
1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

D. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

2.6 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.
1. Clearly mark units for reassembly and coordinated installation.
2. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately.
   1. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated.
   2. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water.
   1. Provide weep holes where water may accumulate.
   2. Locate weep holes in inconspicuous locations.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove flux immediately.
   4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint

I. Form changes in direction as follows:
   1. As detailed.
   2. By bending.
   3. By flush bends.
   4. By radius bends of radius indicated.
   5. By bending to smallest radius that will not result in distortion of railing member.

J. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

K. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.

L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crushresistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.
1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
2. Coordinate anchorage devices with supporting structure.

2.7 STEEL AND IRON FINISHES

A. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, hot-dip galvanize anchors to be embedded in exterior concrete or masonry.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPCSP 6/NACE No. 3.
1. Railings Indicated To Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3.

C. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1 for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
1. Shop prime uncoated railings with universal shop primer unless indicated.
2. Do not apply primer to galvanized surfaces.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Perform cutting, drilling, and fitting required for installing railings.
1. Fit exposed connections together to form tight, hairline joints.
2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
5. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.5 m).

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.

3.3 ANCHORING POSTS

A. Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.

C. Leave anchorage joint exposed with anchoring material flush with adjacent surface.

D. Anchor posts to metal surfaces with flanges, angle type, or floor type, as required by conditions, connected to posts and to metal supporting members as follows:
   1. For steel railings, weld flanges to post and bolt to metal supporting surfaces.
   2. For stainless steel railings, weld flanges to post and bolt to supporting surfaces.

3.4 ATTACHING RAILINGS

A. Anchor railing ends to concrete and masonry with flanges connected to railing ends and anchored to wall construction with anchors and bolts.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends.

C. Secure wall brackets and railing end flanges to building construction as follows:
   1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
   2. For hollow masonry anchorage, use toggle bolts.

3.5 REPAIR

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "Interior Painting."

3.6 CLEANING

A. Clean by washing thoroughly with clean water and soap and rinsing with clean water.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

3.7 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION

SECTION 061000 - ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUBMITTALS

A. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20

B. Lumber fabricated from old growth timber is not permitted.

2.2 DIMENSION LUMBER

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

B. Moisture Content: S-dry or MC19.

C. Miscellaneous Blocking, Nailers, and Furring:

1. Lumber: As indicated on the drawings.

2. Boards: Standard or No. 3.

2.3 CONSTRUCTION PANELS

A. Roof Sheathing:
1. Sheathing not exposed public view: Any Ps 2 type, rated Structural 1 Sheathing. Bond Classification: Exterior. Span Rating: 32. Performance Category: 5/8 PERF CAT.
2. Sheathing exposed to public view: PS-1 type plywood, rated structural sheathing Bond Classification: Exterior. Span Rating: 32.

B. Wall Sheathing: Any PS 2 type. Bond Classification: Exterior. Grade; Structural 1 Sheathing. Span Rating: 24. Performance category: 5/8 PERF CAT.

C. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood; ¾ inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.4 ACCESSORIES

A. Fasteners and Anchors: Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M for exterior, roof related and preservative-treated wood locations, unfinished steel elsewhere.

2.5 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 – Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.

2. Preservative-Treated Wood: Provide lumber and plywood mark or stamped by on ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:

1. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.

a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.

b. Do not use treated wood in direct contact with the ground.

2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (Low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 min.

a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.

b. Treat rough carpentry items as indicated.

c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:

1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0/25 lb/cu ft retention.

a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.

b. Treat lumber in contact with roofing, flashing, or waterproofing.

c. Treat lumber in contact with masonry or concrete.

1) Treat lumber in other locations as indicated.

2. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative to 0.25 lb/cu ft retention.

a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.

b. Treat plywood in contact with roofing, flashing or waterproofing.

c. Treat plywood in contact with masonry or concrete.

d. Treat plywood less than 18 inches above grade.

e. Treat plywood in other locations as indicated.

PART 3 EXECUTION

3.1 BLOCKING, NAILERS, AND SUPPORTS

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

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and

C. Between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

E. Where ceiling-mounted is indicated, provide clocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

F. Specifically, provide the following non-structural framing and blocking;

1. Handrails.

2. Grab bars.

3. Toilet room accessories.

3.2 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.3 INSTALLATION OF CONSTRUCTION PANELS

A. Roof Sheathing; Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.

1. At long edges provide flat 2x blocking between roof framing members as indicated in the drawings.

2. Nail panels to framing as indicated in the drawings; staples are not permitted.

B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using screws.

1. At long edges provide flat 2x blocking between stud framing members as indicated in the drawings.

2. Nail panels to framing as indicated in the drawings; staples are not permitted.

C. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.

1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.

2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.

3. Install adjacent boards without gaps.

3.4 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.

B. Allow Preservative to dry prior to erecting members.

3.5 TOLERANCES

A. Variation from Plane (Other than Floors): ¼ inch in 10 feet maximum, and ¼ inch in 30 feet maximum.

END OF SECTION

SECTION 062000 - FINISH CARPENTRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Finish carpentry items.

B. Wood standing and running trim.

C. Plastic laminate panels.

1.2 SUBMITTALS

A. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories. Provide the information required by AWI/AWMAC/WI Architectural Woodwork Standards.

B. Samples: Submit two samples of wood trim 6-inch long.

1.3 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years experience.

PART 2 - PRODUCTS

2.1 FINISH CARPENTRY ITEMS

A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI/AWMAC/WI Architectural Woodwork Standards for Custom Grade.
1. Provide maple soffit (1x6 T&G) with clear finish and wainscot as indicated on drawings. Conference Room 3
2. Provide wood paneling, Settlers Plank Oak: As manufactured by Pioneer Millworks. Contact: AJ Henion, 1-800-951-wood.

B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

2.2 SHEET MATERIALS

A. Particleboard: ANSI A208.1; composed of wood chips, sawdust, or flakes of medium density, made with waterproof resin binders; of grade to suit application; sanded faces.

B. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.

2.4 FASTENINGS

A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

B. Fasteners: Of size and type to suit application; use corrosion resistant fasteners for exterior locations.

2.5 ACCESSORIES

A. Lumber for Shimming and Blocking: Softwood lumber of any appropriate species.

B. Primer: Alkyd primer sealer.

C. Wood Filler: Solvent base, tinted to match surface finish color.

2.6 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. Cap exposed plastic laminate finish edges with material of same finish and pattern.

C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

D. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

2.7 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

D. Finish work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards, Section 5 – Finishing for Grade specified and as follows:

1. Transparent:

a. System – 12, Polyurethane, Water-based.

b. Stain: As indicated on drawings.

c. Sheen: As indicated on drawings.

2. Opaque:

a. System – 4, Latex Acrylic, Water-based.

b. Color: As indicated on drawings.

c. Sheen: As indicated on drawings.

E. Back prime woodwork items to be field finished, prior to installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.2 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

D. Install trim with appropriate mechanical fasteners.

E. Install panels with concealed fasteners.

3.3 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.4 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

C. TCNA W202E.

D. Framed Walls: Wall sheathing, weather barrier, cementitious backer board, and direct application; TCNA W244E.

END OF SECTION

SECTION 067413 - FIBERGLASS REINFORCED GRATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes glass-fiber-reinforced-plastic gratings and frames and supports for gratings.

1.3 COORDINATION

A. Coordinate installation of anchorages for gratings, grating frames, and supports. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For glass-fiber-reinforced-plastic gratings.

B. Shop Drawings: Include plans, sections, details, and attachments to other work.

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: McNichols Co. www.mcnichols.com , 800 237-3820

1. Basis of Design product: I-Bar (MS-1-4015-Duragrid), Gray, 1 ½”

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Gratings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Limit deflection to or 1/4 inch (6.4 mm), whichever is less.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941 (ASTM F1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts, and, where indicated, flat washers; ASTM F593 (ASTM F738M) for bolts and ASTM F594 (ASTM F836M) for nuts, Alloy Group 1 (A1).

C. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

2.4 FABRICATION

A. Shop Assembly: Shop fabricate grating sections to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form gratings from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.

D. Fit exposed connections accurately together to form hairline joints.

E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.

F. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.

2.5 GRATING FRAMES AND SUPPORTS

A. Frames and Supports for Glass-Fiber-Reinforced-Plastic Gratings: Fabricate from glass-fiberreinforced- plastic shapes of sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.
   1. Unless otherwise indicated, use shapes made from same resin as gratings.
   2. Equip units indicated to be cast into concrete or built into masonry with integral anchors

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.

D. Fit exposed connections accurately together to form hairline joints.

3.2 INSTALLING GLASS-FIBER-REINFORCED-PLASTIC GRATINGS

A. Comply with manufacturer's written instructions for installing gratings. Use manufacturer's standard stainless-steel anchor clips and hold-down devices for bolted connections.

END OF SECTION

SECTION 068200
FIBERGLASS REINFORCED PLASTIC PANELS (FRP)

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Work of this Section applies to the Drawings, Specifications, and provisions of the Contract. The General Conditions, Supplementary General Conditions, Special Conditions, and Division 1 Specification Sections apply to the work of this Section.

1.2 SUMMARY

A. This Section includes but is not limited to:

1. Provide fiberglass reinforced plastic panel system (FRP) and accessories.

2. Provide miscellaneous materials, accessories, trim, adhesive and components for a complete system.

1.3 QUALITY ASSURANCE

A. Manufacturer: Provide fiberglass panel and accessory product as produced by a single manufacturer, including recommended primers, adhesives, sealants, trims, and moldings.

B. Installer: A firm specializing in fiberglass panel work with not less than three years of experience in installing panels similar to those required for this project.

C. Fire Hazard Classification: Provide materials bearing UL Label and Marking, indicating surface burning characteristics of less than or equal to 200, smoke developed under 450, as determined by ASTM-E-84.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for fiberglass panels and installation materials.

B. Samples: Submit sample of fiberglass panel, illustrating range of colors and textures.

C. Shop Drawings: Indicate and dimension the location of joints and fastener attachments.

D. Certification: Submit manufacturer's certification that materials furnished comply with requirements specified.

E. Maintenance Instructions: Submit manufacturer's printed instructions for maintenance of installed work.

1.5 DELIVERY AND STORAGE

A. General: Comply with instructions and recommendations of manufacturer and as herein specified.

B. Deliver materials to project site in original packages or containers clearly labeled to identify manufacturer, brand name, quality or grade, and fire hazard classification.

C. Panels should be stored flat on a solid, dry surface.

D. Handling:

1. When moving more than a single sheet, place sheets face-to-face and back-to-back.

2. Protect surface during cutting and working by application of temporary, strippable coating or by other means recommended by panel manufacturer.

3. Remove foreign matter from face of panel by use of a soft bristle brush, avoiding abrasive action.

1.6 PROJECT CONDITIONS

A. Installation shall not begin until building is enclosed, permanent heating and cooling equipment is in operation, and residual moisture from concrete work has dissipated.

B. During installation and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type f adhesive used.

C. Do not allow containers of adhesive to be opened until all potential sources of flame or spark have been shut down or extinguished and until warnings against their ignition during adhesive application have been posted.

D. Provide ventilation to disperse fumes during application of solvent-based adhesive.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturer subject to compliance with requirements, provide fiberglass panels produced by the following:

1. Fiberglass Reinforced Plastic Panel (FRP):
   a. Design Stardard: Kemlite Company “Fire-X Glasbord” with “Surfaseal” finish.
   b. Approved: No substitutions (any product proposed for substitution shall have the “Surfaseal” type finish, and if not, will be rejected).

2. Panel Thickness: 0.09-inches.

3. Size: 4’-0” by height dimension required to provide full height vertical joints with no intermediate horizontal joints. Hold vertical FRP trim pieces off floor 4" to avoid "bumps" in resilient base.

   a. FRP will be 4'-0" height x 8' vertical lengths.

4. Color: Color as selected by Architect.

5. Division Bars, Corner Trim: Panel manufacturer's standard single length aluminum pieces; longest length possible - to eliminate end joints.

B. Adhesive: Use a non-flammable, FRP adhesive as recommended by panel manufacturer.

1. Provide and use proper adhesive with the installed substrate.

PART 3 EXECUTION

3.1 PREPARATION

A. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.

3.2 INSTALLATION

A. Do all cutting with carbide tipped saw blades or drill bits or cut with snips.

B. Install panels with manufacturer's recommended gap for panel field and corner joints.

C. Fastener holes in the panels must be predrilled 1/8" oversize.

D. Using a 1/4-inch notched trowel, apply adhesive to panel back for 100 percent coverage.

E. Using products acceptable to manufacturer, install the FRP system in accordance with manufacturer's printed instructions.

F. Seal joints at floor base, corners, and ceilings to allow for water tight installation using manufacturer's recommended sealant.

3.3 ADJUST AND CLEAN

A. Replace removed plates and fixtures; verify cut edges of wall panels are completely concealed.

B. Remove surplus materials, rubbish, and debris resulting from panel installation upon completion of work, and leave areas of installation in neat, clean condition.

END OF SECTION

SECTION 071000 – DAMPPROOFING AND VAPOR RETARDERS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide cold applied asphalt emulsion damp proofing to all perimeter foundation walls and top of footings.

B. Provide vapor retarder below interior concrete slabs.

1.2 SUBMITTALS

A. Product data for each type of product specified, including data substantiating that materials comply with requirements for each damp proofing material specified. Include recommended method of application, recommended primer, number of coats, coverage or thickness, and recommended protection course.

1. Certification by damp proofing manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOC's).

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Employ experienced workers specializing in bituminous damp proofing and vapor retarder systems.

B. Single-Source Responsibility: Obtain primary damp proofing and vapor retarder materials and primers from a single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

1.4 PROJECT CONDITIONS

A. Proceed with damp proofing work only after substrate construction and penetrating work have been completed. Do not proceed with work until all joints have been caulked and sealed, walls have been patched and sealed at penetrations for conduits and pipes, and unsatisfactory surface conditions have been corrected. Coordinate with backfilling operations.

B. Proceed with damp proofing work only when existing and forecast weather conditions will permit work to be performed in accordance with manufacturer's directions.

C. Provide adequate ventilation during application of solvent-based components in enclosed spaces. Maintain ventilation until vapor retarder adhesives have thoroughly cured.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Products that may be incorporated in the Work:

1. Cold-Applied, Asphalt Emulsion Damp proofing:

a. Meadows: W.R. Meadows, Inc. (complying example).

Other manufacturers:

a. ChemRex, Inc.; Sonneborn Building Products Div.

b. Euclid Chemical Co.

c. Karnak Chemical Corporation.

d. Koppers Industries, Inc.

e. Deco Products, Inc.

2. Vapor Retarder:

a. Stego Industries, LLC. “Stego Wrap”, 15 mil.

Other Manufacturers:

a. W.R. Meadows, Inc.
P.O. Box 543, Elgin, IL. 60121;
Phone (708) 683-4500 or 1-800-342-5976

b. Viper Vaporcheck II 15 mil.

c. Vaporblock VB15

3. Hot-Applied Asphalt Damp proofing:

a. Meadows: W.R. Meadows, Inc.

b. Owens-Corning Fiberglass Corp.; Trumbull Division

4. Foil Barrier Membrane:

a. Fortifiber Corporation

2.2 BITUMINOUS DAMPPROOFING

A. Provide cold applied asphalt emulsion damp proofing to all perimeter foundation walls and top of footing. Provide products recommended by manufacturer for designated application.

B. Cold-Applied, Asphalt Emulsion ("vertical") Damp proofing:

1. Semimastic Grade: Emulsified asphalt semimastic, prepared with mineral-colloid emulsifying agents and containing fibers other than asbestos, complying with ASTM D 1227, Type III or IV. No materials containing asbestos will be allowed.

2.3 VAPOR RESISTANT MEMBRANE (VAPOR RETARDER)

A. Provide permanently bonded multi-ply, semi-flexible core board system. Materials shall be impermeable and both water proof and vapor proof.

B. Manufacturer: Stego Industries, LLC.

1. Alternate Manufacturer: W.R. Meadows, Inc.

2. Viper Vaporcheck II

3. Vaporblock VB15

C. Product: "Stego Wrap"; 15 mil.

1. Alternate Product: "Sealtight Pre-moulded Membrane Vapor Seal with Plasmatic Core", including bonding agents, bitumen and detail strip.
48" x 96" sheets.

D. Provide seam tape, mastic, pipe and conduit boots and other related accessories for a complete installation. Refer to manufacturers details.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBSTRATE

A. Clean substrate of projections and substances detrimental to work; comply with directions of manufacturer.

B. Install cant strips and similar accessories as recommended by manufacturer even though not shown.

C. Fill voids, seal joints, and apply bond breakers (if any) as recommended by manufacturer, with particular attention at construction joints.

D. Install separate flashings and corner protection stripping, as recommended by manufacturer, where indicated to precede application of damp proofing. Comply with manufacturer's directions. Pay particular attention to requirements at building expansion joints, if any.

E. Prime substrate as recommended by prime materials manufacturer.

F. Do not apply damp proofing above finish grade. Coordinate installation with backfill operations. Do not allow liquid and mastic compounds to enter and clog drains and conductors. Prevent spillage and migration onto other surfaces of work, by masking or otherwise protecting adjoining work.

G. Prepare and level sub-grade below slabs as required by manufacturer prior to vapor retarder membrane installation.

3.2 INSTALLATION, GENERAL

A. Apply "vertical" damp proofing from line of finish grade to the top of the footing, extending over the footing.

Apply according to manufacturer's directions, including coverage amounts.
Coverage: approximately 5 gallons per 100 SF.

B. Install vapor barrier below all slab-on-grade concrete using "Dutch Lap" method.
Lap edges of sheets 6" per manufacturer's directions. Seal all laps with manufacturer's bonding agent or tape.

C. Turn up edges of membrane against concrete perimeter foundation wall. Seal to wall with manufacturer's adhesive product.

D. Fully seal all penetrations in the vapor barrier per manufacturer's directions.

E. Comply with manufacturer's directions, except where more stringent requirements are indicated or specified and where project conditions require extra precautions or provisions to ensure satisfactory performance of work.

F. Application: Apply damp proofing to the following surfaces.

1. Exterior of foundation walls and top of footings. Do not apply to surfaces exposed to view.

3.3 COLD-APPLIED ASPHALT EMULSION ("vertical") DAMPPROOFING

A. Semimastic Grade: Brush apply a coat of asphalt emulsion damp proofing at a rate of approximately 5 gal./100 sq. ft. (2 L/sq. m), to produce a uniform, dry-film thickness of not less than 30 mils (0.8 mm).

3.4 SUB SLAB VAPOR RESISTANT MEMBRANE (VAPOR RETARDER)

A. Install using “Dutch Lap” method. Lap edges of sheets 6” per manufacturer’s instructions. Seal all laps with manufacturer’s bonding agent or tape.

B. Turn up edges of membrane against concrete foundation wall. Dimensions shall be the full thickness of the slab. Seal to foundation wall with manufacturer’s adhesive.

C. Apply other materials as indicated in manufacturer’s instructions for a complete vapor seal. Seal all penetrations.

3.5 PROTECTION AND CLEANING

A. Protect exterior, below-grade damp proofing from damage until backfill is completed. Remove excess materials (over-brushed areas) and spilled materials from surfaces not intended to receive damp proofing.

3.6 CLEAN UP

A. Remove all waste materials from site. Correct as necessary all spills, overbrushed areas and any application of damp proofing to above grade interior and exterior surfaces.

END OF SECTION

SECTION 072000 - INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Thermal batt-type building insulation, Sound attenuation batt insulation, Film vapor retarder (VR), Flame resistant vapor retarder (FRVR), & Board type rigid insulation.

1.2 SUBMITTALS

A. Product Data for each type of insulation and vapor retarder material required.

1. After review and approval, submit to Architect.

B. Certified Test Reports: With product data, submit copies of certified test reports showing compliance with specified performance values, including r-values (aged values for plastic insulation), densities, compression strengths, fire performance characteristics, perm ratings, water absorption ratings and similar properties.

1. Submit with Operation and Maintenance manuals.

1.3 QUALITY ASSURANCE

A. Thermal Resistivity: Where thermal resistivity properties of insulation materials are designated by r-values they represent the rate of heat flow through a homogeneous material exactly 1” thick, measured by test method included in referenced material standard or otherwise indicated. They are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.

B. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

1. Surface Burning Characteristics: ASTM E 84.

2. Fire Resistance Ratings: ASTM E 119.

3. Combustion Characteristics: ASTM E 136.

1.4 DELIVERY, STORAGE, AND HANDLING

A. General Protection: Protect insulation from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

B. Protection for Plastic Insulation:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.

2. Protect against ignition at all times. Do not deliver plastic insulating materials to project site ahead of installation time.

3. Complete installation and concealment of plastic materials as rapidly as possible in each area of work.

C. Project construction will be conducted in phases. Coordinate all work of this section within each phase as scheduled and approved.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Glass Fiber Batt Insulation:

a. CertainTeed Corp.

b. Owens-Corning Fiberglas Corp. (Design Standard).

c. Schuller International, Inc.

2. Sound Attenuation Blanket/Batt Type Insulation:

a. United States Gypsum Co. (Design Standard).

b. Manville.

c. or Approved.

3. Board Type foundation and Building Extruded Polystyrene Insulation:

a. Dow Chemical U.S.A. (complying example).
b. Insulae.

2.2 INSULATING MATERIALS

A. General: Provide insulating materials which comply with requirements and with referenced standards.

1. Preformed Units: Sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths and lengths.

B. Thermal Batt Insulation: Lightweight unfaced resilient fiberglass insulation complying with ASTM C 665, Type 1 and ASTM E 136. Size width for installation between studs in wall assembly. Maximum flame spread and smoke developed values of 25 and 50, respectively.

1. Exterior Walls: R-value as indicated.

2. Ceiling Attic Space: R-value as indicated.

C. Sound Attenuation Batt Insulation: Unfaced Mineral Fiber Blanket/Batt Insulation: Acoustical insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I, fibers manufactured from glass, passes ASTM E 136 test, maximum flame spread and smoke developed values of 25 and 50, respectively.

1. Thickness: Full depth of cavity, unless otherwise indicated.

2. Provide in all interior frame partitions.

D. Extruded Polystyrene Board Type Insulation: Rigid, cellular polystyrene thermal insulation formed from polystyrene base resin by an extrusion process using hydrcholoroflurocarbons as blowing agent to comply with ASTM C 578 for type and with other requirements indicated below.

1. Type IV, 1.60-lb/cu. Ft. (26-kg/cu. m) minimum density, unless otherwise indicated.

2. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 75 and 450, respectively.

3. Perimeter Foundation Insulation: R-value or thickness as indicated.

2.3 AUXILIARY INSULATING MATERIALS

A. Film Vapor Retarder: ASTM D 4397, 6-mil polyethylene film, with laboratory-tested vapor transmission rating of 0.2 perms, natural color.

B. Flame Resistant Vapor Retarder: Flame resistant foil scrim kraft (FSK) barrier, flame spread rating of 25 or less, Compac Corp. - FB-1535, Lamtec Corp. - RC-3035, or approved.

1. Provide over all batt insulation not covered by gypsum wall board.

C. Adhesive for Bonding Insulation: Type recommended by insulation manufacturer and complying with requirements for fire performance characteristics.

D. Mechanical Anchors: Type and size indicated or, if not indicated as recommended by insulation manufacturer for type of application and condition of substrate.

E. Foam-In Insulation: Type required to insulate voids at hollow metal door and window frames, vents, louvers, etc.

1. Complying Example: DAP, Inc., “DAP-TEX” Latex Insulating Foam Sealant.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Examine substrates and conditions with Installer present, under which insulation work is to be performed. A satisfactory substrate is one that complies with requirements of the section in which substrate and related work is specified. Obtain Installer's written report listing conditions detrimental to performance of work in this section. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

B. Clean substrates of substances harmful to insulation or vapor retarders, including removal of projections which might puncture vapor retarders.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's instructions applicable to products and application indicated. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.

B. Extend insulation in thickness over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.

1. Provide materials to fully insulate the entire building envelope.

2. Fill cavities of metal studs and wood framing with insulation as they are installed.

C. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

D. Coordinate the installation of acoustical insulation materials and sequencing, needed to properly construct the acoustical walls, in strict compliance with the requirements of Division 9 Section “Acoustical Wall Construction”.

1. Schedule and conduct a pre-installation meeting to discuss the requirements, coordination and the Contractor’s planned construction means and methods for acoustical walls.

3.3 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units as approved by manufacturer.

1. Support insulation as required to prevent sagging of material over time, which will affect other construction and/or result in gaps in insulation.

2. Do not cover insulation until inspection/approval of local jurisdiction.

3. Support board type insulation against foundation walls and protect during back-fill operations.

B. Unfaced Thermal Batt Insulation: Install by friction-fit method except as otherwise required for support of units. Cut, cope and shape units as required at obstructions to provide most effective wall insulation envelope reasonably achievable. Install in all exterior wood and metal stud frame walls from foundation plate and up as required to form full closure with “ceiling” insulation. Place insulation into concealed corners and similar areas while areas are still accessible, whether or not such placement requires special sequencing of the work.

1. Use blanket widths and lengths that fill cavities formed by framing members. Where more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.

2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

C. Sound Attenuation Batt Insulation: Install in ceilings where indicated and in all interior frame partitions and walls from sill plate up to the top of the wall or partition, unless otherwise indicated. Fill all voids, full depth of cavity unless otherwise indicated, for complete insulation system.

D. Fill voids surrounding door and window frames, vents, louvers, etc. with foam-in type insulation. Install per manufacturer’s directions. Clean excess.

3.4 INSTALLATION OF VAPOR BARRIERS

A. General: Extend vapor barrier to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor barrier to cover miscellaneous voids in insulated substrates, including those which have been stuffed with loose fiber-type insulation.

B. All vapor barriers not covered with gypsum board shall be the flame-resistant type vapor barrier (FRVR).

C. Seal vertical joints in vapor barriers over framing by lapping not less than 2 wall studs. Fasten vapor barriers to framing at top, end, and bottom edges, at perimeter of wall openings and at lap joints; space fasteners 16” o.c.

D. Seal overlapping joints in vapor barriers with adhesives per vapor retarder manufacturer's printed directions. Seal butt joints and fastener penetrations with tape of type recommended by vapor retarder manufacturer. Locate all joints over framing members or substrates with mechanical fasteners or adhesives as recommended by vapor retarder manufacturer.

E. Seal joints caused by pipes, conduits, electrical boxes and similar items penetrating vapor retarders with cloth or aluminized tape of type recommended by vapor retarder manufacturer to create an air-tight seal between penetrating objects and vapor retarder.

F. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with tape or another layer of vapor retarder.

3.5 PROTECTION

A. General: Protect installed insulation and vapor retarders from harmful weather exposures and from possible physical abuses, where possible by non-delayed installation of concealing work or, where that is not possible, by temporary covering or enclosure.

END OF SECTION 072000

SECTION 07 2416-POLYMER MODIFIED EIFS

PART 1 – GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install drainage-type polymer modified EIFS system as described in Contract Documents including sealants.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a) ASTM C 150-05, 'Standard Specification for Portland Cement.'
      b) ASTM C 578-01, 'Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.'
      c) ASTM C 1178-04, 'Standard Specification for Glass Mat Water-Resistant Gypsum Backing Panel.'

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: Color selection.
   2. Shop Drawings:
      a) Preliminary shop drawings showing suggested layout of expansion joints, control joints, sealant application, etc, for Architect's approval.
      b) Upon approval of preliminary shop drawings, provide final sets for job site and Architect.
   3. Samples: Finish and color for Architect's selection.

B. Informational Submittals:
   1. Qualification Statement: Letter from System Manufacturer certifying adequate level of training and experience of Installer.

C. Closeout Submittals:
   1. Operation And Maintenance Manuals: Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a) Manufacturer's literature.
      b) Shop Drawings.
      c) Maintenance, cleaning, and repair instructions.
      d) Color selection.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: System shall be recognized for intended use by applicable building codes.

B. Qualifications:

1. System Manufacturer shall have trained installer in installation of system before bidding.
2. Installer shall have performed at least three installations of similar size, scope, and complexity in each of past two years.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be delivered in original, unopened packages with labels intact.

B. Store in cool, dry location, out of direct sunlight and weather, and at temperatures above 40 deg F.

1.6 FIELD CONDITIONS

A. Ambient Conditions:
1. Ambient air temperature shall be 40 deg F or minimum and rising at time of installation and for 24 hours thereafter.
2. Temperature of substrate shall be above 40 deg F during application.

PART 2 – PRODUCTS

2.1 SYSTEMS

A. Manufacturers:
1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
a) Dryvit Systems Inc, West Warwick, RI www.dryvit.com.
b) Georgia Pacific Gypsum Corp, Atlanta, GA www.gp.com.
c) Master Wall Inc, Midland, GA www.masterwall.com.
d) Parex, Redan, GA www.parex.com.
e) Senergy Inc, South Jacksonville, FL www.senergy.cc.
f) STO Finish Systems Div, Atlanta, GA www.stocorp.com.
g) Teifs Wall Systems, San Antonio, TX www.teifs.com.

B. Description:
1. Style / pattern / color as selected by Architect.

C. Materials:
1. Glass Mat Gypsum Sheathing:
a) Tile Backer: (wood and metal framing)
1) 5/8 inch 16 mm thick water-resistant exterior sheathing meeting requirements of ASTM C 1178.
2) Category Four Approved Manufacturer:
a. Dens-Gold Sheathing by G-P Gypsum.
b) Fasteners:
1) Wood Framing: 1-7/8 inch 48 mm long Type W or Type S Hi-Lo screws.
2) Metal Framing: 1-7/8 inch 48 mm long Type S Hi-Lo screws.
c) Joint Tape: 2 inch 50 mm wide glass fiber mesh tape.
2. Insulation:

a) Rigid extruded closed cell polystyrene foam conforming to ASTM C 578, Type IV.
b) Category Four Approved Products:
1) Amofoam by Pactiv Building Products, Atlanta, GA.
2) Foamular by Owens Corning, Toledo, OH.
3) Styrofoam by Dow Chemical, Midland, MI.

3. Mechanical Fasteners:
a) Masonry: Type M expansion fastener with 1-1/2 inch 38 mm diameter nylon washer and one inch 25 mm minimum penetration into masonry.
b) Steel Framing, 20 ga And Thinner: Type S self-tapping bugle head screws with 1-1/2 inch 38 mm diameter nylon washer and 5/8 inch 16 mm minimum penetration into framing.
c) Steel Framing, Thicker Than 20 Ga: Type S-12 self-tapping bugle head screws with 1-1/2 inch 38 mm diameter nylon washer and 5/8 inch 16 mm minimum penetration into framing.
d) Wood Framing: Type W bugle head screws with 1-1/2 inch 38 mm diameter nylon washer and 5/8 inch 16 mm minimum penetration into framing.

4. Trim Accessories:
a) Corner beads, base screeds, expansion joints, control joints, or other channel shapes shall be 26 ga 0.48 mm galvanized minimum or 0.0221 inch 0.55 mm zinc alloy minimum.
b) Casing beads shall be 24 ga 0.64 mm galvanized minimum or 0.027 inch 0.69 mm zinc alloy minimum.

5. Reinforcing Fabric: Balanced open-weave glass fiber approved by System Manufacturer.

6. Base And Finish Coats:
a) Base Coat:
1) Portland Cement: Meet requirements of ASTM C 150, Type I or II, and be product of single manufacturer.
2) Silica Sand: As recommended by Manufacturer for approved finish.
3) Reinforcing: Chopped fiberglass as supplied by EIFS Manufacturer.
4) Liquid: Acrylic or other polymer as supplied by EIFS Manufacturer.
5) Water: Clean, drinkable.
b) Finish Coat:
1) 100 percent Acrylic elastomeric, flexible finish.
2) Aggregate, if used, shall be silica.

2.2 ACCESSORY PRODUCTS
A. Sealants: Silicone by Dow or GE as acceptable to EIFS Manufacturer.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Do not install over unsatisfactory surfaces. Notify Architect in writing of unsatisfactory conditions.

3.2 PROTECTION

A. Protect adjacent surfaces from damage caused by installation of work of this Section.

3.3 INSTALLATION

A. Employ sufficient manpower to ensure continuous operation, free of cold joints, scaffold lines, texture variations, etc.

B. Place insulation horizontally with joints staggered and tightly butted and corners interlocked. Mechanically attach to degree specified by System Manufacturer.
   1. Make 'V' grooves at control joint locations if recommended by System Manufacturer.
   2. Mechanically fasten reinforcing mesh, as recommended by System Manufacturer, to firmly attach mesh and complete mechanical attachment of insulation boards.
   3. Follow System Manufacturer's instructions and approved shop drawings for detail work not described in Contract Documents.

C. Install expansion joints at:
   1. Expansion joints installed in substrate.
   2. Where finish system abuts other materials.
   3. At floor lines of wood framed construction.
   4. Where substrate changes.
   5. Changes in rooflines, building shape, or structural system.

D. Install control joints at:
   1. Locations to limit monolithic wall areas to 144 sq ft 13.4 sq meters.
   2. Dimensions between either horizontal or vertical joints shall not exceed 12 feet 3 600 mm.
   3. High-stress areas such as corners of openings and penetrations such as windows, doors, grilles, etc.

E. Minor Openings: Where openings are minor and control joints impracticable, reinforce corners with mesh strips at 45 degree angle to corners.

F. Base Coat: Apply coating tightly to insulation board surface over reinforcing mesh by hand trowel or spray. Apply additional base coat to achieve uniform thickness required by System Manufacturer. Application of base coat shall be such that surface is acceptable for application of finish coat.

G. Finish Coat:
   1. Allow base coat to dry 24 hours minimum before application of finish coat.

2. Before applying finish coat, correct surface irregularities, such as trowel marks and board lines.
3. During application, maintain wet edge. Same type of equipment and techniques shall be used by all applicators.

H. Apply sealants as required by System Manufacturer.

3.4 CLEANING

A. Remove debris resulting from work of this Section and clean adjacent surfaces.

END OF SECT**ION**

SECTION 075423 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Mechanically fastened thermoplastic polyolefin (TPO) roofing system.
2. Roof insulation.
3. Barrier Board

B. Related Requirements:

1. Section 076000 "Flashing and Sheet Metal" for metal roof flashings and counter flashings.
2. Section 079000 "Joint Sealers" for joint sealants, joint fillers, and joint preparation.
3. See Mechanical for roof drains.

1.3 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.

6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review temporary protection requirements for roofing system during and after installation.
8. Review roof observation and repair procedures after roofing installation.

1.5 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Roof plan showing orientation of steel decking and orientation of roofing, fastening spacings, and patterns for mechanically fastened roofing.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

C. Samples for Verification: For the following products:

1. Sheet roofing, of color required.
2. Walkway pads or rolls, of color required.
3. Roof insulation.
4. Termination bars.
5. Six insulation fasteners of each type, length and finish.
6. Six roof cover fasteners of each type, length and finish.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Manufacturer Certificates: Assembly Letter from Manufacturer

1. Submit evidence of compliance with performance requirements.

C. Product Test Reports: For components of roofing system, tests performed by manufacturer and witnessed by a qualified testing agency.

D. Research/Evaluation Reports: For components of roofing system, from ICC-ES.

E. Field quality-control reports.

F. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For membrane roofing system to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is FM Global approved for roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes roofing, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, and other components of roofing system.

a. Fire/Windstorm Classification: Class 1A-90.
b. Hail Resistance: SH

2. Warranty Period: 15 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Firestone Building Products. BASIS of design product “UltraPly TPO Membrane, Inv
2. GenFlex Roofing Systems.
3. Carlisle

B. Source Limitations: Obtain components including roof insulation fasteners for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.

1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.3 TPO ROOFING

A. Fabric-Reinforced TPO Sheet: ASTM D 6878, internally fabric- or scrim-reinforced, uniform, flexible TPO sheet.

1. Thickness: 60 mils, nominal.
2. Exposed Face Color: White

2.4 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing of same thickness as roof membrane, and same color as TPO sheet.

C. Bonding Adhesive: Manufacturer's standard.

D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roofing to substrate, and acceptable to roofing system manufacturer.

F. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.5 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by TPO roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Global-approved roof insulation.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 3, felt or glass-fiber mat facer on both major surfaces.

C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.
1. See drawings for anticipated locations of tapered insulation to provide positive drainage to roof drains and scuppers.

D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

1. See drawings for anticipated locations of tapered insulation to provide positive drainage to roof drains and scuppers.

E. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together and fasten to roof deck.

1. Fasten cover boards according to MFG requirements for specified Windstorm Resistance Classification.
2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

2.6 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

C. Barrier Board: ASTM C 1177M, glass-mat, water-resistant gypsum substrate 5/8 inch thickness.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Georgia-Pacific Building Products; Dens Deck.

D. Cover Board: Provide 1/2" thickness Dens Deck or 1/2” HD Board.

2.7 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick and acceptable to roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:

1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 053100 "Steel Decking."

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

C. Install roofing and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and to not void warranty for existing roofing system.

3.4 INSULATION INSTALLATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

1. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.

1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Mechanically Fastened Insulation: Install All LAYERS of insulation and barrier board and secure to deck using mechanical fasteners specifically designed and sized for fastening specified top layer board-type roof insulation to deck type.

1. Fasten insulation according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.

2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

3.5 MECHANICALLY FASTENED/INDUCTION WELDED ROOFING INSTALLATION

A. Mechanically fasten roofing over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing and allow to relax before retaining.

1. For in-splice attachment, install roofing with long dimension perpendicular to steel roof deck flutes.

B. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Lay out the membrane panels so field and flashing splices are positioned to shed water.

D. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer’s instructions and details.

E. Welding equipment shall be approved for use by roofing manufacturer for use with the TPO membrane. Roofer shall have successfully completed a manufacturer approved training course.

F. Perform a tool calibration with induction welding tool, as recommended by roofing system manufacturer.

G. All membrane to be welded shall be clean and dry.

H. Follow induction tool manufacturer’s printed guidelines if using invisiweld fasteners for the field or for base tie ins. Activate the weld between the TPO membrane and weld plate using the electromagnetic induction device. The induction coil must be positioned over the center of the plate, +/- 1”. Cycle time will be affected by available power. Use at least a 12 gauge heavy gauge power cord, no longer than 100’ in length.

I. When induction welding cycle is complete, immediately place a magnetic cooling clamp over the welded TPO membrane and plate assembly, to ensure adequate clamping of the membrane to the plate during cooling and affecting a proper weld. The magnetic cooling clamp device must be left in

place for at least 60 seconds, or as recommended in manfacturer's installation instructions, while weld cools and sets. Clean magnetic cooling clamps often to prevent metal shavings or other debris from causing indents in the roofing material over the plates.

J. Secure membrane at all locations where membrane terminates at a roof edge using mechanically fastened reinforced perimeter flattening strips, weld plates, HD plates, or metal edging as indicated or as recommended by roofing manufacturer.
   1. Weld plates may be used for base tie-in securement.
   2. Do not use weld plates for roof edge securement.

K. In-Seam Attachment: Secure one edge of TPO sheet using fastening plates or metal battens centered within seam, and mechanically fasten TPO sheet to roof deck.

L. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.

   1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet.
   2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
   3. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.

M. Spread sealant bed over deck-drain flange at roof drains, and securely seal roofing in place with clamping ring.

3.6 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars].

3.7 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

B. Roof-Paver Walkways: Install walkway roof pavers according to manufacturer's written instructions in locations indicated, to form walkways. Leave 3 inches of space between adjacent roof pavers.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.9 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.10 ROOFING INSTALLER'S WARRANTY

A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: <**Insert name of Owner**>.
2. Address: <**Insert address**>.
3. Building Name/Type: <**Insert information**>.
4. Address: <**Insert address**>.
5. Area of Work: <**Insert information**>.
6. Acceptance Date: _____.
7. Warranty Period: <**Insert time**>.
8. Expiration Date: _____.

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

    a. lightning;

    b. peak wind gusts exceeding 90 mph
    c. fire;
    d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    e. faulty construction of parapet walls, copings, chimneys, skylights, vents,equipment supports, and other edge conditions and penetrations of the work;
    f. vapor condensation on bottom of roofing; and
    g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.

6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION 075423

SECTION 076000 - FLASHING AND SHEET METAL

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes the following:

Metal flashing, Copings, Roof drainage systems (scuppers, gutters, downspouts and accessories), and Exposed trim.

1.2 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. After review and approval, submit to Architect.

B. Product data, Flashing, Sheet Metal, and Accessories: Manufacturer's technical product data, installation instructions and general recommendations for each specified sheet material and fabricated product.

C. Samples of the following sheet metal and accessory items:

1. 8-inch-square samples of specified sheet materials to be exposed as finished surfaces, or:

2. 12-inch-long samples of factory-fabricated products exposed as finished work. Provide complete with specified factory finish.

D. Shop drawings showing profiles, anchorage, and expansion details for gutters and down spouts.

1.3 PROJECT CONDITIONS

A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

1. Provide flashing design and fabrications that are weather and water tight.

1.4 WARRANTY

A. Special Project Warranty: Provide 2-year “Roofing Warranty” signed by Installer (roofing, flashing and sheet metal).

PART 2 – PRODUCTS

2.1 METALS

A. Zinc-Coated Steel: Commercial quality with 0.20 percent copper, ASTM A 526 except ASTM A 527 for lock-forming, G90 hot-dip galvanized, mill phosphatized where indicated for painting; 0.0239-inch thick unless otherwise indicated.

1. Shop Painting:

a. After fabrication, but before installation, clean surfaces of galvanized steel with gasoline; coat with 12% copper sulfate solution.

b. Allow coating to remain for 12 hours, then dust off with stiff brush.

c. Paint surfaces one full coat zinc chromate primer.

2. Fluoropolymer Coating (Pre-Finished): For flashing indicated to be pre-finished, provide manufacturer's custom, low-gloss "Dura Tech 5000" finish (to match roofing system finish) coating consisting of a primer and a minimum 0.8-mil dry film thickness finish coat in accordance with ASTM D 523.

a. Colors as selected by Architect.

2.2 FABRICATION, GENERAL

A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for 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 fit substrates. Comply with material manufacturer 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 hems.

B. Seams: Fabricate non-moving seams in sheet metal with flat-lock seams. For metal other than aluminum, tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.

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.

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. Aluminum Extrusion Units: Fabricate extruded aluminum running units with formed or extruded aluminum joint covers for installation behind main members where possible. Fabricate mitered and welded corner units.

2.3 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Fasteners: Same metal as flashing/sheet metal or other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.

B. Bituminous Coating: SSPC - Paint 12, solvent-type bituminous mastic, nominally free of sulfur, compounded for 14-mil dry film thickness per coat.

C. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, non-drying, nonmigrating sealant.

D. Elastomeric Sealant: Generic type recommended by manufacturer of metal 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 noncorrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior nonmoving 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.

I. Reglets: Metal or plastic units of type and profile indicated, compatible with flashing indicated, noncorrosive.

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, noncorrosive, size and gage required for performance.

K. Cast-Iron Drainage Boots: Gray iron castings of size and pattern indicated, ASTM A 48, bituminous shop-coated.

L. Elastic Flashing Filler: Closed-cell polyethylene or other soft closed-cell material recommended by elastic flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on flashing sheet.

M. Roofing Cement: ASTM D 2822, asphaltic.

2.4 SHEET METAL FABRICATIONS

A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.

1. Exposed Trim, Scuppers, Fascia and Gutters and Downspouts: Fabricate from the following material:

a. Galvanized Steel: 0.0239-inch-thick 24GA; pre-finished as selected by Architect.

b. Gutters: 0.0299-inch-thick (22 GA); Pre-finished as selected by Architect.

c. Downspouts: 0.0239-inch-thick (24 GA) 4" diameter;
Pre-finished as selected by Architect.

d. Color to match adjacent paint color.

2. Copings: Fabricate from the following material:

a. Galvanized Steel: 0.0239 inch thick (24GA); pre-finished.

b. Color as selected.

3. Base Flashing: Fabricate from the following material:

a. Galvanized Steel: 0.0239 inch thick (24GA).

4. Counterflashing: Fabricate from the following material:

a. Galvanized Steel: 0.0239 inch thick (24GA); pre-finished.
b. Color as selected.

5. Flashing Receivers: Fabricate from the following material:

a. Galvanized Steel: 0.0239 inch thick (24GA); pre-finished.

6. Equipment Support Flashing: Fabricate from the following material:

a. Galvanized Steel: 0.0299 inch thick (22GA).

7. Roof-Penetration Flashing: Fabricate from the following material:

a. Galvanized Steel: 0.0299 inch thick (22GA).

8. Miscellaneous Flashing and Trim:

a. As indicated.

b. Color as selected.

PART 3 - EXECUTION

3.1 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, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.

B. Underlayment: Where stainless steel or aluminum is to be installed directly on cementitious 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.

E. 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.

F. Install elastic flashing in accordance with manufacturer's recommendations. Where required, provide for movement at joints by forming loops or 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.

G. Roof-Drainage System: Install drainage items fabricated from sheet metal, with straps, adhesives, and anchors recommended by SMACNA’s Manual or the item manufacturer,

to drain roof in the most efficient manner. Coordinate roof-drain flashing installation with roof-drainage system installation. Coordinate flashing and sheet metal items for steep-sloped roofs with roofing installation.

H. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation. Weld or seal flashing to equipment support member.

I. Roof-Penetration Flashing: Coordinate roof-penetration flashing installation with roofing and installation of items penetrating roof. Install flashing as follows:

1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.

2. Seal and clamp flashing to pipes penetrating roof, other than lead flashing on vent piping.

3.2 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Protection: Advise 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.

C. Use small (as possible) paint brush when touching up scratches with manufacturer's standard touch-up Paint. Minimize over-painting of scratched areas. Use of spray paint for touch-up will be rejected.

END OF SECTION

SECTION 078100 – APPLIED FIREPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes SFRMs applied to surfaces that are concealed from view behind other construction when the Work is completed.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show extent of sprayed fire-resistive material for each construction and fire-resistance rating, applicable fire-resistive design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction, and minimum thicknesses.

C. Product certificates.

D. Compatibility and adhesion test reports.

E. Research/evaluation reports.

F. Field quality-control test and special inspection reports.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer approved by SFRM manufacturer to install manufacturer's products. A manufacturer's willingness to sell its SFRM to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.

B. SFRM Testing: By a qualified testing and inspecting agency engaged by Contractor or manufacturer to test for compliance with specified requirements for performance and test methods.

1. SFRMs are randomly selected for testing from bags bearing the applicable classification marking of UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
2. Testing is performed on specimens of SFRMs that comply with laboratory testing requirements specified in Part 2 and are otherwise identical to installed fire-resistive materials, including application of accelerant, sealers, topcoats, tamping, troweling, rolling, and water overspray, if any of these are used in final application.
3. Testing is performed on specimens whose application the independent testing and inspecting agency witnessed during preparation and conditioning. Include in test reports a full description of preparation and conditioning of laboratory test specimens.

C. Compatibility and Adhesion Testing: Engage a qualified testing and inspecting agency to test for compliance with requirements for specified performance and test methods.

1. Test for bond per ASTM E 736 and requirements in UL's "Fire Resistance Directory" for coating materials. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
2. Verify that manufacturer, through its own laboratory testing or field experience, has not found primers or coatings to be incompatible with SFRM.

D. Fire-Test-Response Characteristics: Where indicated, provide products identical to those tested for fire resistance per ASTM E 119 by a testing agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
2. Identify products with appropriate markings of applicable testing and inspecting agency.

E. Provide products containing no detectable asbestos as determined according to the method specified in 40 CFR 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy."

F. Mockups: Apply mockups to verify selections made under sample submittals and to set quality standards for materials and execution.

1. Extent of Mockups: Approximately 100 sq. ft. of surface for each product indicated.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

G. Preinstallation Conference: Conduct conference at Project site.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply SFRM when ambient or substrate temperature is 40 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of SFRM. Use natural means or, if they are inadequate, forced-air circulation until fire-resistive material dries thoroughly.

C. Sequence and coordinate application of SFRM with other related work specified in other Sections to comply with the following requirements:

1. Provide temporary enclosure as required to confine spraying operations and protect the environment.
2. Provide temporary enclosures for applications to prevent deterioration of fire-resistive material due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.
3. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.
4. Do not apply fire-resistive material to metal roof deck substrates until concrete topping, if any, has been completed. For metal roof decks without concrete topping, do not apply fire-resistive material to metal roof deck substrates until roofing has been completed; prohibit roof traffic during application and drying of fire-resistive material.
5. Do not apply fire-resistive material to metal floor deck substrates until concrete topping has been completed.
6. Do not begin applying fire-resistive material until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.

7. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.
8. Do not install enclosing or concealing construction until after fire-resistive material has been applied, inspected, and tested and corrections have been made to defective applications.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by Contractor and by Installer, in which manufacturer agrees to repair or replace SFRMs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Cracking, flaking, spalling, or eroding in excess of specified requirements; peeling; or delaminating of SFRM from substrates.
b. Not covered under the warranty are failures due to damage by occupants and Owner's maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and other causes not reasonably foreseeable under conditions of normal use.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONCEALED SFRM

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Concealed Cementitious SFRM:

a. Carboline Co., Fireproofing Products Div.; Pyrolite 15 High Yield.
b. Grace, W. R. & Co. - Conn., Construction Products Div.; Monokote Type MK-6/HY and MK-6s.
c. Isolatek International Corp.; Cafco 300.
d. Southwest Vermiculite Co., Inc.; Type 5.

B. Material Composition: Manufacturer's standard product, as follows or either of the following:

1. Concealed Cementitious SFRM: Factory-mixed, dry formulation of gypsum or portland cement binders, additives, and lightweight mineral or synthetic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application.

C. Physical Properties: Minimum values, unless otherwise indicated, or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property as follows:

1. Dry Density: 15 lb/cu. ft. for average and individual densities, or greater if required to attain fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method."

2. Thickness: Minimum average thickness required for fire-resistance design indicated according to the following criteria, but not less than 0.375 inch, per ASTM E 605:

   a. Where the referenced fire-resistance design lists a thickness of 1 inch or more, the minimum allowable individual thickness of SFRM is the design thickness minus 0.25 inch.
   b. Where the referenced fire-resistance design lists a thickness of less than 1 inch but more than 0.375 inch, the minimum allowable individual thickness of SFRM is the greater of 0.375 inch or 75 percent of the design thickness.
   c. No reduction in average thickness is permitted for those fire-resistance designs whose fire-resistance ratings were established at densities of less than 15 lb/cu. ft..

3. Bond Strength: 150 lbf/sq. ft. minimum per ASTM E 736 based on laboratory testing of 0.75-inch minimum thickness of SFRM.
4. Compressive Strength: 5.21 lbf/sq. in. minimum per ASTM E 761. Minimum thickness of SFRM tested shall be 0.75 inch and minimum dry density shall be as specified but not less than 15 lb/cu. ft..
5. Corrosion Resistance: No evidence of corrosion per ASTM E 937.
6. Deflection: No cracking, spalling, or delamination per ASTM E 759.
7. Effect of Impact on Bonding: No cracking, spalling, or delamination per ASTM E 760.
8. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. in 24 hours per ASTM E 859. For laboratory tests, minimum thickness of SFRM is 0.75 inch, maximum dry density is 15 lb/cu. ft., test specimens are not prepurged by mechanically induced air velocities, and tests are terminated after 24 hours.
9. Fire-Test-Response Characteristics: Provide SFRM with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

   a. Flame-Spread Index: 10 or less.
   b. Smoke-Developed Index: 0.

10. Fungal Resistance: No observed growth on specimens per ASTM G 21.

2.2 AUXILIARY FIRE-RESISTIVE MATERIALS

A. General: Provide auxiliary fire-resistive materials that are compatible with SFRM and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers: For use on each substrate and with each sprayed fire-resistive product, provide primer that complies with one or more of the following requirements:

   1. Primer's bond strength complies with requirements specified in UL's "Fire Resistance Directory" for coating materials based on a series of bond tests per ASTM E 736.
   2. Primer is identical to those used in assemblies tested for fire-test-response characteristics of SFRM per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

C. Adhesive for Bonding Fire-Resistive Material: Product approved by manufacturer of SFRM.

D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required to comply with fire-resistance designs indicated and fire-resistive material

manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive SFRM.

E. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by manufacturer of SFRM.

F. Topcoat: Type recommended in writing by manufacturer of each SFRM.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of work. A substrate is in satisfactory condition if it complies with the following:

1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.
2. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, incompatible paints, incompatible encapsulants, or other foreign substances capable of impairing bond of fire-resistive materials with substrates under conditions of normal use or fire exposure.
3. Objects penetrating fire-resistive material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
4. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying fire-resistive material.
5. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Verify that concrete work on steel deck has been completed.

C. Verify that roof construction, installation of roof-top HVAC equipment, and other related work are completed.

D. Conduct tests according to fire-resistive material manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.

E. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application.

F. Clean substrates of substances that could impair bond of fire-resistive material, including dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, and incompatible primers, paints, and encapsulants.

G. Prime substrates where recommended in writing by SFRM manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive SFRM.

H. Install reinforcing fabric, as required, to comply with fire-resistance ratings and fire-resistive material manufacturer's written recommendations for conditions of exposure and intended use. Securely attach fabric to substrate in position required for support and reinforcement of fire-resistive material. Use anchorage devices of type recommended in writing by SFRM manufacturer. Attach accessories where indicated or required for secure attachment of fabric to substrate.

I. Coat substrates with bonding adhesive before applying fire-resistive material where required to achieve fire-resistance rating or as recommended in writing by SFRM manufacturer for material and application indicated.

J. Extend fire-resistive material in full thickness over entire area of each substrate to be protected. Unless otherwise recommended in writing by SFRM manufacturer, install body of fire-resistive covering in a single course.

K. Spray apply fire-resistive materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by SFRM manufacturer.

L. Where sealers are used, apply products that are tinted to differentiate them from SFRM over which they are applied.

M. Apply concealed SFRM in thicknesses and densities not less than those required to achieve fire-resistance ratings designated for each condition, but apply in greater thicknesses and densities if specified in Part 2 "Concealed SFRM" Article.

N. Apply water overspray to concealed sprayed-fiber fire-resistive material as required to obtain designated fire-resistance rating and where indicated.

O. Cure concealed SFRM according to product manufacturer's written recommendations.

P. Apply sealer to concealed SFRM where indicated.

Q. Apply topcoat to concealed SFRM where indicated.

R. Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

S. Repair or replace work that has not successfully protected steel.

3.2 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections and prepare reports:

1. SFRM.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

C. Tests and Inspections: Testing and inspecting of completed applications of SFRM shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with application of SFRM for the next area until test results for previously completed applications of SFRM show compliance with requirements. Tested values must equal or exceed values indicated and required for approved fire-resistance design.

1. Thickness for Floor, Roof, and Wall Assemblies: For each 1000-sq. ft. area, or partial area, on each floor, from the average of 4 measurements from a 144-sq. in. sample area, with sample width of not less than 6 inches per ASTM E 605.
2. Thickness for Structural Frame Members: From a sample of 25 percent of structural members per floor, taking 9 measurements at a single cross section for structural frame beams or girders, 7 measurements of a single cross section for joists and trusses, and 12 measurements of a single cross section for columns per ASTM E 605.
3. Density for Floors, Roofs, Walls, and Structural Frame Members: At frequency and from sample size indicated for determining thickness of each type of construction and structural framing member, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method."
4. Bond Strength for Floors, Roofs, Walls, and Structural Framing Members: For each 10,000-sq. ft. area, or partial area, on each floor, cohesion and adhesion from one sample of size indicated for determining thickness of each type of construction and structural framing member, per ASTM E 736.

    a. Field test SFRM that is applied to flanges of wide-flange, structural-steel members on surfaces matching those that will exist for remainder of steel receiving fire-resistive material.
    b. If surfaces of structural steel receiving SFRM are primed or otherwise painted for coating materials, perform series of bond tests specified in UL's "Fire Resistance Directory." Provide bond strength indicated in referenced UL fire-resistance criteria, but not less than 150 lbf/sq. ft. minimum per ASTM E 736.

5. If testing finds applications of SFRM are not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.

D. Remove and replace applications of SFRM that do not pass tests and inspections for cohesion and adhesion, for density, or for both and retest as specified above.

E. Apply additional SFRM, per manufacturer's written instructions, where test results indicate that thickness does not comply with specified requirements, and retest as specified above.

END OF SECTION

SECTION 078123 INTUMESCENT FIREPROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes intumescent fire-resistive coatings applied to primary and secondary structural steel members to provide specified fire resistance rating.

1.03 RELATED WORK OF OTHER SECTIONS

A. Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:

2. Section 05 12 00 – Structural Steel Framing
3. Section 05 50 00 – Metal Fabrications
5. Section 07 84 00 – Firestopping
6. Section 09 29 00 – Gypsum Board Assemblies
7. Section 09 91 20 – Painting and Coatings

1.04 REFERENCE STANDARDS

1. 40 CFR 59, Subpart D – National Volatile Organic Compound Emission Standards for Architectural Coatings
2. ASTM D2240 - Standard Test Method for Rubber Property — Durometer Hardness
3. ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation — Impact Resistance
4. ASTM D4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser — Abrasion Resistance
5. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers — Bond Strength
6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
7. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials
8. National Fire Protection Association, NFPA 251
9. Underwriters Laboratories Inc. (UL) ANSI/UL263
10. Underwriters Laboratories of Canada (ULc) CAN/ULC S101-M

11. Association of the Wall and Ceiling Industry, AWCI Technical Manual 12-B, current edition.

1.05 SUBMITTALS

A. Product data and application instructions for each intumescent coating indicated on drawings and Finish Schedule.

B. Product certificates from manufacturer documenting intumescent coatings comply with specified requirements including those for fire test response characteristics and compatibility with adhesives, primers, and other surface coatings on substrates indicated to receive intumescent coatings.

C. Fire Resistance Rating Listings: UL, ULc, or other accredited testing agency indicating type and size of steel member to receive intumescent coatings and minimum dry thickness (mils) to achieve specified fire resistance rating.

D. LEED Submittals:

1. Product Data for Credit EQ c4.2: Low emitting materials – Adhesives and sealants, documentation including printed statement of VOC content.
2. VOC content: 0 g/L according to EPA method 24.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company responsible for the manufacture of fire protection materials with local direct technical employee(s) (as distinct from distributors or authorized agents) readily available at the project site. Intumescent coatings shall be manufactured under the follow-up services program of Underwriter's Laboratories (UL) or UL Canada (ULc) and bear the UL (and/or ULc) label (mark). Manufacturer's technical representative to be on site during start of installation and be generally available on site as requested during the application process.

B. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by the intumescent coatings manufacturer as having the necessary training to install manufacturer's products, and otherwise have the experience and staff to properly perform the installation. Installer shall be trained by the intumescent coatings manufacturer's direct employee(s) (not by distributors or authorized agents).

C. Installation: Verify steel members have been properly prepared, including the use of a compatible primer, and install intumescent coatings in accordance with manufacturer's written recommendations published in their product technical literature and/or provided by manufacturer.

D. Product Identification: Label packages (pail or bucket) with manufacturer name, product name, expiration date, freeze tag, UL or ULc label (mark).

E. Special Inspection: Owner to employ a qualified independent inspection and testing agency to perform field quality control testing services in accordance with AWCI Technical Manual 12-B, local building code and Authority Having Jurisdiction requirements.

F. Inspection and Testing Agency Qualifications: ASTM E329-09, “Standard Specification for Agencies Engaged in Construction Inspection and Testing” and AWCI Technical Manual 12-B.

G. Field Constructed Mockups: Prior to installing intumescent coatings, Installer shall apply products specified for exposed applications to demonstrate aesthetic qualities and workmanship. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.

1. Location: As indicated on drawings.
2. Extent of Mockups: Approximately 5 sq. ft. of surface for each product indicated.
3. Notify architect one week in advance of the dates and times when mockups will be built.
4. Obtain architect's written acceptance of mockups before start of actual unit of work.
5. Retain and maintain mockups during construction in undisturbed condition as a standard for judging completed units of work.
    a. Accepted mockups in undisturbed condition at time of substantial completion may become part of completed unit of work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in original, unopened packages with manufacturer’s labels intact and legible.

B. Install intumescent coatings prior to expiration date included on packaging. Properly discard expired product.

C. Store intumescent coatings protected from direct sunlight and maintained at a temperature as specified by the manufacturer. The product must not be frozen, or stored at freezing temperatures. Verify proper storage of material as indicated by the freeze indicator label attached to the pail. Identify and label material damaged due to improper storage, remove from Project site and properly discard.

1.08 PROJECT CONDITIONS

A. Environmental Conditions:

1. Do not install intumescent coatings when ambient or substrate temperatures are, or prior to full cure will be, outside the manufacturer’s recommended installation temperatures, unless temporary protection and heating/cooling is provided to

maintain temperatures within the prescribed range for the period specified by the manufacturer.

2. Do not install intumescent coatings when relative humidity is outside the limits established by the manufacturer. Consult manufacturer to determine precautions that may be implemented to prevent condensation from forming on the steel during application of fireproofing.

B. Ventilation: Ventilate areas where intumescent coatings will be installed by natural means or, where this is inadequate, forced air circulation during and after application until fireproofing dries thoroughly.

1.9 SEQUENCING

A. Sequence and coordinate application of intumescent coatings with related work specified in other Sections to comply with the following requirements:

1. Coordinate installation of intumescent coatings with other items of work that may interfere with proper installation of coatings.
2. Do not begin applying intumescent coatings until clips, hangers, supports, and other welded connections have been installed. Intumescent coatings manufacturer must approve in writing any clips, hangers, supports or connections that may installed over coating using mechanical or adhesive devices.
3. Provide temporary enclosures as necessary to prevent deterioration of intumescent coatings due to exposure to unfavorable environmental conditions.
4. Take appropriate steps to avoid abrasion and other damage to the applied intumescent coatings during construction operations.

5 Do not protect or conceal structural members to which intumescent coatings have been applied until each area has been inspected, tested, and corrections have been made to any deficient areas.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Design: Provide intumescent thin-film fire protection systems tested by an independent testing agency in accordance with ASTM E119 and acceptable to authorities having jurisdiction (AHJ).

2.2 MATERIALS

A. Fire-Resistive Coatings - Interior: Thin-film intumescent fire protection system for structural steel.

1. Manufacturer's standard, factory-mixed formulation or factory-mixed, multicomponent system consisting of intumescent base coat and topcoat, and complying with UL Design BXUV.Y633, BXUV.Y634, BXUV.N640 and BXUV.D990.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    1. Hilti, Inc.
b. Basis of Design Product:
    1. Fire Finish Steel Protection Spray CFS-SP WB by Hilti, Inc.
c. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.
d. Surface Burning Characteristics: Class A, flame spread/smoke developed index of 0/0, maximum, when tested in accordance with ASTM E84
e. VOC Content: Less than 0 g per L when tested in accordance with 40 CFR 59, Subpart D (EPA Method 24)

B. Fire-Resistive Coatings - Exterior: Thin-film intumescent fire protection system for structural steel.

1. Manufacturer's standard, factory-mixed formulation or factory-mixed, multicomponent system consisting of intumescent base coat and topcoat, and complying with UL Designs BXUV.Y656, BXUV.Y657, BXUV.N655.

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
        1. Hilti, Inc.
    b. Basis of Design Product:
        1. All Weather High Build CFS-SP AWHB by Hilti, Inc.
    c. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.
    d. Surface Burning Characteristics: Class A, flame spread/smoke developed index of 0/10, maximum, when tested in accordance with ASTM E84
    e. VOC Content: Less than 125 g per L when tested in accordance with 40 CFR 59, Subpart D (EPA Method 24)

C. Sealers and Primers: As required by tested and listed assemblies and recommended by intumescent coatings manufacturer to suit specific substrate conditions.

2.3 AUXILIARY FIREPROOFING MATERIALS

A. General: Provide auxiliary fireproofing materials that are compatible with intumescent coating products and substrates and are approved by UL or other accredited testing agencies acceptable to authorities having jurisdiction for use in the fire resistive designs indicated.

B. Substrate Primers: For use on each different substrate, provide primer that complies with the following requirements:

1. Primer shall be approved in writing by manufacturer of intumescent coatings, and applied in full compliance with the primer manufacturer’s written instructions. Primer must be fully cured prior to installation of the intumescent coating.

C. Topcoats: Suitable for application over applied intumescent coatings; of type recommended in writing by intumescent coatings manufacturer for each fire resistance design. Color of topcoat shall be as selected by the architect. Colors shall not be limited to manufacturer's standard colors.

PART 3 - EXECUTION

3.1 PREPARATION

A. Cover other work subject to damage from fall out or overspray of intumescent coatings materials during application. Provide temporary enclosure as required to confine spraying operations, protect the environment, and ensure maintaining adequate ambient conditions for temperature and ventilation.

B. Clean substrates of substances that could impair bond of thin-film fire resistive material, including oil, grease, dirt, dust, rolling compounds, incompatible primers, and loose mill scale.

C. Prime substrates with compatible primer approved by the intumescent coatings manufacturer except where compatible shop primer has been applied and is in satisfactory condition to receive intumescent coatings. Primer must be fully cured prior to applying intumescent coatings.

D. Apply intumescent coatings: Protect intumescent coatings from rain, direct sunlight, high humidity, strong wind (with dirt, dust or sand) during the application and drying phases. Do not apply an additional coat of intumescent coating until previous layer has fully cured.

E. For applications visible upon completion of project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections that would telegraph through fire resistive products after application.

3.2 INSTALLATION, GENERAL

A. Coordinate application of intumescent coatings with other construction to allow for proper application and minimize need to repair damage.

B. Comply with intumescent coatings manufacturer's instructions for mixing materials, application procedures, and types of equipment used to convey and install products, as applicable to the particular conditions of installation and as required to achieve fire resistance ratings indicated.

C. Coat substrates with primer and allow proper cure time prior to applying intumescent coatings as recommended by intumescent coatings manufacturer for material and application indicated.

D. Apply intumescent coatings identical to mock-ups.

3.3 INSTALLING INTUMESCENT FIREPROOFING

A. Apply intumescent coatings in thicknesses required to achieve fire resistance ratings designated for each condition.

B. Provide a uniform finish complying with description indicated for type of material and matching finish approved for field erected mockup.

3.4 FIELD QUALITY CONTROL

A. Inspection and Testing Agency: Coordinate installation of fireproofing with owner’s independent inspection and testing agency.

B. Inspection & testing shall be in accordance with AWCI Technical Manual 12-B.

C. Testing agency will promptly report test results in writing to the installer and architect.

D. Remove and replace intumescent coatings where test results indicate that fireproofing does not comply with specified requirements for adhesion.

E. Apply additional intumescent coatings per manufacturer's directions where test results indicate that the thickness does not comply with specified requirements.

F. Additional Testing: Where intumescent coatings are removed and replaced or repaired, Owner’s inspection and testing agency shall perform additional testing to determine compliance with specified requirements.

3.5 CLEANING, REPAIR, AND PROTECTION

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove product over spray and fall out from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Cure intumescent coatings according to manufacturer's recommendations.

C. Protect intumescent coatings from damage during construction.

D Repair or replace work that was not properly protected from damage during construction in accordance with manufacturer’s recommendations.

E. Ensure full curing of intumescent coating prior to application of top coat.

END OF SECTION

SECTION 078400 - FIRESTOPPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and provisions of the Contract. The General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

B. Related Work in Other Sections:

1. Mechanical and electrical and other penetrations through fire-rated assemblies shall receive firestopping as specified herein, and shall be inspected and approved in writing by the jurisdiction before cover.

2. Sections Sections that are related to this Section include but are not limited to the following:

a. Division 5 Sections “Structural Steel,” Cold-Formed Metal Framing.”

b. Division 6 Section “Rough Carpentry.”

c. Division 7 Section “Joint Sealers.”

d. Division 9 Sections “Gypsum Drywall”; “Painting.”

C. General Scope of Work

1. Provide firestopping assemblies as specified herein for application at all mechanical, electrical and other penetrations through fire-rated assemblies. Such penetrations include piping, conduit and the like.

1.02 QUALITY ASSURANCE

A. Applicator

1. Application of firestopping shall be performed by qualified, factory-trained applicators having proper equipment and training to complete the installation in accordance with manufacturer’s instructions and applicable U.L. Fire Resistance Directory System Nos.

B. Approvals, Listings and Classifications

1. Firestopping materials and assemblies shall be approved as listed and described in the U.L. Fire Resistance Directory - Volume II, latest edition.

2. Materials shall also have been tested and conform to the time/temperature requirements of ASTM E119, as well as to ASTM E814, as applicable.

3. Manufacturer: The manufacturer for the specified systems is Specified Technologies (STI), Sommersville, NJ, and is the design standard for this Section. Use of products or manufacturers not approved shall be rejected and any work must be replaced with the specified or approved product(s).

   a. Products used on this project must be provided from a single manufacturer and its line of products unless otherwise approved by the Architect and the jurisdiction.

   b. Approval must be received by the Architect and the jurisdiction prior to use on this project. Time for a proper review must be given. Lack of time to review the products and system(s) may be cause for rejection of approval. Requirements of Section 01631 shall apply.

4. Inspections of penetrations: All penetrations made in any fire-rated assembly or wall, or any adjacent wall to a fire- rated wall or assembly, shall be sealed properly with approved firestopping material and systems for the particular condition(s). Each penetration shall be inspected and approved in writing by the jurisdiction prior to cover. Should a penetration be made in any fire-rated assembly or wall following the completion of the fire-stopping/approval process indicated above, then a subsequent inspection of the assembly and its approval in writing must be obtained by the jurisdiction.

1.03 SUBMITTALS

A. Product Data

1. Submit product data from firestopping material manufacturer indicating materials to be used in the work and installation instructions. Indicate materials and specific, job related application.

   a. Following review and approval, submit to Architect.

B. Jurisdictional Inspection and Approval

1. At Substantial Completion, the Contractor shall submit a letter confirming that the firestopping system that has been provided has been inspected and approved in writing by the jurisdiction having authority.

2. Provide supporting data in the form of approval letters, inspection reports, photographs and other pertinent information, including written approvals from the

jurisdiction of penetrations made, including those that had been made after the wall had been initially approved.

3. Submit to Architect as indicated and include copies of the information in the Operation and Maintenance Manual for the Owner's records.

1.04 PRODUCT DELIVERY, STORAGE & HANDLING

A. General

1. Deliver in unopened containers, labels intact with complete instructions for use.

2. Protect all materials from freezing in transit and storage.

3. Store all materials at a temperature of not less than 40 degrees F. Protect storage space floor from spillage; keep covered at all times.

4. All firestopping materials shall be obtained from a single manufacturer and verified for proper application prior to installation.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

A. Firestopping Materials

1. Firestopping materials and assemblies shall be approved as listed and described in the U.L. Fire Resistance Directory - Volume II, latest edition, consisting of intumescent sealant or intumescent firestop collars, intumescent putty or combinations thereof, complete with necessary accessory materials such as mineral wool or fiberglass packing and sheet metal sleeves, as applicable, for complete U.L. listed and approved assembly in each case.

2. Firestopping systems shall conform to both Flame (F) and Temperature (T) ratings as required by local building code. The F rating shall be a minimum of one (1) hour but not less than the fire resistance rating of the floor or wall assembly being penetrated.

B. List of Products: Provide the following products as manufactured by Specified Technologies, Inc. (STI), Somerville, NJ, or approved, for the following conditions:

Type 1: SpecSeal Series 100 Sealant: For small to medium openings through common construction.

Type 2: Pensil 300 Sealant: For fire-rated architectural joints.

Type 3: SpecSeal Putty/Putty Pads: For small to medium openings through wall and floor penetrations.

Type 4: SpecSeal Wrap Strip: For single openings in common construction for plastic piping up to 8" diameter and fiberglass insulated steel iron and copper piping.

Type 5: SpecSeal Mortar: For multiple openings in concrete and masonry construction, used in conjunction with SpecSeal Wrap Strips, for plastic piping up to 8" diameter and fiberglass insulated steel iron and copper piping.

Type 6: SpecSeal Collars: Flexible, pre-molded, factory fabricated collars for use with single openings of plastic or other combustible piping. May be used in conjunction with SpecSeal Mortar for multiple penetrations through concrete and masonry construction.

Type 7: SpecSeal Pillows: For use in medium to large size openings in masonry walls and floors and gypsum board walls.

Type 8: Pensil 200 Foam: For use in medium to large openings through concrete or masonry walls or floors. For use with multiple non-combustible steel or iron piping, jacketed cables, cable trays and blank openings.

C. In order to receive approval, submit detailed description and verify the correct application of materials for each distinct condition from the manufacturer seeking approval.

D. Approved: Hilti Firestop Systems

PART 3 EXECUTION

3.01 INSPECTION OF SURFACES & CONDITIONS

A. General

1. Examine all penetrations to be firestopped.

2. Conform to system manufacturer's printed instructions.

3.02 PREPARATION

A. Preparation of Surfaces

1. Clean contact surfaces of dust, dirt, grease and other materials which may effect bond of firestopping materials.

3.03 INSTALLATION

A. Application of Firestopping

1. Apply firestopping at all penetrations through fire-rated wall and floor assemblies in accordance with applicable U.L. Fire Resistance Directory requirements and manufacturer's printed instructions for all materials required in each case. Contractor to verify application requirements.

2. Install firestop material in sufficient depth to achieve required fire endurance rating, filling all holes or voids made by penetrations.

3. All combustible penetrants (i.e., non-metallic pipes or insulated metallic pipes) shall be firestopped using products and systems tested in a configuration representative of the field condition.

4. Coordinate with plumbing, mechanical, electrical and other trades to assure that all pipe, conduit, cable, and other items which penetrate fire-rated construction have been permanently installed prior to installation of firestops. Schedule and sequence the work to assure that partitions and other construction which would conceal penetrations are not erected prior to the installation of firestops. The subcontractor responsible for penetrations through fire-rated assemblies shall also be responsible for providing firestopping, or shall make arrangements with the General Contractor for providing the firestopping.

5. Provide miscellaneous materials and construction to hold firestopping pillows, collars, mortar, and foam in place.

B. Cleaning Up

1. Remove all residue and excess items resulting from work in this Section.

3.04 FIELD QUALITY CONTROL

A. General

1. Firestopping work shall remain accessible until inspected and approved by the authority having jurisdiction.

2. Patching penetrations in fire-rated gypsum board walls with taping compound is not acceptable and, if done, will be rejected whenever discovered.

3. Patching penetrations in fire-rated concrete walls or floors or masonry walls with mortar, grout, or non-rated cementitious materials is not acceptable, and if done, will be rejected whenever discovered.

END OF SECTION

SECTION 079000 - JOINT SEALERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sealants and joint backing.

1.2 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

2 PART 2 PRODUCTS

2.1 SEALANTS

A. Exterior Window and Joint Sealant:

1. Vertical joints: Sonneborn NP-1 or Sashco “Big Stretch”.

2. Horizontal joints: Sonneborn SL-1 or Sashco “Big Stretch”.

3. Standard colors matching finished surfaces.

B. Interior Glazing Sealant: one-part mildew resistant silicone sealant; DOW

1. Standard colors matching finished surfaces.

C. interior Building Sealants (Painted surfaces)

1. One-part Acrylic Latex with Silicone (paintable) sealant:

a. Dap – 35-year warranty.

D. Approved Manufacturers:

1. Tremco, Cleveland, OH www.tremcosealants.com .

E. joint treatment at polished concrete floor system
1. Green Umbrella Polylock

2. Hi Tech PE 85

2.2 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant; D1667, closed cell polyethylene or polyurethane; oversized 30 to 50 percent larger than joint width, no gassing.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

3

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that substrate surfaces and joint openings are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

C. Remove loose materials and foreign matter which might impair adhesion of sealant.

D. Clean and prime joints in accordance with manufacturer's instructions.

E. Perform preparation in accordance with manufacturer's instructions and ASTM C1193. Provide architect with manufacturer’s instructions for joint preparation and installation instructions.

3.2 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions. Provide a copy for the Architect before application.

B. Perform installation in accordance with ASTM C1193.

C. Clean off excess sealants or smears adjacent to joints without damaging adjacent surface or finishes.

D. Clean joint to eliminate all detrimental substances.

E. Install joint filler and backing without gaps between ends. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

G. Tool joints concave.

END OF SECTION

SECTION 083463 - DETENTION DOORS AND FRAMES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Swinging detention doors.
2. Sliding detention doors
3. Detention panels.
4. Detention frames.

B. Related Requirements:
1. Section 087163 "Detention Door Hardware" for door hardware for detention doors.

1.3 DEFINITIONS

A. Minimum-Thickness Steel: Indicated as the specified minimum thicknesses for base metal without coatings, according to NAAMM-HMMA 803.

B. Nominal-Thickness Stainless Steel: Indicated as the specified thicknesses for which over- and under-thickness tolerances apply, according to ASTM A480/A480M.

1.4 COORDINATION

A. Coordinate installation of anchorages for detention frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors that are to be embedded in adjacent construction. Deliver such items to Project site in time for installation.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, core descriptions, label compliance, fire-resistance rating, and finishes for each detention door and frame type specified.

B. Shop Drawings: In addition to requirements below, provide a schedule using same reference numbers for details and openings as those on Drawings:
1. Elevations of each door type.
2. Direction of swing.
3. Inmate and non-inmate sides.
4. Details of doors, including vertical and horizontal edge details, and metal thicknesses.
5. Details of frames, including dimensioned profiles, and metal thicknesses.

6. Locations of reinforcement and preparations for hardware.
7. Details of each different wall opening condition.
8. Details of anchorages, joints, field splices, and connections.
9. Details of food-pass openings.
10. Details of moldings, removable stops, and glazing.
11. Details of conduits, junction boxes, and preparations for electrically operated door hardware.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Anchor inspection reports, documenting inspections of built-in and cast-in anchors.

C. Field quality-control reports, documenting inspections of installed products.
1. Field quality-control certification, signed by Contractor and Detention Specialist.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Security Fasteners: Furnish not less than one box for every 50 boxes or fraction thereof, of each type and size of security fastener installed.
2. Tools: Provide two sets of tools for installing and removing security fasteners.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver detention hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Deliver detention frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store detention hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6.3-mm) space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ceco Door Products; an ASSA ABLOY
2. Custom Products Division; Chief Industries, Inc
3.. Habersham Metal Products Co
4. Sweeper Metal Fabricators Corp.
5. Trussbilt; an ASSA ABLOY group company

B. Source Limitations: Obtain detention doors and frames from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
2. Oversize Fire-Rated Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing and inspecting agency acceptable to authorities having jurisdiction for fire protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 DETENTION DOOR AND FRAME ASSEMBLIES

A. Detention Door and Frame Assemblies: Provide detention door and frame assemblies that comply with the following, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project:

1. Security Grade: Assemblies pass testing requirements in ASTM F1450 for security grades specified.
2. Tool-Attack Resistance: Small-tool-attack-resistance rated when tested according to UL 437 and UL 1034.

B. Detention Frames: Provide sidelight and borrowed-light detention frames that comply with ASTM F1592 and removable stop test according to NAAMM-HMMA 863, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project.

2.4 DETENTION DOORS

A. General: Provide flush-design detention doors of seamless hollow construction, 2 inches (51 mm) thick unless otherwise indicated. Construct detention doors with smooth, flush surfaces without visible joints or seams on exposed faces or stile edges.
   1. For single-acting swinging detention doors, bevel both vertical edges 1/8 inch in 2 inches (3 mm in 51 mm).
   2. For sliding detention doors, square both vertical edges.

B. Core Construction: Provide the following core construction of same material as detention door face sheets, welded to both detention door faces:
   1. Steel-Stiffened Core: 0.042-inch- (1.0-mm-) thick, steel vertical stiffeners extending full door height, with vertical webs spaced not more than 4 inches (102 mm) apart, spot welded to face sheets a maximum of 3 inches (76 mm) o.c. Fill spaces between stiffeners with insulation.
   2. Truss-Stiffened Core: 0.013-inch- (0.3-mm-) thick, steel, truncated triangular stiffeners extending between face sheets and for full height and width of door; with stiffeners welded to face sheets not more than 3 inches (76 mm) o.c. vertically and 2-3/4 inches (70 mm) horizontally. Fill spaces between stiffeners with insulation.

C. Vertical Edge Channels: 0.123-inch- (3.1-mm-) thick, continuous channel of same material as detention door face sheets, extending full-door height at each vertical edge; welded to top and bottom channels to create a fully welded perimeter channel. Noncontiguous channel is permitted to accommodate lock-edge hardware only if lock reinforcement is welded to and made integral with channel.

D. Top and Bottom Channels: 0.123-inch- (3.1-mm-) thick metal channel of same material as detention door face sheets, spot welded, not more than 4 inches (102 mm) o.c., to face sheets.
   1. Reinforce top edge of detention door with 0.053-inch- (1.3-mm-) thick closing channel, welded so channel web is flush with top door edges.

E. Hardware Reinforcement: Fabricate reinforcing plates from same material as detention door face sheets to comply with the following minimum thicknesses:
   1. Full-Mortise Hinges and Pivots: 0.187 inch (4.7 mm) thick.
   2. Maximum-Security Surface Hinges: 0.250 inch (6.3 mm) thick.
   3. Strike Reinforcements: 0.187 inch (4.7 mm) thick.
   4. Slide-Device Hanger Attachments: As recommended by device manufacturer.
   5. Lock Fronts, Concealed Holders, and Surface-Mounted Closers: 0.093 inch (2.3 mm) thick.
   6. All Other Surface-Mounted Hardware: 0.093 inch (2.3 mm) thick.
   7. Lock Pockets: 0.123 inch (3.1 mm) thick at non-inmate side, welded to face sheet.

F. Hardware Enclosures: Provide enclosures and junction boxes for electrically operated detention door hardware of same material as detention door face sheets, interconnected with UL-approved, 1/2-inch- (12.7-mm-) diameter conduit and connectors.

1. Access Plates: Where indicated for wiring installation, provide access plates to junction boxes, fabricated from same material and thickness as face sheet and fastened with at least four security fasteners spaced not more than 6 inches (152 mm) o.c.

G. Interior Detention Doors: Construct interior doors to comply with materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances indicated in NAAMM-HMMA 863 and as specified.
1. Security Grade 2: Provide doors with face sheets of 0.093-inch- (2.3-mm-) minimum thickness, cold-rolled steel.
2. Security Grade 3: Provide doors with face sheets of 0.067-inch- (1.7-mm-) minimum thickness, cold-rolled, steel.

2.5 DETENTION FRAMES

A. General: Provide fully welded detention frames with integral stops, of seamless construction without visible joints or seams. Fabricate detention frames with contact edges closed tight and corners mitered, reinforced, and continuously welded full depth and width of detention frame.

B. Stop Height: Provide minimum stop height of 0.625 inch (16 mm) for detention door openings and minimum stop height of 1-1/4 inches (32 mm) in security glazing or detention panel openings unless otherwise indicated.

C. Interior Detention Frames: Construct interior frames to comply with materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances indicated in NAAMMHMMA 863 and as specified.
1. Security Grade 2: Provide frames fabricated from 0.093-inch- (2.3-mm-) minimum thickness, cold-rolled steel.
2. Security Grade 3: Provide frames fabricated from 0.067-inch- (1.7-mm-) minimum thickness, cold-rolled steel.

D. Hardware Reinforcement: Fabricate reinforcing plates from same material as detention frame to comply with the following minimum thicknesses:
1. Hinges and Pivots: 0.187 inch (4.7 mm) thick by 1-1/2 inches (38 mm) wide by 10 inches (254 mm) long.
2. Strikes, Flush Bolts, and Closers: 0.187 inch (4.7 mm) thick.
3. Surface-Mounted Hardware: 0.093 inch (2.3 mm) thick.
4. Lock Pockets: 0.123 inch (3.1 mm) thick at non-inmate side, welded to face sheet. Provide 0.123-inch- (3.1-mm-) thick, lock protection plate for attachment to lock pocket with security fasteners.

E. Hardware Enclosures: Provide enclosures and junction boxes for electrically operated detention door hardware, interconnected with UL-approved, 1/2-inch- (12.7-mm-) diameter conduit and connectors.
1. Access Plates: Where indicated for wiring installation, provide access plates to junction boxes, fabricated from same material and thickness as face sheet and fastened with at least four security fasteners spaced not more than 6 inches (152 mm) o.c.

F. Mullions and Transom Bars: Provide closed or tubular mullions and transom bars where indicated. Fasten mullions and transom bars at crossings and to jambs by butt welding. Reinforce joints between detention frame members with concealed clip angles or sleeves of same metal and thickness as detention frame.

G. Jamb Anchors: Weld jamb anchors to detention frames near hinges and directly opposite on strike jamb or as required to secure detention frames to adjacent construction.
1. Number of Anchors: Provide two anchors per jamb plus the following:
a. Detention Door Frames: One additional anchor for each 18 inches (457 mm), or fraction thereof, above 54 inches (1372 mm) in height.
b. Detention Frames with Security Glazing or Detention Panels: One additional anchor for each 18 inches (457 mm), or fraction thereof, above 36 inches (914 mm) in height.
2. Masonry Anchors: Adjustable, perforated, strap-and-stirrup anchors to suit detention frame size; formed of same material and thickness as detention frame; with strap not less than 2 inches (51 mm) wide by 10 inches (254 mm) long.

H. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, formed of same material and thickness as detention frame, and as follows:
1. Monolithic Concrete Slabs: Clip anchors, with two holes to receive fasteners, welded to bottom of jambs and mullions with at least four spot welds per anchor.
2. Separate Topping Concrete Slabs: Adjustable anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment, welded to jambs and mullions with at least four spot welds per anchor. Terminate bottom of detention frames at finish floor surface.

I. Rubber Door Silencers: Except on weather-stripped detention doors, drill stops in strike jambs to receive three silencers on single-detention-door frames and drill head jamb stop to receive two silencers on double-detention-door frames. Keep holes clear during construction.

J. Grout Guards: Provide factory-installed grout guards of same material as detention frame, welded to detention frame at back of hardware cutouts, silencers, and glazing-stop screw preparations to close off interior of openings and prevent mortar or other materials from obstructing hardware operation or installation.

2.6 DETENTION PANELS

A. Provide fixed detention panels of same materials, construction, and finish as specified for adjoining detention door.

2.7 MOLDINGS AND STOPS

A. Provide fixed moldings on inmate side of glazed openings and removable stops on non-inmate side.
1. Height: As required to provide minimum 1-inch (25-mm) glass engagement, but not less than 1-1/4 inches (32 mm).

2. Fixed Moldings: Formed from same material as detention door and frame face sheets, but not less than 0.093-inch (2.3 mm) thick, and spot welded to face sheets a maximum of 5 inches (127 mm) o.c.
3. Removable Stops: Formed from 0.123-inch- (3.1-mm-) thick angle, of same material as detention door face sheets. Secure with button head security fasteners spaced uniformly not more than 6 inches (152 mm) o.c. and not more than 2 inches (51 mm) from each corner, and as necessary to satisfy performance requirements. Form corners with notched or mitered hairline joints.

B. Coordinate rabbet width between fixed and removable stops with glass or panel type and installation type indicated.

2.8 MATERIALS

A. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, CS (Commercial Steel), Type B; free of scale, pitting, or surface defects; pickled and oiled.

B. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, CS (Commercial Steel), Type B.

C. Metallic-Coated Steel Sheet: ASTM A653/A653M, CS (Commercial Steel), Type B; with G60 (Z180) zinc (galvanized) or A60 (ZF180) zinc-iron-alloy (galvannealed) coating designation.

D. Stainless-Steel Sheet: ASTM A240/A240M, austenitic stainless steel, Type 304.

E. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

F. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.

G. Masonry Anchors: Fabricated from same steel sheet as door face.

H. Embedded Anchors: Fabricated from mild steel shapes and plates, hot-dip galvanized according to ASTM A153/A153M.

I. Post-Installed Anchors: Torque-controlled expansion anchors.
1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.

J. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

K. Glazing: Comply with Section 088853 "Security Glazing."

L. Grout: Comply with ASTM C476, with a slump of not more than 4 inches (102 mm) as measured according to ASTM C143/C143M.

M. Insulation: Slag-wool-fiber/rock-wool-fiber or glass-fiber blanket insulation. ASTM C665, Type I (unfaced); with maximum flame-spread and smoke-developed indexes of 25 and 50,

respectively; passing ASTM E136 for combustion characteristics. Minimum 1.5-lb/cu. ft. (24-kg/cu. m) density.

N. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.9 FABRICATION

A. Fabricate detention doors and frames rigid, neat in appearance, and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Weld exposed joints continuously; grind, fill, dress, and make smooth, flush, and invisible. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate detention doors and frames to comply with manufacturing tolerances indicated in NAAMM-HMMA 863.

C. Removable Jamb Faces: Provide removable jamb faces where required for access to embedded anchors. Fabricate to allow secure reattachment of removable face with security fasteners.

D. Fabricate multiple-opening detention frames with mullions that have closed tubular shapes and with no visible seams or joints.

E. Exterior Detention Doors: Provide weep-hole openings in bottoms of detention doors to permit entrapped moisture to escape. Seal joints in top edges of detention doors against water penetration.

F. Hardware Preparation: Factory prepare detention doors and frames to receive mortised hardware, including cutouts, reinforcement, mortising, drilling, and tapping, according to final Door Hardware Schedule and templates provided by detention door hardware supplier.
   1. Reinforce detention doors and frames to receive surface-mounted door hardware. Drilling and tapping may be done at Project site.
   2. Locate door hardware according to NAAMM-HMMA 863.

G. Factory cut openings in detention doors.

H. Weld components to comply with referenced AWS standard. Weld before finishing components to greatest extent possible. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

2.10 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM-NOMMA 500, "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish detention doors and frames after assembly.

2.11 METALLIC-COATED STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A780/A780M.

B. Factory Priming for Field-Painted Finish: Apply shop primer specified in "Shop Primer" Subparagraph below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mil (0.02 mm).

1. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, lead- and chromate free primer complying with SDI A250.10 acceptance criteria; recommended by primer manufacturer for zinc-coated steel; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

2.12 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.
2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Directional Satin Finish: No. 4.

2.13 SECURITY FASTENERS

A. Operable only by tools produced by fastener manufacturer or other licensed fabricator for use on specific fastener type. Provide drive-system type, head style, material, and protective coating as required for assembly, installation, and strength, and as follows:

1. Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to, the following:
   a. Acument Global Technologies North America
   b. Bryca Fastener
   c. Safety Socket LLC
   d. Tamperproof Screw Co
   e. Tamper-Pruf Screws
2. Drive-System Type: Pinned Torx-Plus or [Pinned Torx.
3. Fastener Strength: 120,000 psi (827 MPa).
4. Protective Coatings for Heat-Treated Alloy Steel:
   a. Zinc phosphate with oil, ASTM F1137, Grade I, or black oxide unless otherwise indicated.

2.14 SEALANTS

A. Epoxy Security Sealants: Manufacturer's standard, nonsag, tamper-resistant sealant for joints with no movement.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to, the following:
      a. BASF Construction Chemicals LLC, Building Systems; Epolith-G
      b. Eucli Company (The) an RPM Company; Euco Model No 452-P
      c. Pecora Corporation; Dnyapoxy EP-1200

   2. Security Sealant shall have a VOC content of 250 g/l or less when calculated according to 40 CFR 59, subpart D (EPA Method 24)

2.15 ACCESSORIES

A. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.

B. Embedded Plate Anchors: Fabricated from mild steel shapes and plates, minimum 3/16-inch (4.8 mm) thick; with minimum 1/2-inch- (12.7-mm-) diameter, headed studs welded to back of plate.

C. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

D. Pass-Through Openings: Fabricate flush openings using 0.093-inch- (2.3-mm-) thick, interior channels of same material as detention door faces, inverted to be flush with openings, welded to inside of both face sheets and with corners fully welded. Mount shutters on non-inmate side of detention doors. Reinforce for locks and food-pass hinges.
   1. Inset Shutters: Fabricate from two steel plates, 0.123 inch (3.1 mm) thick, of same material as detention door face sheets, spot welded together and sized to inset inside opening and to prevent inmate tampering of lock and hinges.
   2. Overlapping Shutters: For surface application on non-inmate side of door. Fabricate from a single steel plate, of same material as detention door face sheets, 0.187 inch (4.7 mm) thick, sized to overlap food-pass openings by 1/2 inch (12.7 mm).

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations of detention frame connections before detention frame installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Inspect embedded plate installations before installing detention frames to verify that plate installations comply with requirements. Prepare inspection reports.
   1. Remove and replace plates where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
   2. Perform additional inspections to determine compliance of replaced or additional work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory.

B. Before installation and with shipping spreaders removed, adjust detention frames for squareness, alignment, twist, and plumbness to the following tolerances:
   1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb and perpendicular to frame head.
   2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of face.
   3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of door rabbet.
   4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.

3.3 INSTALLATION

A. General: Install detention doors and frames plumb, rigid, properly aligned, and securely fastened in place, complying with Drawings, schedules, and manufacturer's written instructions.

B. Anchorage: Set detention frame anchorage devices according to details on Shop Drawings and according to anchorage device manufacturer's written instructions.
   1. Masonry Anchors: Coordinate frame installation to allow for solidly filling space between frames and masonry with grout.
   2. Embedded Anchors: Install embedded plates in wall surrounding frame openings to match frame angle locations.
   3. Postinstalled Anchors: Drill holes in existing construction at locations to match bolt locations, and install bolt expansion shields or inserts.

C. Where detention frames are fabricated in sections due to shipping limitations, assemble frames and install angle splices at each corner, of same material and thickness as detention frame, and extend at least 4 inches (102 mm) on both sides of joint.
   1. Field splice only at approved locations. Weld, grind, and finish as required to conceal evidence of splicing on exposed faces.
   2. Continuously weld and finish smooth joints between faces of abutted, multiple-opening, detention frame members.
   3. Field Welding: Comply with the following requirements:
      a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

b. Obtain fusion without undercut or overlap.
c. Remove welding flux immediately.
d. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Apply bituminous coating to backs of frames before filling with grout.

E. Placing Detention Frames: Install detention frames of sizes and profiles indicated. Set detention frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
1. Embedded Anchors: Remove jamb faces from detention frames and set detention frames into opening. Weld steel connector angle to frame angle and to embedded plate with 1- inch- (25-mm-) long welds at each end of connector angle to form a rigid frame assembly that is solidly anchored. Reinstall jamb faces using security fasteners.
2. Postinstalled Anchors: Install bolt. After bolt is tightened, weld bolt head to provide nonremovable condition. Grind, dress, and finish smooth welded bolt head.
3. At fire-rated openings, install detention frames according to NFPA 80.
4. Install detention frames with removable stops located on non-inmate side of opening.

F. Grout: Fully grout detention frame jambs and heads. Completely fill space between frames and adjacent substrates. Hand trowel grout and take other precautions, including bracing detention frames, to ensure that frames are not deformed or damaged by grout forces.

G. Security Sealant: Apply epoxy security sealant at all exposed gaps between detention frames and adjacent substrates.

H. Swinging Detention Doors: Fit non-fire-rated detention doors accurately in their frames, with the following clearances:
1. Between Doors and Frames at Jambs and Head: 1/8 inch (3.2 mm).
2. Between Edges of Pairs of Doors: 1/8 inch (3.2 mm).
3. At Door Sills with Threshold: 3/8 inch (9.5 mm).
4. At Door Sills without Threshold: 3/4 inch (19 mm).
5. Between Door Bottom and Nominal Surface of Floor Covering: 1/2 inch (12.7 mm).

I. Sliding Detention Doors: Fit sliding detention doors in their frames according to manufacturer's written instructions and as required to allow doors to slide without binding.

J. Fire-Rated Detention Doors: Install with clearances as specified in NFPA 80.

K. Smoke-Control Detention Doors: Install according to NFPA 105.

L. Installation Tolerances: Comply with installation tolerances indicated in NAAMM-HMMA 863.

M. Glazing: Comply with installation requirements in Section 088853 "Security Glazing" unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.

B. Detention work will be considered defective if it does not pass tests and inspections.

C. Perform additional inspections to determine compliance of replaced or additional work.

D. Prepare field quality-control certification endorsed by Detention Specialist that states installed products comply with requirements in the Contract Documents.

E. For verification that construction complies with requirements, select one detention door at random from detention doors delivered to Project and have it cut in half or otherwise taken apart.
   1. Test Method: Verify weld strength by prying or chiseling door apart at edge seams, end channels, or stiffeners. Not more than 5 percent of welds may fail test.
      a. If tested door fails, replace, or rework all detention doors to bring them into compliance at Contractor's expense.
      b. If tested door passes, replace tested door at Contractor's expense.

F. Prepare test and inspection reports.

3.5 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including detention doors and frames that are warped, bowed, or otherwise unacceptable.

B. Clean grout and other bonding material off detention doors and frames immediately after installation.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

D. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
   1. After finishing smooth field welds, apply air-drying primer.

END OF SECTION

SECTION 083600
SECTIONAL OVERHEAD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Insulated Sectional Overhead Doors.

B. Electric Operators and Controls.

C. Operating Hardware, tracks, and support.

1.2 RELATED SECTIONS

A. Section - Cast-In-Place Concrete.

B. Section – Concrete Unit Masonry.

C. Section - Metal Fabrications.

D. Section – Wood Framing.

E. Section - Joint Sealants.

F. Section - Door Hardware.

G. Section - Paints and Coatings.

H. Section - Parking Control Equipment.

I. Section - Raceway and Boxes.

J. Section - Common Work Results for Electrical.

1.3 REFERENCES

A. ANSI/DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

A. Wiring Connections: Requirements for electrical characteristics.
   1. 115 volts, single phase, 60 Hz.

B. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

1.5 SUBMITTALS

A. Submit under provisions of Section 010010.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Indicate plans and elevations including opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

E. Operation and Maintenance Data.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Authorized representative of the manufacturer with minimum five years documented experience.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened labeled packaging until ready for installation.

B. Protect materials from exposure to moisture until ready for installation.

C. Store materials in a dry, ventilated weathertight location.

1.8 PROJECT CONDITIONS

A. Pre-Installation Conference: Convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

1.9 WARRANTY

A. Warranty: Manufacturer's limited door warranty for 10 year against delamination of polyurethane foam from steel face and all other components for 1 year.
B. Warranty: Manufacturer's limited door and operators System warranty for 10 year against delamination of polyurethane foam from steel face and all other components for 5 years or 50,000 cycles, whichever comes first.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Overhead Door Corporation, 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: info@overheaddoor.com.

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 010010.

2.2 INSULATED SECTIONAL OVERHEAD DOORS

A. Insulated Steel Sectional Overhead Doors: Model 596 Thermacore Insulated Steel Doors by Overhead Door Corporation. Units shall have the following characteristics:
1. Door Assembly: Metal/foam/metal sandwich panel construction, with PVC thermal break and weather-tight ship-lap design meeting joints.
a. Panel Thickness: 2 inches (51 mm).
b. Exterior Surface: Flush, textured.
c. Exterior Steel: 20 gauge, galvanized.
d. End Stiles: 16 gauge with thermal break.

e. Spring Counterbalance: Sized to weight of the door, with a helically wound, oil tempered torsion spring mounted on a steel shaft; cable drum of diecast aluminum with high strength galvanized aircraft cable. Sized with a minimum 7 to 1 safety factor.
   1) High cycle spring: 50,000 cycles.
f. Insulation: CFC-free and HCFC-free polyurethane, fully encapsulated.
g. Thermal Values: Tested installed assembly U-factor of 0.10 Btu/hr/SF degrees F; calculated section R-value of 17.40.
h. Air Infiltration: 0.08 cfm at 15 mph; 0.08 cfm at 25 mph.
i. Sound Transmission: Class 26.
j. High-Usage Package: Provide with optional high-usage package.

2. Finish and Color:
   a. Two coat baked-on polyester:
      1) Interior color, white.
      2) Exterior color, gray.
3. Wind Load Design: Design as calculated in accordance with applicable code.
4. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.
5. Lock:

   a. Interior mounted slide lock with interlock switch for automatic operator.

6. Weatherstripping:
   a. EPDM bulb-type strip at bottom section.
   b. Flexible Jamb seals.
   c. Flexible Header seal.
7. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.
   a. Size:
      1) 3 inch (76 mm).
   b. Type:
      1) Standard lift.

8. Electric Motor Operation: Provide UL listed electric operator, size and type as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second. Operator shall meet UL325/2010 requirements for continuous monitoring of safety devices.
   a. Entrapment Protection: Required for momentary contact, includes radio control operation.
      1) Photoelectric sensors monitored to meet UL 325/2010.
   b. Operator Controls:
      1) RSX Operator with auxiliary input and output tied into control booth control panel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until openings have been properly prepared.

B. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

C. Verify electric power is available and of correct characteristics.

D. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean adjacent surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install overhead doors and track in accordance with approved shop drawings and the manufacturer's printed instructions.

B. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.

C. Anchor assembly to wall construction and building framing without distortion or stress.

D. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

E. Fit and align door assembly including hardware.

F. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

3.4 CLEANING AND ADJUSTING

A. Adjust door assembly to smooth operation and in full contact with weatherstripping.

B. Clean doors, frames, glass, and polycarbonate according to manufacturer's instructions.

C. Remove temporary labels and visible markings. Do not remove polycarbonate care and maintenance label required to maintain warranty.

3.5 PROTECTION

A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

B. Protect installed products until completion of project.

C. Touch-up, damaged coatings and finishes and repair minor damage before Substantial Completion.

END OF SECTION

SECTION 08 56 53 – SECURITY WINDOWS
Insulgard 44/250 Bullet Resistant Sash System

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Field glazed bullet resistant aluminum windows

B. Speak Around Window

1.2 ACTION SUBMITTALS

A. Refer to Section 010010 BASIC REQUIREMENTS.

B. Product Data: For each type of framing and glass including manufacturer recommended installation instructions.

C. Shop Drawings: Include plans, elevations, sections, details, attachment to other work and glazing details for field-glazed units

D. Samples: For each exposed finish.

1.3 INFORMATION SUBMITTALS

A. Product Test Reports: Indicating compliance with requirements

B. Warranty: Sample of finish warranty

1.4 CLOSEOUT SUBMITTALS

A. Refer to Section 010010 BASIC REQUIREMENTS

B. Maintenance data.

1.5 DELIVERY, STORAGE AND HANDLING

A. Protect “windows” and accessories in accordance with AAMA CW-10 "Care and Handling of Architectural Aluminum from Shop to Site" until Substantial Completion.

1.6 WARRANTY

A. Finish Warranty: Manufacturer's warranty against deterioration of factory finishes for the period of **10** years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Basis of Design: 44/250 Bullet Resistant Sash System by Insulgard Security Products; Phone 800.624.6315; website www.insulgard.com

1. Subject to compliance with requirements, manufacturers of products of equivalent design may be acceptable if approved in accordance with 010010 Basic Requirements.

B. Description

1. Factory fabricated framing constructed from either 6105-T5 or 6005-T5 extruded aluminum with tensile strength of

a. Ultimate: 38 ksi minimum
b. Yield: 36 ksi minimum

2. Dimensions:

a. Head, Jamb, and Sill Members: 1-1/2 inches by 2-1/2 inches.
b. Mullion Members: 3 inches by 2-1/2 inches.

3. Components:

a. One piece head and sill extrusions with integral weep at sill
b. Two piece jamb extrusions with removable faces to allow for reglazing
c. Three piece mullion extrusions for glazing and lite replacement

C. SPEAK AROUND WINDOW (Client / Attorney)

1. Bullet resistant window with natural speak around frame spacing.

a. Quikserv's speak around window 30" W x 36" H
b. Dark bronze anodized frame finish
c. Level 2 bullet resistant glazing
d. Heavy duty construction
e. Stainless steel shelf base extending to the interior / exterior of the window with bullet resistant deal tray.

2.2 PERFORMANCE CRITERIA

A. Ballistic Resistant:

1. Level 1 in accordance with UL 752 – Testing for Ballistic Resistance for the complete assembly including framing, glazing and panels.

2.3 FABRICATION

A. Tolerances: All joints and connections shall be tight, providing hairline joints and true alignment of adjacent members

2.4 FRAMING FINISH

A. Factory-applied finish:

1. PVDF-Based Coating: Fluoropolymer finish containing minimum 70 percent PVDF resins, in accordance with AAMA 2605 “Voluntary Specification, Performance Requirements and Test Procedures for Superior Performance Organic Coatings on Aluminum Extrusions and Panels”

a. Coats: three coat system,
b. Color: from manufacturer's full color range

2.5 GLAZING

A. SURE-GARD GLASS-CLAD POLYCARBONATE ICGCP2416

B. WMFL 60 MIN FORCED ENTRY; ASTM F 1915 GRADE 1

C. Glazing gaskets:

1. Interior: Closed cell neoprene (40-50 Shore “A” Durometer)
2. Exterior: Solid neoprene (65-75 Shore “A” Durometer)

2.6 ACCESSORIES

A. Anchors: Fully concealed manufacturer recommended.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify field dimensions of opening prior to fabrication of framing.

B. Coordinate structural requirements to ensure proper attachment and support.

3.2 INSTALLATION

A. Install framing in accordance with manufacturer's recommendations and approved shop drawings.

B. Provide required support and securely fasten and set windows plumb, square, and level without twist or bow.

C. Apply sealant in accordance with window and sealant manufacturer's recommendations as indicated in installation instructions. Wipe off excess, and leave exposed sealant surfaces clean and smooth

3.3 PROTECTION

A. Clean and protect windows from damage during construction operations. If damage occurs, remove and replace as required to provide windows in their original, undamaged condition.

END OF SECTION

SECTION 088853 - SECURITY GLAZING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes glass-clad polycarbonate laminated glass and polycarbonate for the following applications:
   1. Windows
   2. Doors
   3. Window & Door Security Glass Laminate

1.3 DEFINITIONS

A. Glazing Manufacturers: Firms that produce primary glass, monolithic plastic glazing, or fabricated security glazing, as defined in referenced glazing publications.

B. Interspace: Space between lites of air-gap security glazing or insulating security glazing.

1.4 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on security glazing, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Review temporary protection requirements for security glazing during and after installation.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Security Glazing Samples: For each type of security glazing; 12 inches (300 mm) square.

C. Glazing Accessory Samples: For sealants and colored spacers, in 12-inch (300-mm) lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

D. Security Glazing Schedule: List security glazing types and thicknesses for each size opening and location. Use same designations indicated on Drawings. Indicate coordinated dimensions of security glazing and construction that receives security glazing, including clearances and glazing channel dimensions.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glazing installers for this Project who are certified under the National Glass Association Glazier Certification Program.

B. Security Glazing Testing Agency Qualifications: Subject to compliance with requirements, testing agency is one of the following:
   1. H. P. White Laboratory, Inc.
   2. Underwriters Laboratories, Inc.
   3. Wiss, Janney, Elstner Associates, Inc.
   4. Insert testing agency name.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect security glazing and glazing materials according to manufacturer's written instructions. Prevent damage from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating security glazing and with air-gap security glazing manufacturers' written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
   1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

1.10 WARRANTY

A. Manufacturer's Special Warranty for Glass-Clad Polycarbonate: Manufacturer agrees to replace glass-clad polycarbonate that deteriorates within specified warranty period. Deterioration of glass-clad polycarbonate is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning glass-clad polycarbonate contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glazing, blemishes exceeding those allowed by referenced glass-clad polycarbonate standard, yellowing, and loss of light transmission.
   1. Warranty Period: Five years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Laminated Glass and Polycarbonate: Manufacturer agrees to replace laminated glass and polycarbonate that deteriorates within specified warranty period. Deterioration of laminated glass and polycarbonate is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass and polycarbonate contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glazing,

blemishes exceeding those allowed by referenced glass-clad polycarbonate standard, yellowing, and loss of light transmission.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Security Glazing: Obtain security glazing from single source from single manufacturer using the same types of lites, plies, interlayers, and spacers for each security glazing type indicated.

B. Source Limitations for Glazing Sealants and Gaskets: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

A. General:

1. Installed security glazing shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing; or other defects in construction.
2. Installed security glazing shall withstand security-related loads and forces without damage to the glazing beyond that allowed by referenced standards.

B. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

2.3 SECURITY GLAZING, GENERAL

A. Glazing Publications: Comply with published recommendations of security glazing and glazing material manufacturers and organizations below unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Plastic Glazing Labeling: Identify plastic sheets with appropriate markings of applicable testing and inspecting agency, indicating compliance with required fire-test-response characteristics.

C. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glazing, glass thickness, and safety glazing standard with which glazing complies.

D. Insulating Glazing Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the Insulating Glass Certification Council.

E. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

F. Fire-Test-Response Characteristics of Polycarbonate Sheets: As determined by testing polycarbonate sheets identical to those used in security glazing products by a qualified testing agency acceptable to authorities having jurisdiction.
   1. Self-ignition temperature of 650 deg F (343 deg C) or more when tested according to ASTM D1929 on plastic sheets in thicknesses indicated for the Work.
   2. Smoke-Developed Index of 450 or less when tested according to ASTM E84, or smoke density of 75 or less when tested according to ASTM D2843 on plastic sheets in thicknesses indicated for the Work.
   3. Burning extent of 1 inch (25 mm) or less when tested according to ASTM D635 at a nominal thickness of 0.060 inch (1.52 mm) or thickness indicated for the Work.

G. Thermal and Optical Performance Properties: Provide security glazing with performance properties specified, as indicated in manufacturer's published test data, based on construction products indicated and on procedures indicated below:
   1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
   2. Solar-Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
   3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.4 GLASS PRODUCTS

A. Float Glass: ASTM C1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Heat-Treated Float Glass: ASTM C1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
   1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
   2. For heat-strengthened float glass, comply with requirements for Kind HS.
   3. For fully tempered float glass, comply with requirements for Kind FT.
   4. For uncoated glass, comply with requirements for Condition A.
   5. For coated vision glass, comply with requirements for Condition C (other coated glass).

C. Reflective-Coated Vision Glass: ASTM C1376, Kind CV (coated vision glass), coated by pyrolytic process or vacuum deposition (sputter-coating) process, and complying with other requirements specified.

2.5 LAMINATED GLASS

A. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
2. Interlayer Color: Clear unless otherwise indicated.

2.6 POLYCARBONATE SECURITY GLAZING

A. Polycarbonate Sheet: ASTM C1349, Appendix X1, Type II, coated, mar-resistant, UV-stabilized polycarbonate with coating on exposed surfaces and Type I, standard, UV-stabilized polycarbonate where no surfaces are exposed.

B. Laminated Polycarbonate: Polycarbonate sheets laminated with clear urethane interlayer that complies with ASTM C1349, Appendix X2, and has a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation. Provide laminated units that comply with requirements of ASTM C1349 for maximum allowable laminating process blemishes and haze.

C. Glass-Clad Polycarbonate: ASTM C1349.

D. Laminated Glass and Polycarbonate: ASTM C1349.

2.7 GLAZING SEALANTS

A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they contact, including security glazing, seals of insulating security glazing and air-gap security glazing, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and security glazing manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Field applied sealants shall have a VOC content of 250 g/L or lessColors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

2.8 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and security glazing manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:

1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.

2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of security glazing and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by security glazing manufacturer to maintain security glazing lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit security glazing lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.10 FABRICATION OF SECURITY GLAZING

A. Fabricate security glazing in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Grind smooth and polish exposed security glazing edges and corners.

2.11 WINDOW & DOOR SECURITY GLASS LAMINATE

A. Provide Riot Resistant Plus laminate window film as manufactured by Safe Haven Defense LLC.
Contact: Chuck Paolini
Phone: 505-301-1613

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine framing for security glazing, with Installer present, for compliance with the following:
1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.

4. Minimum required bite.
5. Effective sealing between joints of framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving security glazing immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of security glazing, sealants, gaskets, and other glazing materials unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect edges of security glazing from damage during handling and installation. Remove damaged security glazing from Project site and legally dispose of off Project site. Damaged ecurity glazing includes units with edge or face damage or other imperfections that, when installed, could weaken security glazing and impair performance and appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications unless otherwise required by glazing unit manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by security glazing manufacturers for installing lites.

F. Provide spacers for security glazing lites where the length plus width is larger than 50 inches (1270 mm).
1. Locate spacers directly opposite each other on both inside and outside faces of security glazing. Install correct size and spacing to preserve required face clearances unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with performance requirements.
2. Provide 1/8-inch (3-mm) minimum bite of spacers on glazing lites and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent security glazing from moving sideways in glazing channel, as recommended in writing by security glazing manufacturer and according to requirements in referenced glazing publications.

H. Set security glazing in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set coated security glazing with proper orientation so that coatings and films face exterior or interior as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by security glazing, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center security glazing in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect security glazing from contact with contaminating substances resulting from construction operations, including weld splatter. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do come into contact with security glazing, remove substances immediately as recommended in writing by security

glazing manufacturer. Remove and replace security glazing that cannot be cleaned without damage.

C. Wash security glazing on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash security glazing as recommended in writing by security glazing manufacturer.

3.6 GLASS-CLAD POLYCARBONATE SECURITY GLAZING SCHEDULE

A. Security Glazing Type SG-1: Clear symmetrical glass-clad polycarbonate.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. <**Global Security Glazing 9/16 inch Secur-Tem-Poly**

2. Detention Security Grade: Grade 4 according to ASTM F1915.
3. Maximum Overall Unit Thickness: 9/16 inch
4. Outer Ply: 1/8 inch heat-strengthened float glass.
5. Single Core: 0.236-inch (5.99-mm) polycarbonate.
6. Interlayer Material: Polyurethane.
7. Interlayer Thickness: 0.050 inch (0.127 mm).

B. Security Glazing Type SG-2: Clear reflective coated symmetrical glass-clad polycarbonate.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. <**Global Security Glazing 13/16 inch Secur-Tem-Poly**

2. Detention Security Grade: Grade 3 according to ASTM F1915.
3. Maximum Overall Unit Thickness: 9/16 inch
4. Outer Ply: 1/8 inch heat-strengthened float glass. 1/4 inch mirropane (#1 Surface)
5. Single Core: 0.236-inch (5.99-mm) polycarbonate.
6. Interlayer Material: Polyurethane.
7. Interlayer Thickness: 0.050 inch (0.127 mm).

END OF SECTION

SECTION 092900-GYPSUM BOARD ASSEMBLIES

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Interior gypsum wallboard.

B. Tile Backer Board for application at wall tile and FRP.

C. Provide Type X Glass Mat gypsum substrate

D. Cementitious Backer Board (CBB)

E. Refer to drawings for proprietary gypsum board.

1.2 SUBMITTALS

A. Product Data for each type of product indicated.

1.3 FIRE TEST RESPONSE CHARACTERISTICS

A. For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.4 SOUND TRANSMISSION CHARACTERISTICS

A. For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

1.5 QUALITY ASSURANCE

A. Fire-resistance ratings: Where fire-resistance ratings are indicated, provide materials/assemblies complying with ASTM E 119 and as required by local authorities.

B. Comply with recommendations of Gypsum Association GA-216.

C. Comply with ASTM 1396, “Specification for Gypsum Board”.

1.6 FIELD CONDITIONS

A. Temperature shall be 50 deg F and 95 deg F maximum day and night during entire joint operation and until execution of certificate of Substantial Completion. Provide ventilation to eliminate excessive moisture. Avoid hot air drafts that will cause rapid drying.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Gypsum Board Products; Georgia-Pacific Corp., Gold Bond Building Products, United States Gypsum.

1. Or approved by Architect

2.2 PANEL PRODUCTS, GENERAL: provide sizes in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

A. Gypsum Wallboard: ASTM C36.

1. Type X: Fire-resistance-rated.

2. Thickness: 5/8” minimum.

3. Edges: Tapered

B. Tile Backer Board unit (TBB): Silicone Based Tile Backer Board installed behind ceramic wall tile and FRP as manufactured by “Denshield” by Georgia Pacific or approved.

1. Thickness: 5/8” minimum.

2.. Edges: Tapered

C. Cementitious Backer Board: “Hardi Backer” by James Hardie installed behind all bath / shower walls.

1. Thickness: 1/2”

2.3 INTERIOR TRIM: ASTM C1047

A. Cornerbead: Use at outside corners.

B. LC-Bead (J-Bead): Use at exposed panel edges.

C. L-Bead: Use where indicated or where needed to finish gypsum board edges.

D. U-Bead: Use where indicated:

E. Expansion (Control) Joint: One-piece control joint, formed with v-shaped slot and removable strip covering slot opening.

2.4 JOINT TREATMENT MATERIALS, GENERAL: Comply with ASTM C 475

A. Joint Tape:

1. Interior Gypsum Wallboard: Paper.

B. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Joint Compound: Vinyl-type powder or ready-mixed for interior use.

a) Grade: Single multi-purpose grade for entire application.

2. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.

3. Embedded and First Coat: For embedded tape and first coat on joints, flanges of trim accessories, and fasteners, use setting-taping compound.

a) Use setting-type compound for installing paper-faced metal trim accessories

4. Fill Coat: For second coat, use setting-type, sandable topping compound.

5. Finish Coat: For third coat, use setting-type, sandable topping compound.

6. Skim Coat: For final coat of Level 4 finish, use drying-type, all-purpose compound.

C. Joint Compound for Exterior Applications:

1. Exterior Gypsum Soffit Board: Use USG Sheetrock setting-type (Durabond) taping, Durabond LC, Sheetrock Lightweight (easy-sand) or approved equal and setting-type, sandable topping compounds as occurs; see architectural drawings.

D. Joint Compound for Tile Backing Panels:

1. Water-Resistant Gypsum Backing Board: Use special water-resistant setting-type taping and setting-type, sandable topping compounds.

2.5 ACOUSTICAL SEALANT FOR EXPOSED AND CONCEALED JOINTS

A. Nonsag, paintable, nonstaining, latex sealant complying with ASTM XC 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

2.6 ACOUSTICAL SEALANT FOR CONCEALED JOINTS:

A. Nondrying, nonhardening, non-skinning, non-staining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

2.7 AUXILIARY MATERIALS:

A. Provide auxiliary materials that comply with referenced installation standards and manufacturer’s written recommendations.

1. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

   a) Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

   b) Fastening gypsum board to wood members.

   c) Fastening gypsum board to gypsum board.

PART 3 – EXECUTION

3.1 POLYETHYLENE VAPOR RETARDER: Install to comply with requirements specified in Division 7 Section "Insulation."

3.2 GYPSUM BOARD APPLICATION: Comply with ASTM C 840 and GA-216.

A. Space screws a maximum of 12 inches (304.8mm) o.c. for vertical applications.

B. Space fasteners in panels that are tile substrates a maximum of 8 inches (203.2mm) o.c.

C. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated. Install ceiling boards across framing to minimize the number of end-butt joints and avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

   1. Install ceiling board on furring system specified as recommended by manufacturer of system.

D. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

E.

   1. Stagger abutting end joints not less than one framing member in alternate courses of board.

   2. At high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

F. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

G. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screw.

H. Laminate to Substrate: Comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

I. Provide Control Joints and expansion joints at locations of potential building movement, with space between edges of panels, prepared to receive trim accessories.

J. Cover both faces of partition framing with gypsum panels in concealed spaces (above ceiling, etc.), except in chase walls which are braced internally.

K. Tile Backer Board: Install with ¼ - inch (6.4-mm) gap where panels abut other construction or penetrations.

1. Use at all plumbing walls and all FRP locations

L. Multi-Layer Fastening: Apply base layers of gypsum panels and face layer to supports with screws.

3.3 INSTALLING TRIM ACCESSORIES:

A. For trim with black flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instruction.

3.4 FINISHING GYPSUM BOARD ASSEMBLIES:

A. Treat gypsum board joint, 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.

1. Prefill open joints and damaged surface areas

2. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape

3. **Gypsum Board Finish Levels:** Finish panels to levels indicated below, according to ASTM C 840. For locations indicated:

a) 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.

b) Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where panels are substrate for tile and where indicated.

c) Level 3: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at all gypsum board walls and ceilings to receive paint.

END OF SECTION

SECTION 09 50 00 SECURITY CEILINGS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Section Includes

Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section

1.2 SUMMARY

A. Section Includes

1. Acoustical metal ceiling panels
2. Exposed grid suspension system
3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings
4. Perimeter Trim

B. Alternates

1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products that have not been approved by Addenda, the specified products shall be provided without additional compensation.
2. Submittals that do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process

4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
7. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
8. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
9. ASTM E 580 Installation of Metal Suspension Systems in Areas Requiring Moderate Seismic Restraint
10. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems
11. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
12. ASTM E 1264 Classification for Acoustical Ceiling Products

B. International Building Code

C. ASHRAE Standard 62 1 2004 Ventilation for Acceptable Indoor Air Quality

D. NFPA 70 National Electrical Code

1.4 SYSTEM DESCRIPTION
Continuous/Wall-to-Wall

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.

B. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.

C. Shop Drawings: Layout and details of acoustical ceilings show locations of items that are to be coordinated with, or supported by the ceilings.

D. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.

E. If the material supplied by the acoustical subcontractor does not have an Underwriter's Laboratory classification of acoustical performance on every carton, subcontractor shall be required to send material from every production run appearing on the job to an independent or NVLAP approved laboratory for testing, at the architect's or owner's discretion. All products not conforming to manufacturer's current published values must be removed, disposed of and replaced with complying product at the expense of the Contractor performing the work.

1.6 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.

a. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 Classification.

C. Acoustic Panels: As with other architectural features located at the ceiling, may obstruct or skew the planned fire sprinkler water distribution pattern through possibly delay or accelerate the activation of the sprinkler or fire detection systems by channeling heat from a fire either toward or away from the device. Designers and installers are advised to consult a fire protection en gineer, NFPA 13, or their local codes for guidance where automatic fire detection and suppression systems are present.

D. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.9 PROJECT CONDITIONS

A. Space Enclosure:

Standard Ceilings: Do not install interior ceilings until space is enclosed and weatherproof; wet work in place is completed and nominally dry; work above ceilings is complete; and ambient conditions of

temperature and humidity are continuously maintained at values near those intended for final occupancy. Building areas to receive ceilings shall be free of construction dust and debris.

HumiGuard Plus Ceilings: Building areas to receive ceilings shall be free of construction dust and debris. Products with HumiGuard Plus performance and hot dipped galvanized steel, aluminum or stainless steel suspension systems can be installed up to 120°F (49°C) and in spaces before the building is enclosed, where HVAC systems are cycled or not operating. Cannot be used in exterior applications where standing water is present or where moisture will come in direct contact with the ceiling.

HumiGuard Max Ceilings: Building areas to receive ceilings shall be free of construction dust and debris. Ceilings with HumiGuard Max performance can be installed in conditions up to 120°F (49°C) and maximum humidity exposure including outdoor applications, and other standing water applications, so long as they are installed with either SS Prelude Plus, AL Prelude Plus, or Prelude Plus Fire Guard XL suspension systems. Products with Humiguard Max performance can be installed in exterior applications, where standing water is present, or where moisture will come in direct contact with the ceiling. Only Ceramaguard with AL Prelude Plus suspension system can be installed over swimming pools.

1.10 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:
   1. Acoustical Panels: Sagging and warping
   2. Grid System: Rusting and manufacturer's defects

B. Warranty Period:
   1. Acoustical Metal panels: One (1) year from date of substantial completion
   2. Grid: Ten (10) years from date of substantial completion

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.11 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
   1. Acoustical Metal Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
   2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Metal Ceiling Panels:
1. Armstrong World Industries, Inc.

B. Suspension Systems:
1. Armstrong World Industries, Inc.

C. Aluminum Custom Trims:
1. Armstrong World Industries, Inc.

2.2.1 ACOUSTICAL CEILING UNITS

A. Acoustical Panels Type AMP
1. Acoustical Panels **Type 1S**:
a. Surface Texture: Smooth
b. Composition: Metal
c. Color: White
d. Size: 24" x 24"
e. Edge Profile: Square Lay-In for interface with PRELUDE XL 15/16" Exposed Tee grid.
f. Perforation Option: Round - Diagonal
g. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton 0.80
h. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton 38
i. Sabin: N/A
j. Articulation Class (AC):
k. Flame Spread: ASTM E 1264; Class A (UL).
l. Light Reflectance (LR) White Panel: ASTM E 1477; 0.61.
m. Dimensional Stability: Standard
n. Recycle Content: Post-Consumer - 0% Pre-Consumer - 30%
q. Acceptable Product: METALWORKS SECURELOCK, 5488P4 No added formaldehyde as manufactured by Armstrong World Industries
2. Metal Panel Accessories:
1. 5396 - Hold Down Border Clips - 18 gauge
2. 5398 - Access Door - 18 gauge
3. 5598 - TEK Screws
4. 5650 - C Channel - 18 gauge

B. Acoustical Panels Type AMP
1. Acoustical Panels **Type 1**:
a. Surface Texture: Smooth
b. Composition: Metal

c. Color: White
d. Size: 24" x 24"
e. Edge Profile: Square Lay-In for interface with PRELUDE XL 15/16" Exposed Tee grid.
f. Perforation Option: Unperforated
g. Noise Reduction Coefficient (NRC):
h. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton 36
i. Sabin: N/A
j. Articulation Class (AC):
k. Flame Spread: ASTM E 1264; Class A (FM).
l. Light Reflectance (LR) White Panel: ASTM E 1477; 0.77.
m. Dimensional Stability: Standard
n. Recycle Content: Post-Consumer - 0% Pre-Consumer - 30%
q. Acceptable Product: METALWORKS SECURELOCK, 5488P1 No added formaldehyde as manufactured by Armstrong World Industries

2. Metal Panel Accessories:
   1. 5396 - Hold Down Border Clips - 18 gauge
   2. 5398 - Access Door - 18 gauge **(Provide 30, location to be verified with Electrical Subcontractor)**
   3. 5594 - Compression Strut
   4. 5596 - Security Screws

2.3.1 METAL SUSPENSION SYSTEMS

A. Components:

Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.

a. Structural Classification: ASTM C 635 Heavy Duty duty
b. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
c. Recycle Content: Post-Consumer - 23% Pre-Consumer - 7%
d. Sustainability: Environmetal Product Declaration (EPD), Health Product Declaration (HPD)
e. Acceptable Product: PRELUDE XL 15/16" Exposed Tee as manufactured by Armstrong World Industries

B. Attachment Devices:

Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

C. Wire for Hangers and Ties:

ASTM A 641, Class 1 zinc coating, soft annealed, with a yield stress load of at least time three design load, but not less than 12 gauge.

D. Edge Moldings and Trim:

7800 - 12' Wall Molding

E. Accessories: Provide all accessories as required for a complete and final installation.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations. (Exception: HumiGuard Max Ceilings)

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION

A. Follow manufacturer installation instructions

B. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.

C. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

D. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.

E. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

F. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.

B. Clean exposed surfaces of ceilings panels, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 095113-ACOUSTICAL PANEL CEILINGS

PART 1 – GENERAL

1.1 SUMMARY

A. Includes but Not Limited To:

1. Furnish and install acoustical ceiling panels for suspended acoustical ceilings as described in Contract Documents.

2. Provide materials and accessories for a complete system.

1.2 SUBMITTALS

A. Action Submittals:

1. Sample: Two sample panels.

B. Closeout Submittals:

1. Operations and Maintenance Data: Include following in Operations and Maintenance Manual.

a) Manufacturer's literature.

b) Color and pattern selection.

C. Maintenance Material Submittals:

1. Extra Stock Materials:

a) Provide Owner with one carton of each type of tile for future use.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store materials where protected from moisture and damage.

B. Use no soiled, scratched, or broken material in the Work.

1.4 FIELD CONDITIONS

A. Ambient Conditions: Building shall be enclosed, mechanical system operating with proper filters in place, and temperature and humidity conditions stabilized within limits under which Project will operate before, during, and after installation until Substantial Completion.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Firm with not less than 3 years of successful experience in installation of acoustical ceilings similar to requirements for this project and which is acceptable to manufacturer of acoustical units, as shown by current written statement from manufacturer.

B. Fire Performance Characteristics: Provide acoustical ceilings that are identical to those tested for the following fire performances characteristics, per ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting agency.

1. Surface Burning Characteristics: As follows, tested per ASTM E84 and complying with ASTM E 1264 for class A products.

a) Flame Spread: 25 or less.

b) Smoke Developed: 50 or less.

C. Single-Source Responsibility for Ceiling Units: Obtain each type of acoustical ceiling unit from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Standards for Acoustic Panel Units: Provide manufacturer’s standard units of configuration indicated that comply with ASTM E 1264 classifications as designated by reference to types, patterns, acoustical ratings, and light reflectance, unless otherwise indicated.

B. Acceptable Manufacturers.

1. Armstrong World Industries Co, Lancaster, PA www.armstrong.com.

2. Celotex, Tampa, FL www.bpb-na.com.

3. Eurostone by Chicago Metallic Corp, Chicago, IL www.chicago-metallic.com.

3. USG Inc, Chicago, IL www.usg.com.

2.2 ACOUSTICAL PANELS (Office)

A. Type, Form, and Finish: Provide Fiberglass Fine surface texture, NRC 0.90, Flame Spread – Class A (UL).
   a. Products: Design Standard.
      i. Armstorng World Industries, Inc. “OPTIMA Square Tegular 15/16 in”.
      ii. Provide for interface with PRELUDE ML 15/16” Exposed Tee Grid.
      iii. Size: 24 in x 48 in
      iv. Color: White

PART 3 – EXECUTION

3.1 EXAMINATION

A. Inspect for defects in support that are not acceptable. Report defects to Architect in writing. Do not install ceiling panels until defects in support are corrected.

3.2 INSTALLATION

A. Materials shall be dry and clean at time of application.

B. If recommended by Manufacturer, use tile one at a time from at least four open boxes to avoid creating any pattern due to slight variations from box to box. Use tile from same color run in individual rooms to assure color match.

C. Leave tile in true plane with straight, even joints.

3.3 ADJUSTING

A. 'Touch-up' minor abraded surfaces.

B. Remove and replace discolored panels to match adjacent panels.

C. Remove and replace damaged panels at no additional cost to Owner.

3.4 CLEANING

A. Remove from site all debris connected with work of this Section.

END OF SECTION

SECTION 095323-METAL ACOUSTICAL SUSPENSION ASSEMBLIES

PART 1 – GENERAL

1.1 SUMMARY

A. Includes but Not Limited To:
1. Furnish and install acoustical suspension system and metal suspension systems as described in Contract Documents.

1.2 REFERENCES

A. Reference Standards:

1. ASTM International:

a) ASTM C 635-00, 'Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.'

b) ASTM C 636-06, 'Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.'

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Meet seismic bracing requirements of 2018 IBC and the Northwest wall and Ceiling Bureau Technical Report #401.

B. Provide perimeter wall clips in lieu of the 2” horizontal flange requirements (per Technical Report #401).

PART 2 – PRODUCTS

2.1 SYSTEM

A. Manufacturers:

1. Acceptable Manufacturers:

a) Armstrong World Industries, Lancaster, PA

b) Chicago Metallic Corporation, Chicago, IL

c) USG Inc, Chicago, IL

d) Or as approved by Architect before bidding.

B. Materials:

1. Grid:

a) Systems shall meet requirements of ASTM C 635, Intermediate Duty or Heavy-Duty suspension system.

b) Main runners and cross T's shall have one-inch exposed face.

2. Performance Standards:
   a. Tile-1: PRELUDE ML, 15/16", color "white" Exposed Tee Grid System.

3. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

   a. Zinc-Coated Carbon Steel Wire: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper.

   b. Size: Select wire diameter so that its stress at 3 times the hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than the yield stress of wire but provide not less than 0.106- inch-(2.69-mm-) diameter wire.

4. Extruded-Aluminum Edge Moldings and Trim: Where indicated provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's product designation, complying with the following requirements:

   a. Aluminum Alloy: Alloy and temper recommended by aluminum extrusions complying with ASTM B 221 (ASTM B 221M) for alloy and temper 6063-T5.

   b. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel according to paint manufacturer's specification for cleaning, conversion coating, and applying organic coating.

      1) Organic Coating: Manufacturer's standard thermosetting coating system with a minimum dry film thickness of 0.8 to 1.2 mil (0.0203 to 0.0305 mm).

      2) Color: Match color of finish on flanges of suspension system surfaces.

5. Hold-down Clips: As required by UL to prevent lifting of panels under unusual draft conditions.

2.2 METAL SUSPENSION SYSTEMS

A. Components:

1. Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction with exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.

a. Structural Classification: ASTM C 635 Heavy Duty

b. Color: As selected by Architect

c. Acceptable Product: Prelude XL 360 Painted as manufactured by Armstrong World Industries

PART 3 – EXECUTION

3.1 INSTALLATION

A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's instruction and CISCA "Ceiling Systems Handbook"

1. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.

2. Standard for Ceiling Suspension Systems: OSSC Chapters and Standards are made a part of these specifications.

3. Suspend main beam from overhead construction with Aircraft cable hanger wires spaced 4-0 on center along the length of the main runner. Install hanger wires plumb and straight.

B. Suspend ceiling hangers from building's structural members and as required by OSSC.

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of the supporting structure or of the ceiling suspension system.

a. Provide struts adequate to resist the vertical component induced by the bracing wires.

2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, contersplaying, or other equally effective means.

3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of 3 tight turns. Connect hangers either directly to structures or to inserts, eye screws, or other devices that are secure, that are appropriate for substrate, and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

5. Do not attach hangers to steel roof or deck. Attach hangers to structural members

6. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise shown; and provide hangers not more than 6 inches from ends of each member.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

2. Screw attach moldings to substrate at intervals not over 16-inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8-inche in 12 feet (3.18 mm in 3.66 m). Miter corners accurately and connect securely.

3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

1. Install system in fire rated areas to maintain proper fire rating.

E. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide neat, precise fit.

1. Arrange directionally patterned acoustical panels as follows:

a. Install panels with pattern running in one direction.

2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.

3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.

END OF SECTION

SECTION 096800 - MODULAR CARPET FLOORING

PART 1 GENERAL

1.01 THIS SECTION INCLUDES

A. Textile composite flooring modules as shown on the drawings and schedules and as indicated by the requirements of this section.

B. Resilient Base (RB)

1.02 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract (including General and Supplementary Conditions and Division 1 sections) apply to the work in this section only.

1.03 RELATED SECTIONS

A. Other Division 9 sections for floor finishes related to this section but not the work of this section.

B. Division 3 Concrete - not included work this section.

C. Division 6 Wood and Plastics - not included work this section.

D. Division 7 Thermal and Moisture Protection - not included work this section.

1.04 QUALITY ASSURANCE AND REGULATORY REQUIREMENTS

A. Qualifications of flooring installation contractor: All work shall be done by installation firms specializing in commercial flooring and carpet installation. It is required, that the firm or individual shall be a member of the Floor Covering Installation Contractors Association (FCICA) and/or certified by the Certified Floorcovering Installers Association (CFI). Flooring contractor to be specialty contractor normally engaged in this type of work and shall have three (3) years minimum documented experience in commercial installation of similar flooring materials and participation in manufacturer's environmental program including responsible flooring removal, recycling, and installation.

B. Flooring contractor will be responsible for the proper product installation, including floor preparation in all the areas indicated in the drawings to receive Kinetex modules. The installation standard will be as listed in J+J Flooring Kinetex Installation Instructions.

C. Flooring contractor to provide owner a written warranty that guarantees the completed

installation to be free from defects in materials and workmanship for a period of no less than two (2) years after job completion.

D. Manufacturer qualifications: Manufacturing facility to ISO 14001 certified and have a minimum of 20 years experience in the manufacture of commercial flooring.

E. Manufacturer to offer a reclamation program for the recycling of existing broadloom carpet, modular carpet tile and textile composite flooring.

F. All warranties must be issued by the manufacturer as standard published warranties on all types of flooring modules within this document. Second source warranties that involve parties other than the textile composite flooring manufacturer are unacceptable. If the product fails to perform as warranted when installed according to the J+J Flooring's Kinetex installation instruction and maintained according to J+J Flooring's Kinetex maintenance instructions, the affected area will be repaired or replaced at the expense of the manufacturer. J+J Flooring will provide standard published written performance warranties for the following:

1. Lifetime product performance. Will not delaminate along seams or lose more than five (5%) percent by weight of fiber during its useful life.
2. Lifetime static propensity, meaning built-in protection below 3.0 kv as tested under AATCC-134.
3. Lifetime Stain Removal
4. Lifetime Colorfastness (Light and Crocking)

G. Manufacturer to provide field service experts to assist in project start-up as required by the job and will notify owner, architect, general contractor, or another designated contact if any installation instructions are not followed.

H. Provide flooring material to meet the following test performance criteria as tested by a recognized independent testing laboratory. Certified test reports shall be submitted by the manufacturer for each test method. Requirements listed below must be met by all products being submitted for approval:

1. Pill Test / DOC-FF-1-70 (ASTM D-2859) - Requirement: Pass
2. Flooring Radiant Panel / ASTM E-648 - Requirement: Class I (Above .45 w/cm)
3. CRI VOC Chamber Test/Indoor Air Quality test (CRI-IAQ) Green Label Plus™ Test.
4. Lightfastness: Rating of not less than 5 on International Grey Scale after 40 SFU's when tested in accordance with AATCC Test Method 16E.
5. Crockfastness: Minimum stain rating on International Grey Scale of not less than 5 wet or dry when tested in accordance with AATCC Test Method 165.
6. Atmospheric Fading: Burned Gas shall not be less than 5 on International Grey Scale after two cycles on each test as per AATCC Test Method 129 Ozone and AATCC Test Method 23.
7. Noise Reduction Coefficient (ASTM C 423-02): NRC Rating of 0.30
8. Impact Insulation Classification (ASTM E 492-09): IIC Rating of 64

9. Slip Resistance (ASTM 1028-96): Complies with ADA Guidelines for level surface
10. Thermal Insulation (ASTM C 518): R-4

1.05 SUBMITTALS

A. Submit to architect and/or owner ten (10) days prior to bid, two (2) 6.5" x 6.5" (minimum size) finished samples of the exact type of flooring proposed, including quality, pattern, color and backing.

B. Submit to architect and/or owner ten (10) days before bid, any proposed substitutions for consideration. Submit at least three (3) references of installations using the same flooring technology, as described within this text. Include contact names and telephone numbers.

C. Submit manufacturer's warranties, installation instructions, and maintenance instructions before bid date.

D. Submit the manufacturer's certification that the flooring has been tested by an independent laboratory and complies with the required flammability tests as well as other testing requirements as listed under 1.04 F.

1.06 ENVIRONMENTAL/FIELD CONDITIONS

A. Deliver all materials to the installation site in the manufacturer's original packaging and in good condition. Packaging to contain manufacturer's name and marks, identification number, shipping and handling instructions and related information.

B. Delivered and stored materials must be available for inspection as required by the owner, architect, general contractor and/or the manufacturer.

C. Sub-floor preparation is to include all required work to prepare the existing floor for installation of the product as specified in this document. Sub-floor preparation shall meet all conditions as specified in J+J Flooring's Kinetex textile composite flooring installation instructions.

D. Sub-floor preparation will include, as required, the removal and repair of the existing floor surface. It is required that the floor of a renovation project be inspected before the bid date.

E. All materials, including adhesives, are to be delivered to the site of installation at a minimum of 48 hours prior to the start of installation and stored in a clean and dry room that measures above 65°F and below 95°F and measures between 10% and 65% relative humidity (RH). To maintain temperature and relative humidity, permanent heating and air conditioning systems (HVAC) must be in operation. Place pallets of textile composite flooring modules on a flat surface (do not double stack pallets). After work is completed, the ambient room temperature should remain at 65°F and relative humidity between 10% and 65% for 48 hours. These materials and related adhesives shall be protected from the direct flow of heat from

heating fixtures and appliances such as hot-air registers, radiators, or other. Site conditions shall include those specified in the flooring manufacturer's installation instructions and shall also include sufficient heat, light and power required for effective and efficient working condition.

F. Once the temperature and relative humidity in area for installation have been stabilized, loose lay the modules within the installation area and allow them to precondition for 48 hours prior to installation. Module installation shall not commence until painting and finishing work is complete and ceiling and overhead work is tested, approved and completed. Traffic shall be closed during the installation of the textile composite flooring products. Verify concrete slabs are dry per the standards for bond and moisture tests listed in the manufacturer's installation instructions.

G. Tests: When installed on concrete slab on grade, submit results of all bond and moisture tests prior to installation including:

1. ASTM F 710: "Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring." Provide temperature and humidity readings per ASTM F 710. Maximum limits for moisture and vapor pressure tests shall not exceed the limits set forth in Table 1. Schedule the referenced tests to be taken after the space to receive flooring is brought to "in-use" conditions through the use and operation of the permanent HVAC system. Tests shall be taken no more than 7 days prior to the installation of the flooring materials.

    a. Testing shall take place within the building envelope when it is conditioned to the same ambient design temperature and relative humidity levels that will be maintained during the operation of the space(s) after Substantial Completion.

2. ASTM F 2170 "Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using *in situ* Probes."

3. ASTM F 1869 "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydros Calcium Chloride."

1.07 SUBSTITUTIONS

A. All Bid submittals must conform to the specifications in this document.

B. All test results to be in accordance with a certified independent testing laboratory.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Kinetex, a brand of J+J Flooring, P.O. Box 1287, Dalton, GA, 30722. (800) 241-4586. JJFLOORINGGROUP.COM. Please contact BRETT BENNETT, (801) 866-3670, brett.bennett@jjflooring.com

B. Resilient Base (RB): ASTM F-1861 vinyl; top set coved

2.02 TEXTILE COMPOSITE FLOORING MATERIALS

A. Kinetex flooring modules (tiles):

1. Product: Downtown 1850
2. Color: Bourbon 3156
3. Backing: Polyester Felt Cushion
4. Dye Method: Solution Dyed
5. Wear Layer: 100% Polyester
6. Total Weight (Nominal Average): 4.5 oz - 5.2 oz / square foot
7. Pattern Repeat: N/A
8. Soil Release: Yes
9. Standard Size: 24" x 24" (approx. (60.96cm x 60.96 cm)
10. Warranties: Lifetime Product Performance, Colorfastness to Light & Crocking, Stain Removal, Static Protection, Protection from Edge Ravel and Delamination Failure; Lifetime Dimensional Stability.
11. Testing Specifications - Pill Test: Yes
12. Testing Specifications - Flooring Radiant Panel: Class 1
13. Testing Specifications - Smoke Density: Less than 450.0 flaming (ASTM E 662)
14. Testing Specifications - Static Test: Less than 3.0kv (AATCC-134)
15. Recycled content: Minimum of 45% recycled content
16. NSF/ANSI 140 Platinum Certified
17. Closed-loop recyclable

2.03 ADHESIVES

A. Kinetex® Adhesive, an aggressive, pressure-sensitive adhesive designed for the installation of Kinetex textile composite flooring modules is required.

B. Kinetex PreFix®, a quick installation for all Kinetex textile composite flooring products. The release liner easily peels away to reveal a series of pre-applied adhesive strips that securely anchor the Kinetex module in place, (PreFix Primer is required).

2.04 ACCESSORIES

A. Kinetex requires protective transition 3/16-inch to other floor covering thickness. Provide

transition/reducing strips tapered to meet abutting materials.

B. Provide aluminum edge with lip to protect Kinetex edge.

C. Resilient Base:

1. Height: 4 inch.
2. Thickness: 0.125 inch thick.
3. Length: Roll.
4. Color as selected by Architect

PART 3 EXECUTION

3.01 INSPECTION

A. Examine and verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive installation of modules.

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

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are dry enough and ready for flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F 710; obtain instructions if test results are not within limits recommended by J+J Flooring.

E. Verify that required floor-mounted utilities are in correct location.

F. J+J Flooring requires that Kinetex textile composite flooring be inspected prior to installation for proper style, color and potential defects. No claims will be honored if the modules are installed with visible defects. Should there be a problem, call J+J Flooring's Customer Relations Department at 800.241.4586.

3.02 PREPARATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. SURFACE PREPARATION- Dust, dirt, debris and non-compatible adhesive must be removed before the installation begins. Surfaces must be smooth and level with all holes and cracks filled with Portland cement-based patch reinforced with polymers. Kinetex Adhesive cannot be applied to any substrate where chemical or solvent-based cleaners have been used.

C. LATEX ADHESIVES - Old latex adhesives must be mechanically scraped down to a bare residue. Latex adhesive residues must be smooth and level with all holes and cracks filled with a Portland cement-based patch reinforced with polymers, or encapsulated with APAC ENCapSeal. *Note: Failure to remove or seal, old latex adhesive may cause installation failure, shifting, buckling or edge curling; these conditions will not be covered under warranty.*

D. CUT BACK ADHESIVES - Must be wet mechanically scraped to a minimum residue and encapsulated with APAC ENCapSeal.

E. CONCRETE MOISTURE TESTING and pH TESTING - Substrate surfaces must be tested for moisture emission. It is the responsibility of the owner or owner's representative to perform moisture testing prior to starting the installation. ASTM-F 2170-2 relative humidity probe moisture testing is required. Acceptable relative humidity probe testing results are up to 100% RH when using Kinetex Adhesive or Kinetex PreFix. Alkalinity tests should also be performed per ASTM F 710. The maximum acceptable pH is 11.0 when using Kinetex Adhesive or Kinetex PreFix.
Note: pH readings of 9.0 - 11.00, Commercialon Premium Sealer is required.

SUBFLOORS

F. New Concrete - New concrete must be fully cured and free of moisture (see ASTM F 710). New concrete requires a curing period of approximately 90 days.

G. Old Concrete - Old concrete must be checked for moisture. Dry, dusty, porous floors must be primed. *Note: Primers will not correct a moisture problem. For complete information, refer to CRI-104 Installation Standard.*

H. Wood - Wood floors must be APA flooring grade smooth and level, or CanPly Select Grade. If the floor is uneven, an approved underlayment will be required. Old finishes must be tested for compatibility with adhesives or removed and porous wood primed. Wood floors must receive a roll-on application of Commercialon® Premium Sealer. Follow instructions on the Commercialon® Premium Sealer label.

I. Terrazzo / Marble - Level all grout lines with Portland cement-based patch reinforced with polymers. Glossy surfaces must be sanded for proper adhesive bond. Waxes and similar finishes must be removed.

J. Other Hard Surfaces (VCT/VAT) - Tiles must be well secured to the floor or removed. Broken, damaged or loose tiles must be replaced. Waxes and similar finishes must be removed from VCT before applying adhesive. Existing sheet vinyl is not a suitable substrate for modular installation and must be removed.

K. Raised Access Panel Floors - The panels must be flat, warped panels can result in the carpet modules being off grid. The panel joints must be tight and level. Screws are to be countersunk.

L. Gypcrete - Gypcrete subfloors must be fully cured and free of high moisture (see ASTM F 2170-2). Gypcrete requires a curing period of approximately 90 days. Additionally, Gypcrete must be treated using primer in advance of applying adhesive.

M. Carpet - Remove old carpet and carpet adhesives by scraping or other mechanical means. Any remaining adhesive residues may be covered with a Portland based patching compound or encapsulated with TriSeal Sealer.

3.03 INSTALLATION OF TEXTILE COMPOSITE FLOORING

A. Install flooring in strict accordance with the finish drawings and J+J Flooring's Kinetex installation instructions.

B. ADHESIVE SYSTEM - Kinetex requires use of Kinetex Adhesive or PreFix pre-applied adhesive for all Kinetex flooring modules.

1. Full Spread Kinetex Adhesive System: Installation requires full spread use of Kinetex Adhesive. The spread rate for Kinetex Adhesive is approximately 640 square feet per four- gallon bucket over a properly prepared floor and must be spread using a 1/16” x 1/16” x 1/16” square notched trowel. Kinetex adhesive is a transitional hard-set PSA with limited working time. Allow the adhesive to dry until the anchor lines are visible and begin installation. Once the control lines are visible complete theinstallation within 2 hours, which includes trimming and rolling. Replace the trowel clip each time that a new 4-gallon pail of Kinetex Adhesive is opened. Kinetex adhesive average coverage is 640 SF per 4 gallon pail or 160 SF per one gallon pail.

   Note: Inadequate amounts of adhesive can cause modules to shift and move and will not be covered by warranty. J+J Flooring will not be responsible for the adhesive bond where other adhesives have been used.
2. PreFix Pre-Applied Adhesive
   a. PreFix Primer Application (REQUIRED) *Note: Read all installation instructions thoroughly.*
      i. Pour the diluted primer onto the substrate and roll on using 3/8" nap or foam roller. Do not puddle. Additional coats may be required upon visual inspection over extremely porous concrete.
      ii. Allow the material to dry to the touch. Lower substrate temperatures and/ or higher humid conditions could extend the drying time
   b. Installing PreFix Kinetex Modules
      After the PreFix primer has dried, begin the installation at the intersection of the central module anchor lines. Peel off the release film and save it to be recycled. Complete the installation one quarter area at a time laying the modules firmly and accurately along the anchor lines. ***Follow approved installation method(s) for each specific product.***

C. MODULE PLACEMENT - Arrows are printed on the module backing to show pile/machine direction. A tight installation without compression is mandatory for optimum performance and appearance of the modular installation. It is critical that each module uniformly touch each adjoining module without a gap. To ensure a clean tight fit, do not pull/tug or slid-in modules, but instead lay each module into its location against the adjoining module. Use your hands to press/form the module into place where the new module meets the previously installed module. **See specific product specifications for approved installation method(s).**

Note: To reposition a Kinetex module during installation, remove it by gently lifting all four sides of the module with a spatula or putty knife, rotating around each side of the module doing a little at a time. The very center of the module should be the last part of the module touching the floor upon removal. Do not stretch a module while it is in the adhesive in order to align next to an adjoin modular. An attempt to stretch will likely result in the module pulling back to its original position. NEVER ATTEMPT TO REMOVE A MODULE ALL AT ONCE BY PULLING ONE OR ONLY TWO SIDES OF THE MODULAR. DOING SO MAY LEAD TO DISTORTING THE MODULE.

D. PALLET AND BUNDLE SEQUENCING - It is very important to install Kinetex modules in the order they were manufactured; this is easily accomplished by selecting pallets in sequential order and following the numbers located on each bundle of modules. Typically, an installation will begin with the lowest bundle numbers and progress through the highest numbers until the project is complete. Installing modules by bundle sequence will assure the most even uniform look possible. (For layout and installation instructions refer to J+J Flooring's Kinetex Installation Instructions.)

E. STAIRS - Use single or double undercut stair nosing and cut modules. Then, using full spread Kinetex Adhesive or SRT Tape, install modules on steps and risers, inserting the stair nosing edge and the top of the riser edge of each module into the vinyl undercut.

F. COMPLETING INSTALLATION - To avoid dislodging modules, do not walk on or move furniture onto modules until the area is completely anchored. Roll entire area with 75-100 lb. roller in both directions (north-south and east-west) after completion of installation. It is also required that sheets of plywood or hardboard be laid over the new modular surface when transporting heavy furniture on carts or dollies. As a final step, vacuum the entire area with an upright vacuum.

3.04 INSTALLATION OF ACCESSORIES

A. Install accessories as required by drawings and per manufacturer's specifications.

B. Adhere base tight to wall and floor surfaces. Fit joints tightly and make vertical. Miter internal corners.

3.05 CLEANING AND PROTECTION

A. Use a moist cloth when wet; if dry, use a solvent based product applied to a towel then worked onto the Kinetex module for removal of contaminants such as adhesive, paint, oil and grease. Follow J+J Flooring's maintenance guidelines.

B. Clean and vacuum surfaces.

END OF SECTION

SECTION 099120 – PAINTS AND COATINGS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following substrates:

1. Concrete masonry units (CMU).
2. Steel.
3. Wood.
4. Gypsum board.
5. Asphalt and Concrete Paving line marking paint.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.

C. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current “MPI Approved Products List” for each product category specified in Part 2, with the proposed product highlighted.

1.3 QUALITY ASSURANCE

A. 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.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.

2. Remove rags and waste from storage areas daily.

1.5 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.6 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.

1. Quantity: Furnish an additional 5 percent, but not less than 4 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co.

2. PPG Architectural Finishes, Inc.

3. Sherwin-Williams Company (The).

4. Rodda Paint

2.2 PAINT, GENERAL

A. 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.

B. Colors: As selected by Architect.

C. Finishing System: Premium Grades unless otherwise indicated.

2.3 BLOCK FILLERS

A. Interior/Exterior Latex Block Filler: MPI #4.

1. VOC Content: E Range of E2.

2.4 PRIMERS/SEALERS (INTERIOR)

A. Interior Latex Primer/Sealer: MPI #50.

1. VOC Content: E Range of E2

B. Interior Alkyd Primer/Sealer: MPI #45.

1. VOC Content: E Range of E2

C. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

2.5 METAL PRIMERS (INTERIOR)

A. Quick-Drying Alkyd Metal Primer: MPI #76.

1. VOC Content: E Range of E2

2.6 WOOD PRIMERS (INTERIOR)

A. Interior Latex-Based Wood Primer: MPI #39.

1. VOC Content: E Range of E2.

2.7 LATEX PAINTS (INTERIOR)

A. High-Performance Architectural Latex (Eggshell): MPI #139 (Gloss Level 3).

1. VOC Content: E Range of E2.

2.8 METAL TRIM, DOORS & FRAMES (INTERIOR & EXTERIOR)

A. Quick-Drying Enamel (Semi-gloss): MPI #163 (Gloss Level 5).

1. VOC Content: E Range of E2.

2.9 DRY FOG/FALL COATINGS (INTERIOR)

A. Interior Latex Dry Fog/Fall: MPI #118.

1. VOC Content: E Range of E2.

2.10 METAL PRIMERS (EXTERIOR)

A. Quick-Drying Alkyd Metal Primer: MPI #76.

1. VOC Content: E Range of E1.

B. Waterborne Galvanized-Metal Primer: MPI #134.

1. VOC Content: E Range of E1.

2. Environmental Performance Rating: EPR 1.

2.11 ACRYLIC LATEX (EXTERIOR)

A. Exterior Acrylic Latex (Satin): MPI #10, 15 (Gloss Level 2).

1. VOC Content: E Range of E2.

2.12 LINE MARKING PAINT

A. Line Marking Paint: Alkyd resin-type, ready-mixed complying with AASHTO M 248, Type I.

2.13 EPOXY PAINT:

A. Epoxy Paint Walls and Floor: 2 coats 2 component, polyamide epoxy coating low sheen: MPI #108.

B. Epoxy Paint Shower and Toilet floors: 2 coats 2 component, polyamide epoxy coating low sheen: MPI #108.
1. Provide Rust-Oleum Durability additive at Shower and Toilet stalls.

2.14 MASONRY SEALER: (Exterior)
A. Weather Seal Blok-Guard & Graffiti Control II.

2.15 CONCRETE FLOOR SEALER (INTERIOR)
A. Rust-Oleum Clear-Seal

2.16 CONCRETE SIDEWALK SEALER (EXTERIOR)
A. Rust-Oleum Clear-Seal
B. Green Umbrella SoloCure

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Masonry (Clay and CMU): 12 percent.

2. Wood: 15 percent.

3. Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and re-prime substrate with compatible primers as required to produce paint systems indicated.

D. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

F. Wood Substrates:

1. Scrape and clean knots and apply coat of knot sealer before applying primer.

2. Sand surfaces that will be exposed to view and dust off.

3. Prime edges, ends, faces, undersides, and backsides of wood.

4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

G. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:

1. Mechanical Work:

a. Uninsulated metal piping.

b. Uninsulated plastic piping.

c. Pipe hangers and supports.

d. Tanks that do not have factory-applied final finishes.

e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.

f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2. Electrical Work:

a. Panelboards.

b. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.

2. Testing agency will perform tests for compliance with product requirements.

3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Steel Substrates:

1. Quick-Drying Enamel System: MPI INT 5.1A.

a. Prime Coat: Quick-drying alkyd metal primer.

b. Intermediate Coat: Quick-drying enamel matching topcoat.

c. Topcoat: Quick-drying enamel (semi-gloss).

2. Alkyd Dry-Fall System: MPI INT 5.1D at all exposed ceiling areas.

a. Prime Coat: Quick-drying alkyd metal primer.

b. Topcoat: Interior alkyd dry fog/fall.

B. Dressed Lumber Substrates:

1. High-Performance Architectural Latex System: MPI INT 6.4A.

a. Prime Coat: Interior latex-based wood primer.

b. Intermediate Coat: High-performance architectural latex matching topcoat.

c. Topcoat: High-performance architectural latex (semi-gloss).

C. Gypsum Board Substrates:

1. High-Performance Architectural Latex System: MPI INT 9.2B.

a. Prime Coat: Interior latex primer/sealer.

b. Intermediate Coat: High-performance architectural latex matching topcoat.

c. Topcoat: High-performance architectural latex (semi-gloss).

D. Concrete Masonry Units MPI 4.2D (interior & exterior)

1. Latex Block Filler at interior locations MP4

2. Latex, 2 coats of high performance at interior locations MPI-139

3. Latex, 2 coats of MPI Exterior Latex (MPI # 10, 15), exterior locations.

END OF SECTION 099120

SECTION 099600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1.2 SUMMARY

A. Section includes surface preparation and the application of high-performance coating systems on the following substrates:

1. Interior Substrates:

a. Concrete, horizontal surfaces.
b. Concrete masonry units (CMUs).

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for shop priming of structural steel with primers specified in this Section.
2. Section 099123 "Interior Painting" for general field painting.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Coatings: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.5 QUALITY ASSURANCE

A. Mockups: Apply mockups of each coating system indicated 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 coating system.

a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
b. Other Items: Architect will designate items or areas required.

2 Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3 Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

4 Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following

1. Carboline
2. Prime Coat Coating System
3. Tnemec

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be 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, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
3. Products shall be of same manufacturer for each coat in a coating system.

C. Colors: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMUs): 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and coating systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

1. Clean surfaces with pressurized water. Use pressure range of 1500 to 4000 psi (10 350 to 27 580 kPa) at 6 to 12 inches (150 to 300 mm).
2. Abrasive blast clean surfaces to comply with SSPC-SP 7/NACE No. 4.

E. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or alkalinity of mortar joints exceeds that permitted in manufacturer's written instructions.

1. Clean surfaces with pressurized water. Use pressure range of 100 to 600 psi (690 to 4140 kPa) at 6 to 12 inches (150 to 300 mm).

F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 7/NACE No. 4.
2. SSPC-SP 11.
3. SSPC-SP 6/NACE No. 3.
4. SSPC-SP 5/NACE No. 1.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for coating and substrate indicated.
2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.

1. Contractor shall touch up and restore coated surfaces damaged by testing.
2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 NTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Floors by one of the following systems or approved equal::

1. Prime Coat Coating System
   a. 1st Coat: Membrane; Prime Coat Coating System PC620.
   b. I2nd Coat: Build Coat; Prime Coat Coating System PC 332 with PC322 aggregate.
   c. 3rd Coat: Finish Coat; Prime Coat Coating System PC 400 glazed coat with PC337 Anti Skid finish:
   d. Install Prime Coat Coating System 4 inch rolled cove at shower floor and wall transition.

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2. Carboline System:
   a. 1st Coat: Sanitile Primer
   b. 2nd Coat: Sanitile 944 HB
   c. 3rd Coat: Sanitile 944 HP woth 60/40 mesh silica sand anti skid finish
   d. Install Carboline System Carboguard 163 4 inch cove at floor and wall transition

3. Tnemec System:
   a. 1st Coat: Sub-Flex EP Series 206 at 30 mils
   b. 2nd Coat: Power-Tread series 237 at 20 mils
   c. Broadcast: Clean, Dry, bagged 30/50 mesh sand, the aggregate calculated at one half pound per sq ft per broadcast application. 4 inch rolled cove at shower floor and wall transition
   d. 3rd Coat: Tneme-Glaze Series 211 Glass Beads. Provide a mock up to determine the degree of texture and slip resistance desired.
   e. 1st Coat: Apply PC Gelcoat 630 at 12-14 mils DFT
   f. 2nd Coat: Apply PC201 Fibercoat SV at 25-35 mils DFT
   g. 3rd Coat: Apply PC 400W Glazecoat at a DFT of 6-8 mils
   h. 4th Coat: Apply PC 509 with PC 499 anti-microbial at a DFT of 2-3 mils

4. Carboline System
   a. 1st Coat: Sanitile 600 Series as required to provide void free surface
   b. 2nd Coat: Sanitile 855 with add-2 mildewcide additive
   c. 3rd Coat: Sanitile 855 with Add-2 Mildewcide additive
   d. 1st Coat: Surfacing Epoxy Series 215. Install Series 273 Part C Fiberglass Mat into the wet Series 273. Saturate the Fiberglass Mat with a coat of Series 273 at 8-12 mils
   e. 2nd Coat: Tnemec Glaze series 280 at 8-10 mils
   f. 3rd Coat: Enviro-Glaze Series 297 at 2-3 mils

END OF SECTION 099600

SECTION 102813.63 - DETENTION TOILET ACCESSORIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Safety hooks.
2. Miscellaneous toilet accessories.
3. Stainless-steel mirrors.
4. Grab bars.
5. Shower seats. (NOT USED)

1.3 COORDINATION

A. Coordinate installation of anchorages for detention toilet accessories. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in adjoining construction. Deliver such items to Project site in time for installation.

B. Coordinate size and location of recesses in wall construction to receive recessed detention toilet accessories.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Product Schedule: For detention toilet accessories. Indicate types, quantities, sizes, and installation locations by room of each accessory required.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For detention toilet accessories to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Security Fasteners: Furnish not less than 1 box for each 50 boxes or fraction thereof, of each type and size of security fastener installed.

2. Tools: Provide two sets of tools for installing and removing security fasteners.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace detention toilet accessories that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Structural failures including deflection exceeding 1/4 inch (6.3 mm).
b. Faulty operation of hardware.
c. Deterioration of metals, metal finishes, and other materials.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DETENTION SAFETY HOOKS

A. Multiple, Curved, Safety Hook Strip: Minimum 5-1/2-inch- (140-mm-) high backplate by length indicated, formed from 0.125-inch- (3.18-mm-) thick, stainless-steel sheet. Provide 0.188-inch- (4.77-mm-) thick, stainless-steel hooks attached to backplate; with each hook having a friction washer assembly, adjustable with a nonremovable security screw that maintains pressure on hook and allows hook to pivot when load exceeds preset limit indicated in Part 3.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to, the following:
a. A & J Washroom Accessories Inc, Security Hook Strip US39
b. American Specialties Inc, Surface mounted Clothes Hook Strip, Model No. 127
c. Bradley Corporation, Security Clothes Hook Strip Model SA39
d. Sweeper Metal Fabrications Corp, Clothes hook
e. Bobrick Washroom Equipment, Inc, Model B984
2. Configuration: 18 inches (457 mm) long with four hooks.
3. Mounting: Front mounting with security fasteners.

B. Materials:

1. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, Type 304.

C. Stainless-Steel Finish:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches.
a. Run grain of directional finishes with long dimension of each piece.
b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

c. Directional Satin Finish: No. 4.

2.2 MISCELLANEOUS DETENTION TOILET ACCESSORIES

A. Recessed, Detention Toilet Tissue Holder: Minimum 5-inch diameter by 4-1/2 inches (127-mm diameter by 114 mm) deep; formed from 0.062-inch- (1.57-mm-) thick, stainless-steel sheet. Secure to wall with rear-mounting steel strap and adjustment bolts.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to, the following:
   a. A & J Washroom Accessories Inc, Security Toilet Paper Holder
   b. American Specialties Inc, Security Recessed Toilet Paper Holder
   c. Bradley Corporation, Security Recessed Toilet Tissue Roll holder Model SA12
   d. Maximum Security Product Corp.
   e. Willoughby Industries
2. Face: 7-inch- (178-mm-) square face flange.

B. Materials:

1. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, Type 304.

C. Stainless-Steel Finish:
1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches.
   a. Run grain of directional finishes with long dimension of each piece.
   b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
   c. Directional Satin Finish: No. 4.

2.3 DETENTION MIRRORS

A. Small, Framed Detention Mirror: Formed from 0.038-inch- (0.95-mm-) thick, stainless-steel sheet with fiberboard backing; enclosed in a frame formed from 0.064-inch (1.63-mm) nominal thickness, zinc-plated steel sheet; with round corners. Fabricate frame with welded and ground corners or from one piece of metal.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to, the following:
   a. Bradley Corporation, Security Mirror SA05
   b. Sweeper Metal Fabrications Corp,
   c. Maximum Security Products Corp. Model SM990
   d. Bobrick Washroom Equipment, Inc, Model B942
2. Size: Approximately 9-1/2 by 11 inches (241 by 279 mm).
3. Mounting: Front mounting with security fasteners to 0.168-inch (4.27-mm) nominal thickness, metallic-coated steel mounting plate.

B. Materials:

1. Metallic-Coated Steel Sheet: ASTM A653/A653M, CS (Commercial Steel), Type B; with G60 (Z180) zinc (galvanized) coating designation.
2. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, Type 304.

C. Finishes:

1. Stainless-Steel Finish:
   a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
   b. Polished Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches.
      1) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
      2) Mirrorlike Reflective, Nondirectional Polish: No. 8.

2.4 DETENTION GRAB BARS

A. Grab Bars: 1-1/2 inches (38.1 mm) in diameter; formed from 0.038-inch- (0.95-mm-) thick, stainless-steel tubing, with 3-inch- (76.2-mm-) diameter flanges formed from 0.125-inch- (3.18-mm-) thick, stainless steel. Closure plates formed from 0.125-inch- (3.18-mm-) thick, stainless steel. All-welded construction.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to, the following:
   a. A & J Washroom Accessories Inc,
   b. American Specialties Inc,
   c. Bradley Corporation, SA70 Series
   d. Gamco A Division of Bobrick Washroom Equipment Inc

2. Length: As indicated on Drawings.

3. Mounting: Front mounting with security fasteners.

B. Materials:

1. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, Type 304.
2. Stainless-Steel Tubing: ASTM A1016/A1016M, austenitic stainless steel, Type 304, seamless.

C. Stainless-Steel Finish:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches.
   a. Run grain of directional finishes with long dimension of each piece.

b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
c. Directional Satin Finish: No. 4.

2.5 DETENTION SHOWER SEATS

A. Shower Seats: Double-pan retractable, recessed shower seat with recessed handle. Approximately 16- by 16-inch (406- by 406-mm) overall size formed from thick, stainless-steel sheet. Seat pivots on solid 0.375-inch- (9.5-mm-) diameter stainless-steel rod and self-latches when closed. Minimum 750-lb (340-kg) loading capacity.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to, the following:
a. A & J Washroom Accessories Inc
b. American Specialties Inc
c. Bradley Corporation, Model SA65

B. Materials:

1. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, Type 304.

C. Stainless-Steel Finish:
1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finish: Grind and polish surfaces to produce uniform finish, free of cross Scratches.
a. Run grain of directional finishes with long dimension of each piece.
b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
c. Directional Satin Finish: No. 4.

2.6 Detention Shower Curtain Track
1. Basis of Design Product: Imperial Fastener Company: IFC-69 Break Away Track
2. Description: 1 7/16 inch x 9/16 inch x .062 extruded 6063-T5 aluminum curtain track
3. Finish: No. 4 (satin)

2.7 DETENTION SHOWER CURTAIN:
1. Basis of Design Product: Imperial Fastener Company: Break-A-Way Shower Curtain
2. Style: Break A-Way with mesh top and clear bottom.
3. Material: Nylon reinforced vinyl, minimum 10oz. 284 g or .008 inch .02 mm thick vinyl with integral antibacterial agent.
4. Color: White

2.8 FABRICATION
A. Coordinate dimensions and attachment methods of detention toilet accessories with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.

B. Shear and punch metals cleanly and accurately. Remove burrs.

C. Form edges and corners to be free of sharp edges and rough areas. Fold back exposed edges of unsupported sheet metal to form a 1/2-inch- (12.7-mm-) wide hem on the concealed side, or ease edges to a radius of approximately 1/32 inch (0.8 mm) and support with concealed stiffeners.

D. Form metal in maximum lengths to minimize joints. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Weld corners and seams continuously to comply with referenced AWS standard and the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
   5. Weld before finishing components to greatest extent possible. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

F. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure detention toilet accessories rigidly in place and to support expected loads. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce formed-metal units as needed to attach and support other construction.

G. Cut, reinforce, drill, and tap detention toilet accessories to receive hardware, security fasteners, and similar items.

H. Form exposed work true to line and level with accurate angles and surfaces. Grind off and ease edges unless otherwise indicated.

I. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed security fasteners of type indicated or, if not indicated, flat-head (countersunk) security fasteners. Locate joints where least conspicuous.

2.9 SECURITY FASTENERS

A. Operable only by tools produced by fastener manufacturer or other licensed fabricator for use on specific type of fastener. Drive-system type, head style, material, and protective coating as required for assembly, installation, and strength, and as follows:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

a. Acument Global Technologies North America
b. Bryce Fastener
c. Safety Socket LLC
d. Tamperproof Screw Co, Inc
e. Tamper-Pruf Screws

2. Drive-System Type: Pinned Torx-Plus or Pinned Torx.
3. Fastener Strength: 120,000 psi (827 MPa).
4. Protective Coatings for Heat-Treated Alloy Steel:
   a. Zinc and clear trivalent chromium where indicated.
   b. Zinc phosphate with oil, ASTM F1137, Grade I, or black oxide unless otherwise indicated.

2.10 SECURITY SEALANTS

A. Epoxy Security Sealants: Manufacturer's standard, nonsag, tamper-resistant sealant for joints with no movement.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to, the following:
      a. BASF Construction Chemicals, LLC, Building Systems; Epolith-G
      b. Euclid Chemical Company (The) An RPM company; Euco Model No 452-P
      c. Pecora Corporation; DynaPoxy EP-1200

2.11 ACCESSORIES

A. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.

C. Cast-in-Place Anchors in Concrete: Fabricated from corrosion-resistant materials capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E488/E488M, conducted by a qualified testing agency; of type indicated below:

   1. Threaded or wedge type; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed; hotdip galvanized according to ASTM A153/A153M or ASTM F2329/F2329M.

C. Embedded Plate Anchors: Fabricated from mild steel shapes and plates, minimum 3/16 inch (4.8 mm) thick; with minimum 1/2-inch- (12.7-mm-) diameter, headed studs welded to back of plate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of detention toilet accessories.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations of detention toilet accessory connections before detention toilet accessory installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of detention toilet accessories.

D. Inspect built-in and cast-in anchor installations before installing detention toilet accessories to verify that anchor installations comply with requirements. Prepare inspection reports.
   1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
   2. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.

E. Verify locations of detention toilet accessories.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing detention toilet accessories to in-place construction. Include threaded fasteners for masonry inserts, security fasteners, and other connectors.

B. Provide temporary bracing or anchors in formwork for items that are to be built into masonry or similar construction.

C. Apply epoxy security sealant around perimeter in a continuous ribbon on back of detention toilet accessories before installation.

D. Security Fasteners: Install detention toilet accessories using security fasteners with head style appropriate for installation requirements, strength, and finish of adjacent materials. Provide stainless-steel security fasteners in stainless-steel materials.

3.3 ADJUSTING AND CLEANING

A. Remove temporary labels and protective coatings.

B. Adjust curved safety hooks to release with application of 8-lbf (35.6-N) load.
   1. Verify tightness of accessible connections by calibrated torque driver.

C. Touchup Painting: Cleaning and touchup painting of bolted connections and abraded areas of shop paint are specified in Section 099123 "Interior Painting."

END OF SECTION

SECTION 125500 - DETENTION FURNITURE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Detention bunks.
2. Detention tables.
3. Detention seating.
4. Detention bench w/ cuffs

B. Related Requirements:
1. Section 102813 "Detention Toilet Accessories" for detention toilet and bath accessories.

1.3 COORDINATION

A. Coordinate installation of anchorages for detention furniture. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors that are to be embedded in adjacent construction. Deliver such items to Project site in time for installation.

B. Coordinate size and location of recesses in wall construction to receive detention furniture.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for detention furniture.

B. Shop Drawings: For detention furniture.
1. Include plans, elevations, sections, and attachment details.
2. Indicate locations, dimensions, and profiles of wall and floor reinforcements.
3. Indicate locations and installation details of built-in anchors.
4. Show elevations of detention furniture and indicate dimensions of furniture, preparations for receiving anchors, and locations of anchorage.
5. Show details of attachment of detention furniture to built-in anchors.

C. Samples for Initial Selection: For detention furniture with factory-applied color finishes.

1.5 INFORMATIONAL SUBMITTALS

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For detention mattresses to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Security Fasteners: Furnish not less than one box for every 50 boxes or fraction thereof, of each type and size of security fastener installed.

   2. Tools: Provide two sets of tools for installing and removing security fasteners.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify openings for recessed detention furniture by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 DETENTION BUNKS

A. Freestanding Single Bunks:
   1. Products: subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to, the following:
      a. Norix Group Inc; Ironman Welded Bunk System – wall mounted Bunk, Model No B525-104

   2. Bunk Pan: Formed from 12 gauge steel sheet.
      a. Size: Minimum 27 inches wide by 80 inches long with bunk pan 14 inches (356 mm) above floor.
      b. Wall Mounted Bracket: 7 gauge steel.

   3. Assembly: Fully welded

B. Freestanding Double Bunks: (NOT USED)
   1. Products: subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to, the following:
      a. Norix Group Inc; Ironman Steel Floor Mounted Double Bunk, Model No B510-200

   2. Bunk Pan: Formed from 0.134-inch (3.42-mm) nominal-thickness steel sheet.

      a. Size: Minimum 27 inches (689 mm) wide by 76 inches (1930 mm) long with lower bunk pan 14 inches (356 mm) above floor and upper bunk pan at least 49 inches (1245 mm) above floor.

b. Upper Bunk Edges: Turn up edges of back and sides and turn down edge of front, with minimum 2-inch (51-mm) flanges.
c. Lower Bunk Edges: Turn up edges of back, sides, and front, with minimum 2-inch (51-mm) flanges.

3. Drawers: Two; minimum 21 inches (533 mm) wide by 24 inches (610 mm) deep by 5 inches (127 mm) high, with full-width integral pull formed from steel sheet; formed from 0.134-inch (3.42-mm) nominal-thickness steel sheet.
4. Legs and Frames: Formed from 2-by-2-by-3/16-inch (51-by-51-by-4.8-mm) steel angle welded at connections to each other and to bunk pan; provide four legs for each bunk.
5. Mounting Plates: Formed from 1/4-inch- (6-mm-) thick, steel plate punched with one hole for floor anchorage; provide one mounting plate for each leg.
6. Assembly: Fully welded.

C. Materials:
1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, CS (Commercial Steel), Type B; suitable or exposed applications.
3. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, CS (Commercial Steel), Type B; free of cale, pitting, or surface defects; pickled and oiled.

D. Finishes:
1. Steel Factory Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
2. Steel Baked-Enamel or Powder-Coat Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils (0.05 mm).
a. Color and Gloss: As selected by Architect from manufacturer's full range.

2.2 DETENTION TABLES

A. Pedestal-Style Table: Provide 1 table
1. Products: subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to, the following:
a. Norix Group Inc; Ironman Steel Tables, Model No EMX $ 205-4
2. Tabletop: Formed from 0.109-inch- (2.78-mm-) thick, stainless-steel sheet; reinforced with steel shapes or steel plate, with minimum 1-1/2-inch (38-mm) flanged edges.
3. Seats: 12-inch (305-mm) diameter, formed from 0.105-inch (2.66-mm) nominal-thickness steel sheet; reinforced with 0.134-inch (3.42-mm) nominal-thickness steel plate, with minimum 1-1/2-inch (38-mm) flanged edges.
4. Capacity: Four persons.

B. Bench-Style Table: (NOT USED)

1. Products: subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to, the following:
a. Norix Group Inc; Ironman Steel Tables, Model No EMX 9633-8

2. Tabletop: Formed from 0.109-inch- (2.78-mm-) thick, stainless-steel sheet; reinforced with steel channel frame or steel plate, with minimum 1-1/2-inch (38-mm) flanged edges.

3. Benches: 12 inches (305 mm) deep by length of tabletop, formed from 0.109-inch- (2.78-mm-) thick, stainless-steel sheet, with minimum 1-1/2-inch (38-mm) flanged edges.

4. Floor Anchor: Formed from steel angle punched for floor anchorage.

5. Capacity: Eight persons or As indicated on Drawings.

C. Materials:
1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, CS (Commercial Steel), Type B; suitable for exposed applications.

3. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, CS (Commercial Steel), Type B; free of scale, pitting, or surface defects; pickled and oiled.

4. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, Type 304.

5. Steel Tubing: ASTM A513/A513M, Type B unless otherwise indicated; thickness indicated or required by structural loads.

D. Finishes:
1. Steel Baked-Enamel or Powder-Coat Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils (0.05 mm).
   a. Color and Gloss: As selected by Architect from manufacturer's full range.

2. Stainless-Steel Finish:
   a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
   b. Polished Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches.
      1) Run grain of directional finishes with long dimension of each piece.
      2) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
      3) Directional Satin Finish: No. 3.

2.3 DETENTION STOOLS
A. Floor Mount Stool
1. Products: subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to, the following:
   a. Norix Group Inc; Slammer Stone Seat. Model No S561-100

2.4 DETENTION BENCH W/ CUFF RINGS

A. Floor Mount Bench with cuff rings

1. Products: subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to, the following:
   a. Norix Group Inc; Bench with cuff rings, floor mounted. Provide 1 Model No IBF-60 and provide 1 IBF-96.
   b. Cut, formed and welded steel. Cuff rings welded to frame. 12 gauge steel seating surface with 1/8" wall legs and 3/8" dia. Steel cuff rings with powder coat finish. Bolt to floor.

2.5 FABRICATION

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Coordinate dimensions and attachment methods of detention furniture with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.

C. Shear and punch metals cleanly and accurately. Remove burrs.

D. Form and grind edges and corners to be free of sharp edges or rough areas.

1. Fabricate detention furniture with no more than 1/32-inch (0.8-mm) gap between component materials. Weld edges that cannot be crimped to meet tolerance so as to provide a seamless joint with no place for concealment of contraband.

E. Form metal in maximum lengths to minimize joints. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.

F. Weld corners and seams continuously to comply with referenced AWS standard and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish exposed welds and surfaces smooth and blended at exposed connections so that no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
5. Weld before finishing components to greatest extent possible. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

G. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure detention furniture rigidly in place and to support expected loads. Build in straps, plates, and brackets as needed to support and anchor fabricated items to

adjoining construction. Reinforce formed-metal units as needed to attach and support other construction.

H. Cut, reinforce, drill, and tap detention furniture as indicated to receive hardware, security fasteners, and similar items.

I. Form exposed work true to line and level with accurate angles, surfaces, and straight sharp edges.

J. Form exposed connections with hairline joints, flush and smooth using concealed fasteners where possible. Use exposed security fasteners of type indicated or, if not indicated, flat-head (countersunk) security fasteners. Locate joints where least conspicuous.

K. Attach drawer slides shelves to furniture by welding.

2.4 SECURITY SEALANTS

A. Epoxy Security Sealants: Manufacturer's standard, non-sag, tamper-resistant sealant for joints with no movement.

1. Products: subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to, the following:
   a. BASF Construction Chemicals, LLC Building Systems; Epolith-G
   b. The Euclid Chemical Company, an RPM company; Euro Model No 452-P
   c. Pecora Corporation; Dynapoxy EP-1200

2.5 ACCESSORIES

A. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.

B. Cast-in-Place Anchors in Concrete: Fabricated from corrosion-resistant materials capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing per ASTM E488/E488M, conducted by a qualified testing agency; of type indicated below:

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed; hotdip galvanized per ASTM A153/A153M or ASTM F2329/F2329M.

C. Embedded Plate Anchors: Fabricated from mild steel shapes and plates, minimum 3/16 inch (4.8 mm) thick; with minimum 1/2-inch- (12.7-mm-) diameter, headed studs welded to back of plate.

D. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of detention furniture.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations of detention furniture before detention furniture installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of detention furniture.

D. Inspect built-in and cast-in anchor installations, before installing detention furniture, to verify that anchor installations comply with requirements. Prepare inspection reports.
   1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
   2. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.

E. Verify locations of detention furniture with those indicated on Shop Drawings.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing detention furniture to in-place construction. Include threaded fasteners for concrete and masonry inserts, security fasteners, and other connectors.

B. Cutting, Fitting, and Placement: Obtain manufacturer's written approval for cutting, drilling, and fitting required for installing detention furniture. Set detention furniture accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.

E. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Finish exposed welds and surfaces smooth and blended at exposed connections so that no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
   5. Fillet Welds: Minimum size of 1/8 inch by 1-1/2 inches (3 mm by 38 mm) long, spaced not greater than 12 inches (305 mm) o.c. Fill spaces between welds with epoxy security sealant where weld is exposed.
   6. Fillet Welds: Continuous.

F. Assemble detention furniture requiring field assembly with security fasteners with no exposed fasteners on exposed faces and frames.

G. Anchor furniture with security fasteners by welding to floors and walls at intervals required by expected loads, but not more than 12 inches (305 mm) o.c.
1. Use security fasteners with head styles appropriate for installation requirements, strength, and finish of adjacent materials, except that a maximum of two different sets of tools shall be required to operate security fasteners for Project. Provide stainless-steel security fasteners in painted materials.
2. Weld nuts onto cast-in-place anchors after installation so as to be nonremovable.

H. Apply epoxy security sealant at all exposed gaps between detention furniture and adjacent Construction greater than 1/16 inch (1.6 mm).

3.3 FIELD QUALITY CONTROL

A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.

B. Remove and replace detention work if inspections indicate that work does not comply with specified requirements. Remove malfunctioning units; replace with new units.

C. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.

D. Prepare field quality-control certification endorsed by Detention Specialist that states installed products and their installation comply with requirements in the Contract Documents.

3.4 CLEANING AND PROTECTION

A. Touchup Painting: Immediately after erection, clean bolted connections and abraded areas of shop paint, and paint exposed areas with same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Touchup Painting: Cleaning and touchup painting of bolted connections and abraded areas of shop paint are specified in Section 099123 "Interior Painting."

END OF SECTION

DIVISION 21: FIRE SUPPRESSION

END TABLE OF CONTENTS

SECTION 21 0500 - COMMON REQUIREMENTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pipe, fittings, valves, and connections for sprinkler systems.

1.2 SUMMARY

A. Furnish and install an automatic fire sprinkler protection system as described in Contract Documents.
   1. System shall be installed beginning with connection to the new building service main located as shown and work shall include but not necessarily be limited to the following areas:
      a. New construction
      b. Existing and remodeled.
   2. Provide double check valve on fire sprinkler service lines.
   3. Furnish and install post indicator valves on all fire line services.
   4. It is mandatory that a site visit be made to inspect existing conditions before submitting bid.

1.3 RELATED REQUIREMENTS

A. Section 09 9123 - Painting: Preparation and painting of fire protection piping systems.

B. Section 21 1300 - Wet Pipe Fire Suppression Sprinklers: Sprinkler systems design.

1.4 REFERENCE STANDARDS

A. ASTM A 795/A 795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2008.

B. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2010.

C. NFPA 13 - Standard for the Installation of Sprinkler Systems; National Fire Protection Association; 2010.

D. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

E. UL 262 - Gate Valves for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

F. UL 312 - Check Valves for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.5 APPLICABLE CODES AND ORDINANCES

A. The following form a part of this specification:
   1. National Fire Protection Association Pamphlets: Standards of the National Fire Protection Association for the Installation of Sprinkler and Fire Protection Equipment.
      a. Pamphlet No. 13, 13D, 13R, 14, and applicable standards.
      b. Pamphlet No. 231, 231C and applicable standards.

c. And as approved over this geographical area

2. International Building Code
3. International Fire Code
4. Underwriter's Laboratories, Inc. Publications: List of Inspected Fire Protection Equipment and Materials.
5. Applicable state and local codes and ordinances pertaining to fire protection systems and equipment.
6. Requirements of State Fire Marshal.
7. Requirements of Local Fire Marshal.
8. Safety Code for Elevators and Escalators.
9. Life Safety Code.

B. Work in Idaho must be done by an Idaho licensed sprinkler contractor and plans submitted to and approved by the office of the Idaho State Fire Marshall.

C. Work in other state must be done by a licensed sprinkler contractor in that state and plans submitted to and approved in the office of the State Fire Marshal or other state agency over fire protection systems.

D. The contractor shall notify the State Fire Marshall and the Local Fire Department to witness the test of the fire sprinkler system.

1.6 VERIFICATIONS AND REQUIREMENTS

A. Fire Sprinkler Contractor shall verify adequacy of the water service to the building.

B. Fire Sprinkler Contractor shall also check with the Local City Fire Marshal, the State Fire Marshal and the Fire Rating Bureau to determine requirements for the following:
1. Fire department connections
2. Test connections
3. Exterior and interior piping
4. Spacing of heads
5. Rating of building

1.7 FEES AND PERMITS

A. Fees or permits required to furnish and install a complete fire protection system shall be included as part of this Section of the Contract Documents.

1.8 PIPE SIZING

A. Fire Sprinkler Contractor shall be required to size all piping for this project using the Hydraulic Calculation Method in accordance with requirements of National Fire Protection Association Pamphlet No. 13 for Hydraulically Designed Sprinkler Systems

1.9 SUBMITTALS

A. See General Section – for submittal procedures.

B. Product Data: Provide manufacturers catalogue information. Indicate valve data and ratings.

C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

1. Fire Sprinkler Contractor shall submit complete layouts to underwriters having jurisdiction and the State Fire Marshal for approval prior to submission to Architect.
   a. Particular attention shall be paid in layout to coordination of sprinkler piping and structural system of beams and mechanical ductwork. Notations shall be made on shop drawings where pipes are required to pass thru beams.
   b. Wall sprinkler shall be used in ramp areas where headroom is at a minimum and shall be arranged so as not to conflict with egress and door swings.
   c. Careful coordination shall be given to avoid changing ceiling lighting systems as shown on drawings.
   d. Sprinklers must be spaced equally with lights and ceiling diffusers.
   e. No fabrication of piping shall be done until piping drawings are accepted by the Architect, the Mechanical Engineer and State Fire Marshal.
2. The Fire Protection Sprinkler Contractor shall submit drawings that have been prepared and overseen by a NICET Certified Engineering Technician in fire protection with a minimum, Level 3 rating, or by a Professional Engineer in fire protection. This person shall be employed and be a staff member of the Fire Protection Contractor and shall be required to certify that the drawings are in accordance with the specifications and all regulatory requirements. All drawings shall be signed by the CET or stamped and signed by the Professional Engineer.
3. All area with exposed structure, piping shall neatly follow and be held tight to the line of the deck. When approved by the Architect, piping may follow the line of the exposed structure.

D. Project Record Documents: Record actual locations of components and tag numbering.

E. Operation and Maintenance Data: Include installation instructions and spare parts lists.

1.10 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer: The sub-contractor for the fire protection system shall be duly licensed by the state, county and city in which the project is being constructed. The fire sprinkler contractor must be engaged in the installation of the types of automatic fire sprinkler system required for this project and be fully familiar with all local conditions, specified codes and requirements. Prior to installation, submit data for approval showing that the Fire Sprinkler Contractor has successfully installed Automatic Fire Sprinkler Systems of the type and design as specified herein.

C. Designer: The designer for the fire sprinkler system shall be a staff employee of the “Installer” and shall be either a licensed Fire Protection Engineer in the State of Idaho, or a Certified Engineering Technician in Fire Protection, Level III (NICET Level III). Registration or certification shall be active during the entire contract period. The designer shall certify that the drawings and installation are in accordance with the intent of the plans and specifications. The designer shall make a complete and final inspection of the installation, including operating all alarms, control valves, checking all piping, seismic bracing, hangers, etc. After checking all components of the system, the designer

shall provide a letter stating the installation is complete, operational and in accordance with approved plans and specifications. If changes have been made in the installation since the plans were approved, the designer shall correct the shop drawings and provide as-built drawings to the Owner with the letter.

D. Valves: Bear UL label or marking. Provide manufacturer's name and pressure rating marked on valve body.

E. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

F. Final Inspection: The Sprinkler Contractor CET or PE responsible for overseeing this project shall make a complete and final inspection of the installation, checking out all alarms, valves, piping, seismic bracing, hangers, etc., conduct a final main drain test on the system, and provide documentation of this final inspection

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 - PRODUCTS

2.1 FIRE PROTECTION SYSTEMS

A. Sprinkler Systems: Conform work to NFPA 13.

B. Welding Materials and Procedures: Conform to ASME Code.

2.2 BURIED PIPING

A. Steel Pipe: ASTM A 53/A 53M Schedule 40 or ASTM A 795 Standard Weight, black , with AWWA C105 polyethylene jacket, or double layer, half-lapped polyethylene tape.
   1. Steel Fittings: ASME B16.9, wrought steel or buttwelded; with double layer, half-lapped polyethylene tape.
   2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings.
   3. Joints: Welded in accordance with AWS D1.1.
   4. Casing: Closed glass cell insulation.

2.3 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A 795 Schedule 10 or ASTM A 53 Schedule 40, black.
   1. Steel Fittings: ASME B16.9, wrought steel or buttwelded.
   2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings, ASME B16.4 and threaded fittings.
   3. Malleable Iron Fittings: ASME B16.3 and threaded fittings.
   4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

B. CPVC Pipe: ASTM F 422/F 442M, SDR 13.5.
   1. Fittings: ASTM F Schedule 40, or ASTM F 439 Scheduled 80, C PVC.

2. Joints: Solvent welded using ASTM F 493 Cement.

2.4 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm): Malleable iron, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 inches (50 mm) and Over: Carbon steel, adjustable, clevis.

C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

D. Wall Support for Pipe Sizes to 3 inches (80 mm): Cast iron hook.

E. Wall Support for Pipe Sizes 4 inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.

F. Vertical Support: Steel riser clamp.

G. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

H. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.5 GATE VALVES

A. Up to and including 2 inches (50 mm):
1. Manufacturers:
a. Nibco ; Product Model F-637-31 Flanged Ends.
b. Mueler; Product Model A-2073-6 Flanged Ends.
2. Bronze body, bronze trim, rising stem, handwheel, solid wedge or disc, threaded ends.

B. Over 2 inches (50 mm):
1. Manufacturers:
a. Nibco ; Product Model F-637-31 Flanged Ends.
b. Mueler; Product Model A-2073-6 Flanged Ends.
2. Iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, handwheel, OS&Y, solid rubber covered bronze or cast-iron wedge, flanged ends.

C. Over 4 inches (100 mm):
1. Manufacturers
:
a. Nibco ; Product Model F-637-31 Flanged Ends.
b. Mueler; Product Model A-2073-6 Flanged Ends.
2. Iron body, bronze trim, non-rising stem with bolted bonnet, solid bronze wedge, flanged ends, iron body indicator post assembly.

2.6 GLOBE OR ANGLE VALVES

A. Up to and including 2 inches (50 mm):
1. Bronze body, bronze trim, rising stem and handwheel, inside screw, renewable rubber disc, threaded ends, with backseating capacity repackable under pressure.

B. Over 2 inches (50 mm):
1. Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc,

flanged ends, renewable seat and disc.

2.7 BALL VALVES

A. Up to and including 2 inches (50 mm):
1. Manufacturers:
a. Milwaukee Model BBSC with threaded ends
b. Nibco Model T-505 with threaded ends
c. Nibco Model G-505 with grooved ends
2. Bronze two piece body, brass, chrome plated bronze, or stainless steel ball, teflon seats and stuffing box ring, lever handle and balancing stops, threaded ends with union.

B. Over 2 inches (50 mm):
1. Manufacturers:
a. Milwaukee Model BBSC with threaded ends
b. Nibco Model T-505 with threaded ends
c. Nibco Model G-505 with grooved ends
2. Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle or gear drive handwheel for sizes 10 inches (250 mm) and over, flanged.

2.8 BUTTERFLY VALVES

A. Bronze Body:
1. Manufacturers:
a. Mueller:
1) Model B-3250-00 Wafer type with valve tamper switch
2) Model B-3250-52 Grooved ends type with valve tamper switch
b. Nibco:
1) Model WD3510-4 Wafer type with valve tamper switch
2) Model GD1765-4 Grooved type with valve tamper switch
c. Norris Model NW285AC-2K Wafer type with optional tamper switch
d. Pratt Model IBV
2. Stainless steel disc, resilient replaceable seat, threaded or grooved ends, extended neck, handwheel and gear drive and integral indicating device , and built-in tamper proof switch rated 10 amp at 115 volt AC.

B. Cast or Ductile Iron Body
1. Manufacturers:
a. Mueller:
1) Model B-3250-00 Wafer type with valve tamper switch
2) Model B-3250-52 Grooved ends type with valve tamper switch
b. Nibco:
1) Model WD3510-4 Wafer type with valve tamper switch
2) Model GD1765-4 Grooved type with valve tamper switch
c. Norris Model NW285AC-2K Wafer type with optional tamper switch
d. Pratt Model IBV
2. Cast or ductile iron, chrome or nickel-plated ductile iron or aluminum bronze disc, resilient replaceable EPDM seat, wafer, lug, or grooved ends, extended neck, handwheel and gear drive and integral indicating device , and internal tamper switch rated 10 amp at 115 volt AC.

2.9 CHECK VALVES

A. Up to and including 2 inches (50 mm):
1. Manufacturers:
a. Nibco Model KT-403-W
b. Walworth Figure 412
2. Bronze body and swing disc, rubber seat, threaded ends.

B. Over 2 inches (50 mm):
1. Manufacturers:
a. Nibco Model F-938-31
b. Walworth Fig. 883F
c. Mueller Model A-2120-6
2. Iron body, bronze trim, swing check with rubber disc, renewable disc and seat, flanged ends with automatic ball check.

C. 4 inches (100 mm) and Over:
1. Iron body, bronze disc, stainless steel spring, resilient seal, threaded, wafer, or flanged ends.

2.10 DRAIN VALVES

A. Compression Stop:
1. Bronze with hose thread nipple and cap.

B. Ball Valve:
1. Manufacturers:
a. Milwaukee Model BBSC with threaded ends
b. Nibco Model T-505 with threaded ends
c. Nibco Model G-505 with grooved ends
2. Brass with cap and chain, 3/4 inch (20 mm) hose thread.

2.11 POST INDICATOR VALVES

A. Furnish and install at each fire service entrance a “Post Indicator Valve” with alarm switch equal to Kennedy.

PART 3 - EXECUTION

3.1 FIRE SPRINKLER CONTRACTOR

A. It is the responsibility of the Fire Sprinkler Contractor to inspect the job site prior to fabricating materials. The Fire Sprinkler Contractor shall coordinate the design with all plans and other contractors so that construction can be done without problems. The Fire Sprinkler Contractor shall call for a meeting with all trades to coordinate and sequence installation with the progress of other mechanical and structural systems and work out spaces for all of the work. By doing so, the project will proceed at the General Contractor’s completion schedule.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

C. Install piping to conserve building space, to not interfere with use of space and other work.

D. Areas Subject to Freezing Temperatures:

1. Branches serving these areas may contain a cold weather valve and anti-freeze loop or dry heads.

E. Group piping whenever practical at common elevations.

F. Sleeve pipes passing through partitions, walls, and floors.

G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

H. Pipe Hangers and Supports:

1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
2. Place hangers within 12 inches of each horizontal elbow.
3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
6. Provide copper plated hangers and supports for copper piping.
7. Prime coat exposed steel hangers and supports. Refer to Painting Section. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

I. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain bottom of pipe level.

J. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding. Refer to General Painting Section.

K. Do not penetrate building structural members unless indicated and approved in writing by the Structural Engineer.

L. Provide sleeves when penetrating footings, floors, and walls. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.

M. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

N. Die cut threaded joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.

O. Install valves with stems upright or horizontal, not inverted. Remove protective

coatings prior to installation.

P. Provide gate valves for shut-off or isolating service.

Q. Provide drain valves at main shut-off valves, low points of piping and apparatus.

R. Work shall be executed and inspected in accord with laws, ordinances, rules and regulations of local authorities having jurisdiction over such work. Should any change in the drawings or specifications be required to conform to these ordinances, Fire Sprinkler Contractor shall notify the Architect-Engineer at time of submitting his bid. After entering into the contract, Fire Sprinkler Contractor shall be held to complete all necessary work to meet local requirements without expense to Owner.

S. Sprinkler system shall be installed such that spacing of sprinkler heads in relation to ceiling shall not exceed that permitted for type of ceiling construction involved.

T. General Contractor is required under contract stipulations to leave chases and openings in walls, floors, ceilings, partitions and beams, etc., provided Fire Sprinkler Contractor shall furnish to General Contractor full information as to locations, dimensions, etc., of such chases and openings including the provision and proper setting of all sleeves and other equipment in advance of construction of work so as to cause no delay in work.

U. Should any cutting of walls, floors, ceilings, partitions, etc., be required for proper installation of the work or apparatus of Fire Sprinkler Contractor due to his failure in giving the General Contractor proper information at time required, such cutting shall be done at his own expense and in a manner acceptable to Architect-Engineer. All drilling and patching for anchor bolts, hangers, and other supports shall be subject to approval of Architect-Engineer.

V. Siamese connections and watermains to sprinkler room shall be provided by Fire Sprinkler Contractor and connections to sprinkler system shall be by Fire Sprinkler Contractor.

W. Conduits and wiring for alarm contacts, power wiring from starter to motor, and starter shall be provided and wired complete by Electrical Contractor for testing by Fire Sprinkler Contractor. Control wiring from starter to control and safety devices shall be provided and wired by Fire Sprinkler Contractor.

3.4 FIELD TESTING

A. All portions of the system shall be hydrostatically tested.

B. Flushing of underground piping shall be done in accord with National Fire Protection Association.

C. On completion of the work, system shall be tested by full flow.
1. Each control valve for each sprinkler system shall be tested by use of an inspector's test valve or the application of heat to sprinkler head most remote from the valve.
2. All alarms and other devices shall be tested.
3. All appliances and equipment for testing shall be furnished by Fire Sprinkler Contractor.
4. Expenses, except for water and electricity used in connection with the tests, shall be defrayed by Fire Sprinkler Contractor.
5. On completion of tests by Fire Sprinkler Contractor, any defects detected shall be corrected by Fire Sprinkler Contractor at his own expense and additional tests made until systems are proved satisfactory.

6. Fire Sprinkler Contractor shall submit to Architect-Engineer a certificate covering materials and tests, similar to that specified by National Fire Protection Association, with a request for formal inspection at least five working days prior to date of inspection. The State and Local Fire Marshalls shall also be notified to witness this test. At such inspection any or all of required tests shall be repeated as directed by the Architect- Engineer.

END OF SECTION 21 0500

SECTION 21 0548 - VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Vibration isolators.

B. Seismic restraints.

1.2 SUBMITTALS

A. See General Section – for submittal procedures.

B. Product Data: Provide schedule of vibration isolator type with location and load on each.

C. Shop Drawings: Indicate seismic control measures.

D. Manufacturer's Instructions: Indicate installation instructions with special procedures and setting dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Isolation Technology, Inc: www.isolationtech.com.

B. Kinetics Noise Control, Inc: www.kineticsnoise.com.

C. Mason Industries: www.mason-ind.com.

2.2 VIBRATION ISOLATORS

A. Spring Hanger:
1. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection. Color code springs for load carrying capacity.
2. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators.
3. Misalignment: Capable of 20-degree hanger rod misalignment.

B. Neoprene Pad Isolators:
1. Rubber or neoprene waffle pads.
   a. Hardness: 30 durometer.
   b. Thickness: Minimum 1/2 inch.
   c. Maximum Loading: 50 psi.
   d. Rib Height: Maximum 0.7 times width.
2. Configuration: Single layer.
3. Configuration: 1/2 inch thick waffle pads bonded each side of 1/4 inch thick steel plate.

C. Rubber Mount or Hanger: Molded rubber designed for 0.4 inch deflection with threaded insert.

D. Seismic Fittings and Braces:
1. Earthquake bracing is required and shall conform to the minimum requirements of NFPA-13 and the State Fire Marshall requirements.
2. Calculate and show on the submittal drawings the type of earthquake bracing to

be used and its UL listing or FM approval.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.2 FIELD QUALITY CONTROL

A. Inspect isolated equipment after installation and submit report.

END OF SECTION 21 0548

SECTION 21 0553 - IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND

EQUIPMENT PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe Markers.

1.2 RELATED REQUIREMENTS

A. General Painting Section - Painting: Identification painting.

1.3 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.

1.4 SUBMITTALS

A. See General Section – for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

F. Project Record Documents: Record actual locations of tagged valves.

PART 2 - PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

A. Automatic Controls: Tags.

B. Control Panels: Nameplates.

C. Instrumentation: Tags.

D. Major Control Components: Nameplates.

E. Piping: Tags.

F. Relays: Tags.

G. Small-sized Equipment: Tags.

H. Valves: Namplates and ceiling tacks where above lay-in ceilings.

2.2 NAMEPLATES

A. Manufacturers:
1. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.

2. Seton Identification Products: www.seton.com.

B. Description: Laminated three-layer plastic with engraved letters.
1. Letter Color: White.
2. Letter Height: 1/4 inch (6 mm).
3. Background Color: Black.
4. Thickness: 1/8 inch (3 mm).
5. Plastic: Conform to ASTM D 709.

2.3 TAGS

A. Manufacturers:
1. Advanced Graphic Engraving: www.advancedgraphicengraving.com.
2. Brady Corporation: www.bradycorp.com.
3. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
4. Seton Identification Products: www.seton.com.

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

D. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.4 STENCILS

A. Manufacturers:
1. Brady Corporation: www.bradycorp.com.
2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
3. Seton Identification Products: www.seton.com.

B. Stencils: With clean cut symbols and letters of following size:
1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.
5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3-1/2 inch high letters.
6. Equipment: 2-1/2 inch high letters.

C. Stencil Paint: As specified in Painting Section, semi-gloss enamel, colors conforming to ASME A13.1.

2.5 PIPE MARKERS

A. Manufacturers:
1. Brady Corporation: www.bradycorp.com.
2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
3. MIFAB, Inc.: www.mifab.com.
4. Seton Identification Products: www.seton.com.

B. Color: Conform to ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit

around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

E. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

F. Color code as follows:
1. Fire Quenching Fluids: Red with white letters.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Painting Section - Painting for stencil painting.

3.2 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Apply stencil painting in accordance with Painting Section.

D. Install plastic pipe markers completely around pipe in accordance with manufacturer's instructions.

E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

F. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

G. Locate ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 21 05

SECTION 21 1300 – WET PIPE FIRE SUPPRESSION

SPRINKLERS PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. System design, installation, and certification.

C. Fire department connections.

1.2 RELATED REQUIREMENTS

A. Section 21 0500 - Common Requirements for Fire Suppression: Pipe, fittings, and valves.

B. Section 21 0548 - Vibration and Seismic Controls for Fire Suppression Piping and Equipment.

C. Section 21 0553 - Identification for Fire Suppression Piping and Equipment.

D. Section 26 0519 – Line Voltage Electrical Power Conductors and Cables: Electrical characteristics and wiring connections.

E. Section 26 6411 – Automatic Fire Alarm and Detection System.

1.3 REFERENCE STANDARDS

A. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.4 SUBMITTALS

A. See Section 01 3300 – for submittal procedures.

B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Shop Drawings:
1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
3. Submit shop drawings to authority having jurisdiction for approval. Submit proof of approval to Architect.

D. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

E. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.

F. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

G. 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 Sprinklers: Type and size matching those installed, in quantity required by referenced NFPA design and installation standard.
3. Sprinkler Wrenches: For each sprinkler type.

1.5 QUALITY ASSURANCE

A. Maintain one copy of referenced design and installation standard on site.

B. Conform to UL requirements.

C. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State of Idaho.

D. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

E. Equipment and Components: Provide products that bear UL label or marking.

F. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Sprinklers, Valves, and Equipment:
1. Tyco Fire Suppression & Building Products: www.tyco-fire.com.
2. Viking Corporation: www.vikinggroupinc.com.
3. Reliable: www.reliablehvac.com
4. Central: www.aecinfo.com
5. Substitutions: See Section 01 6000 - Product Requirements.

2.2 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for entire building.

B. Occupancy: Comply with NFPA 13 for hazard classification.

C. Water Supply: Determine volume and pressure from water flow test data.
1. Revise design with test data available prior to submittals.

D. Provide fire department connections where indicated.

E. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

2.3 SPRINKLERS

A. Suspended Ceiling Type: Semi-recessed pendant type with matching screw on escutcheon plate.
1. Finish: Enamel, color white.
2. Escutcheon Plate Finish: White.

3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

B. Concealed Ceiling Type: Fully recessed with surface cap.
1. Finish: Enamel, color white.
2. Surface Cap Finish: White.
3. Fusible Link: Fusible solder link type, temperate rated for specific area hazard.

C. Exposed Area Type: Pendant upright type with guard.
1. Finish: Brass.
2. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

D. Sidewall Type: Semi-recessed horizontal sidewall type with matching screw on escutcheon plate.
1. Finish: Brass.
2. Escutcheon Plate Finish: Brass.
3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

E. Dry Sprinklers: Standard pendant type with matching screw on escutcheon plate.
1. Finish: Brass.
2. Escutcheon Plate Finish: Brass.
3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

F. Furnish and install special sprinkler heads on each side of all windows or doors with windows in the two hour fire rated walls as required by I.B.C. 715.
1. White enamel finish.
2. Liquid filled bulb link.
3. White escutcheon plates.

G. Guards: Finish to match sprinkler finish.

H. Spray Nozzles: Brass with solid cone discharge, 30 degrees of arc with blow-off dust cap.

2.4 SPRINKLER HEADS

A. Sprinkler head orifice sizes shall be in accordance with National Fire Protection Association.

B. Any change in spacing must be in straight rows with lights and walls.

C. Sprinkler heads shall be automatic and conventional (spray) type approved by a nationally recognized testing laboratory.

D. Each head shall have an orifice of nominal 1/2" diameter.

E. Sprinkler heads shall be pendant type where installed above a hung ceiling.

2.5 PROTECTIVE GUARDS

A. Heavy wire protective guard shall be provided for sprinkler heads located in heavy use areas where damage may result including, but not limited to:

B. Gyms, Wrestling rooms

C. Locker rooms

D. Multi-purpose rooms

E. Shops

F. Equipment rooms

2.6 PIPING SPECIALTIES

A. Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm and electric alarm, with pressure retard chamber and variable pressure trim ; with test and drain valve.

B. Electric Alarm: 24 volt D.C. electrically operated chrome plated gong with pressure alarm switch.

C. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.

D. Fire Department Connections:
1. Type: Flush mounted wall type with brass finish.
2. Outlets: Two way with thread size to suit fire department hardware; threaded dust cap and chain of matching material and finish.
3. Drain: 3/4 inch (19 mm) automatic drip, outside.
4. Label: "Sprinkler - Fire Department Connection".

E. Post indicator valves.

PART 3 - EXECUTION

3.1 INSPECTION

A. It is the responsibility of the Fire Sprinkler Contractor to inspect the job site prior to fabricating materials. The Fire Sprinkler Contractor shall coordinate the design with all plans and other contractors so that construction can be done without problems. The Fire Sprinkler Contractor shall call for a meeting with all trades to coordinate and sequence installation with the progress of other mechanical and structural systems and work out spaces for all of the work. By doing so, the project will proceed at the General Contractor’s completion schedule.

3.2 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

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

C. Work to begin inside building, at base of flange to underground fire protection water main.

D. Install system in compliance with methods detailed in NFPA-13, including seismic requirements for Area 3.

E. Offset as needed for other trades. Avoid conflict in areas of tight construction. Do not obstruct access to air control boxes, access doors, lights or other ceiling mounted equipment.

F. Submit piping and equipment data sheets for review by the Architect prior to the start ofthe installation.

G. Install piping straight and true to bear evenly on hangers and supports. Keep the

interior and ends of new piping thoroughly cleaned of foreign matter by closing pipe openings with caps or plugs during installation. Cover and protect components of the system against dirt, chemical or mechanical injury.

H. Piping shall only be installed in areas where temperatures will not drop below 40°F. If piping must be installed in areas where temperature is not maintained above 40°F, the piping must be fitted with an antifreeze loop and filled with an antifreeze solution per the requirements of NFPA- 13.

I. Fire sprinklers shall be centered in ceiling tile in one direction and a minimum of 4-inches from acoustical ceiling ("T") grid. Provide piping offsets or flexible offsets as required that meet the code. Install fire sprinkler head guards on fire sprinklers lower than 7-feet above finished floor and as identified in 2.05.

J. Fire sprinkler piping that is exposed shall be approved and coordinated with the Architect, prior to any pipe fabrication and/or installation of fire sprinkler piping. Care shall be used in locating exposed fire sprinkler piping.

K. Install inspectors test valve at an accessible height, without the use of a ladder, or having to remove ceiling tiles. Location to be approved by the Architect.

L. Provide concrete splash blocks for drains, test valve discharge, etc. Concrete splash blocks shall be prefabricated, 2-1/2inches thick.

M. Install special sprinkler heads on each side of windows or doors with windows in the two hour rated fire walls as required by I.B.C. 715.

N. Provide white painted escutcheons around exposed piping, where piping passes through walls or ceilings in a finished area.

O. Field Changes: Do not make field changes for piping layout or sizing without prior approval, after the approval of the fire sprinkler drawings.

P. Provide approved double check valve assembly at sprinkler system water source connection.

Q. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.

R. Locate outside alarm gong on building wall as indicated.

S. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

T. Flush entire piping system of foreign matter.

U. Hydrostatically test entire system.

V. Require test be witnessed by Fire Marshal.

W. Conduct an inspection and operational test at the end of the one-year warrantee period in accordance with NFPA-25. Provide a written report to the Owner at the completion of the inspection.

3.3 INTERFACE WITH OTHER PRODUCTS

A. Ensure required devices are installed and connected as required to fire alarm system.

B. Work with Fire Alarm Contractor to ensure system alarms properly when activated.

C. Work with Electrical Contractor to ensure that all control devices are properly wired with electrical power and connected to power and alarm systems.

3.4 ACCEPTANCE

A. Acceptance of installation is subject to final inspection and approval by:
1. Idaho State Fire Marshal's Office.
2. Local Fire Department.
3. Architect or his Representative

END OF SECTION 21 1300

END OF DIVISION 21

DIVISION 22: PLUMBING

END TABLE OF CONTENTS

SECTION 22 0501 - COMMON PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Furnish labor, materials, and equipment necessary for completion of work as described in Contract Documents.

B. It is the intent of these specifications that the systems specified herein are to be complete and operational before being turned over to the owner. During the bidding process, the contractor is to ask questions or call to the engineer's attention any items that are not shown or may be required to make the system complete and operational. Once the project is bid and the contractor has accepted the contract, it is his responsibility to furnish and install all equipment and parts necessary to provide a complete and operational system without additional cost to the owner.

C. Furnish and install fire stopping materials to seal penetrations through fire rated structures and draft stops.

1.3 SUBMITTALS

A. Substitutions: By specific designation and description, standards are established for specialties and equipment. Other makes of specialties and equipment of equal quality will be considered provided such proposed substitutions are submitted to the Architect for his approval, complete with specification data showing how it meets the specifications, at least 5 working days prior to bid opening. A list of approved substitutions will be published as an addendum but does not relieve Contractor from meeting all requirements of the specifications.
   1. Submit a single copy of Manufacturer's catalog data including Manufacturer's complete specification for each proposed substitution.
   2. The Architect or Engineer is to be the sole judge as to the quality of any material offered as an equal.

B. Product Data, Shop Drawings: Within 30 days after award of contract, submit 10 sets of Manufacturer's catalog data for each manufactured item.
   1. Literature shall include enough information to show complete compliance with Contract Document requirements.
   2. Mark literature to indicate specific item with applicable data underlined.
   3. Information shall include but not be limited to capacities, ratings, type of material used, guarantee, and such dimensions as are necessary to check space requirements.
   4. When accepted, submittal shall be an addition to Contract Documents and shall be in equal force. No variation shall be permitted.
   5. Even though the submittals have been accepted by the Engineer, it does not relieve the contractor from meeting all of the requirements of the plans and specifications and providing a complete and operational system.

C. Drawings of Record: One complete set of blue line mechanical drawings shall be provided for the purpose of showing a complete picture of the work as actually installed.

1. These drawings shall serve as work progress report sheets. Contractor shall make notations neat and legible therein daily as the work proceeds.
2. The drawings shall be kept at the job at a location designated by the Mechanical Engineer.
3. At completion of the project these "as-built" drawings shall be signed by the Contractor, dated, and returned to the Architect.

D. Operating Instructions and Service Manual: The Mechanical Contractor shall prepare 2 copies of an Operation and Maintenance Manual for all mechanical systems and equipment used in this project. Manuals shall be bound in hard-backed binders and the front cover and spine of each binder shall indicate the name and location of the project. Use plastic tab indexes for all sections. Provide a section for each different type of equipment item. The following items shall be included in the manual, together with any other pertinent data. This list is not complete and is to be used as a guide.
1. Provide a master index at the beginning of the manual showing all items included.
2. The first section of the manual shall contain:
   A. Names, addresses, and telephone numbers of Architect, Mechanical Engineer, Electrical Engineer, General Contractor, Plumbing Contractor, Sheet Metal Contractor, and Temperature Control Contractor.
   B. List of Suppliers which shall include a complete list of each piece of equipment used with the name, address, and telephone number of vendor.
   C. General Description of Systems including –
      1. Location of all major equipment
      2. Description of the various mechanical systems
      3. Description of operation and control of the mechanical systems
      4. Suggested maintenance schedule
   D. Copy of contractor's written warranty
3. Provide a copy of approved submittal literature for each piece of equipment.
4. Provide maintenance and operation literature published by the manufacturer for each piece of equipment which includes: oiling, lubrication and greasing data; belt sizes, types and lengths; wiring diagrams; step-by-step procedure to follow in putting each piece of mechanical equipment in operation.
5. Include parts numbers of all replaceable items.
6. Provide control diagram and operation sequence, along with labeling of control piping and instruments to match diagram.
7. Include a valve chart indicating valve locations.
8. Include air balance and/or water balance reports.

1.4 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
1. Perform work in accordance with applicable provisions of local and state Plumbing Code, Gas Ordinances, and adoptions thereof. Provide materials and labor necessary to comply with rules, regulations, and ordinances.
2. In case of differences between building codes, state laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Promptly notify Architect in writing of such differences.

B. Applicable Specifications: Referenced specifications, standards, and publications shall be of the issues in effect on date of Advertisement for Bid.
1. "Heating, Ventilating and Air Conditioning Guide" published by the American Society of Heating and Air Conditioning Engineers.

2. "Engineering Standards" published by the Heating, Piping, and Air Conditioning Contractors National Association.
3. "2018 International Building Code", "2018 International Mechanical Code", and "2018 International Fire Code" as published by the International Conference of Building Officials.
4. “2017 Idaho Plumbing Code” as published by the International Association of Plumbing and Mechanical Officials.
5. "National Electrical Code" as published by the National Fire Protection Association.
6. "2018 International Energy Conservation Code ".

1.5 INSPECTIONS AND PERMITS

A. Pay for permits, fees, or charges for inspection or other services. Local and state codes and ordinances must be properly executed without expense to Owner and are considered as minimum requirements. Local and state codes and ordinances do not relieve the Contractor from work shown that exceeds minimum requirements.

1.6 ADDITIONAL WORK:

A. Design is based on equipment as described in the drawing equipment schedule. Any change in foundation bases, electrical wiring, conduit connections, piping, controls and openings required by alternate equipment submitted and approved shall be paid for by this division. All work shall be in accordance with the requirements of the applicable sections.

PART 2 - NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Inspection:
   1. Examine premises and understand the conditions which may affect performance of work of this Division before submitting proposals for this work.
   2. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

B. Drawings:
   1. Plumbing drawings show general arrangement of piping, equipment, etc, and do not attempt to show complete details of building construction which affect installation. This Contractor shall refer to architectural, structural, mechanical, and electrical drawings for additional building detail which affect installation of his work.
      A. Follow plumbing drawings as closely as actual building construction and work of other trades will permit.
      B. No extra payments will be allowed where piping and/or ductwork must be offset to avoid other work or where minor changes are necessary to facilitate installation.
      C. Everything shown on the plumbing drawings shall be the responsibility of Plumbing Contractor unless specifically noted otherwise.
   2. Consider architectural and structural drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over mechanical drawings.
   3. Because of small scale plumbing drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings,

valves, and accessories required to meet conditions. Do not scale drawings for locations of equipment or piping. Refer to large scale dimensioned drawings for exact locations.

C. Insure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents.
   1. If approval is received to use other than specified items, responsibility for specified capacities and insuring that items to be furnished will fit space available lies with this Division.
   2. If non-specified equipment is used and it will not fit job site conditions, this Contractor assumes responsibility for replacement with items named in Contract Documents.

3.2 PREPARATION

A. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns, or trusses.
   1. Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials.
   2. Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.
   3. Cutting, patching, repairing, and replacing pavements, sidewalks, roads, and curbs to permit installation of work of this Division is responsibility of Section installing work.

3.3 INSTALLATION

A. Arrange pipes, ducts, and equipment to permit ready access to valves, unions, traps, starters, motors, control components, and to clear openings of doors and access panels.

3.4 STORAGE AND PROTECTION OF MATERIALS:

A. Provide storage space for storage of materials and assume complete responsibility for losses due to any cause whatsoever. Storage shall not interfere with traffic conditions in any public thoroughfare.

B. Protect completed work, work underway, and materials against loss or damage.

C. Close pipe openings with caps or plugs during installation. Cover fixtures and equipment and protect against dirt, or injury caused by water, chemical, or mechanical accident.

3.5 EXCAVATION AND BACKFILL

A. Perform necessary excavation of whatever substance encountered for proper laying of all pipes and underground ducts.
   1. Excavated materials not required for fill shall be removed from site as directed by Engineer.
   2. Excavation shall be carried low enough to allow a minimum coverage over underground piping of 5'-0" or to be below local frost level.
   3. Excess excavation below required level shall be backfilled at Contractor's expense with earth, sand, or gravel as directed by Engineer. Tamp ground thoroughly.
   4. Ground adjacent to all excavations shall be graded to prevent water running into excavated areas.

B. Backfill pipe trenches and allow for settlement.
   1. Backfill shall be mechanically compacted to same density as surrounding undisturbed earth.
   2. Cinders shall not be used in backfilling where steel or iron pipe is used.
   3. No backfilling shall be done until installation has been approved by the Engineer.

3.6 COOPERATION

A. Cooperate with other crafts in coordination of work. Promptly respond when notified that construction is ready for installation of work under Division 22. Contractor will be held responsible for any delays which might be caused by his negligence or failure to cooperate with the other Contractors or crafts.

3.7 SUPERVISION

A. Provide a competent superintendent in charge of the work at all times. Anyone found incompetent shall be removed at once and replaced by someone satisfactory, when requested by the Architect.

3.8 INSTALLATION CHECK:

A. An experienced, competent, and authorized representative of the manufacturer or supplier of each item of equipment indicated in the equipment schedule shall visit the project to inspect, check, adjust if necessary, and approve the equipment installation. In each case, the equipment supplier's representative shall be present when the equipment is placed in operation. The equipment supplier's representative shall revisit the project as often as necessary until all trouble is corrected and the equipment installation and operation is satisfactory to the Engineer.

B. Each equipment supplier's representative shall furnish to the Owner, through the Engineer, a written report certifying the following:
   1. Equipment has been properly installed and lubricated.
   2. Equipment is in accurate alignment.
   3. Equipment is free from any undue stress imposed by connecting piping or anchor bolts.
   4. Equipment has been operated under full load conditions.
   5. Equipment operated satisfactorily.

C. All costs for this installation check shall be included in the prices quoted by equipment suppliers.

3.9 CLEANING EQUIPMENT AND PREMISES

A. Properly lubricate equipment before Owner's acceptance.

B. Clean exposed piping, equipment, and fixtures. Repair damaged finishes and leave everything in working order.

C. Remove stickers from fixtures and adjust flush valves.

D. Trap elements shall be removed during cleaning and flushing period. Replace trap elements and adjust after cleaning and flushing period.

3.10 TESTS

A. No piping work, fixtures, or equipment shall be concealed or covered until they have been inspected and approved by the inspector. Notify inspector when the work is ready for inspection.

B. All work shall be completely installed, tested as required by Contract Documents and the city and county ordinances and shall be leak-tight before the inspection is requested.

C. Tests shall be repeated to the satisfaction of those making the inspections.

D. Water piping shall be flushed out, tested at 100 psi and left under pressure of supply main or a minimum of 40 psi for the balance of the construction period.

3.11 WARRANTEE

A. Contractor shall guarantee work under Division 22 to be free from inherent defects for a period of one year from acceptance.
   1. Contractor shall repair, revise or replace any and all such leaks, failure or inoperativeness due to defective work, materials, or parts free of charge for a period of one year from final acceptance, provided such defect is not due to carelessness in operation or maintenance.

B. In addition to warrantee specified in General Conditions and plumbing systems are to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.

3.12 ONE YEAR PERIOD OF CORRECTIONS

A. Contractor shall warrant work as provided by the General Conditions of the contract, (AIA Document A201, 1997 edition). The contractor shall specifically reference paragraph 3.5 WARRANTY and Paragraph 12.2, CORRECTION OF WORK.

B. Contractor shall certify work under Division 22 to be free from inherent defects for a period of one year from the date of substantial completion.

C. Contractor shall repair, revise or replace any and all such leaks, failure or inoperativeness due to defective work, materials, or parts free of charge for a period of one year from final substantial completion , provided such defect is not due to carelessness in operation or maintenance.

3.13 SYSTEM START-UP, OWNER'S INSTRUCTIONS

A. Owner's Instructions
   1. Instruct building maintenance personnel and Owner Representative in operation and maintenance of mechanical systems utilizing Operation & Maintenance Manual when so doing.
   2. Minimum instruction periods shall be as follows –
      A. Plumbing - Four hours.
   3. Instruction periods shall occur after Substantial Completion inspection when systems are properly working and before final payment is made.
   4. None of these instructional periods shall overlap another.

END OF SECTION 22 0501

SECTION 22 0503 - PIPE, PIPE FITTINGS, PIPE HANGERS & VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 05 01 apply to this Section.

1.2 SUMMARY

A. General piping and valve materials and installation procedures for all piping systems.

1.3 QUALITY ASSURANCE

A. Manufacture:
1. Use domestic made valves, pipe and pipe fittings.

B. General: Support components shall conform to Manufacturer's Standardization Society Specification SP-58.

PART 2 - PRODUCTS

2.1 VALVES

A. Ball Valves:
1. 2" and smaller for domestic water service:
2. Milwaukee BA-100, bronze, screwed, 600# WOG ball valve with Teflon seats
   A. Victaulic S/722.
3. 2" and smaller for heating hot water service:
4. Milwaukee BA-100, bronze, screwed, 600# WOG ball valve with Teflon seats
   A. Victaulic S/722.
5. 2½” and larger - 3 piece full port, bronze, flanged 400# WOG with seats rated for temperature service.
6. Ball valves shall be used where ever possible.

B. Butterfly Valves:
1. 2" and Smaller:
2. Milwaukee BB2-100, bronze body, 350# WOG, stainless steel disc and stem, viton seal, and lever handle
   A. Victaulic S/700, 300, 709.
3. 2 ½" and Larger:
4. Milwaukee ML-223-E, lug wafer type, iron body, 200# WOG with aluminum-bronze disc, 416 S.S. stem, EPDM liner rated for temperature conditions and multi-lock lever
   A. Victaulic
5. Butterfly valves may be used in lieu of gate, globe, and ball valves where temperature and pressure allow.

C. Cutoff service valves may be gate Valves:
1. Up to 2" inclusive: Milwaukee No. 148
2. 2 1/2" and larger: Milwaukee No. F-2885

D. Valves used in bypasses and for throttling service may be globe valves:
   1. Up to 2" inclusive: Milwaukee No. 590
   2. 2 1/2" and larger:
   3. Milwaukee No. 359
      A. Victaulic actuated butterfly valves

E. Check Valves:
   1. Up to 2" inclusive: Milwaukee No. 509
   2. 2 1/2" and larger:
   3. Milwaukee No. F-2974
      A. Victaulic 716, 779

F. Stop and Waste Cocks:
   1. Milwaukee No. F-2885 with 3/4" Milwaukee No. 105 gate valve tapped into pipe on outlet side of main valve.

G. Use ball valves or butterfly valves everywhere unless noted otherwise.

H. Approved Manufacturers:
   1. Crane
   2. Nibco
   3. Hammond
   4. Stockham
   5. Milwaukee
   6. Victaulic

2.2 PIPE

A. Waste and Vent - (within building) above grade, 2" or less - Schedule 40 galvanized steel pipe with 125 lb. galvanized cast iron fittings or cast iron soil pipe with no-hub fittings.

B. Waste and Vent - (within building) 2 ½" or larger - Standard weight hub and spigot cast iron soil pipe with standard weight cast iron fittings and no-hub connections. All soil pipe and fittings shall bear the seal of the Cast Iron Institute.

C. Waste and Vent - (below grade) Cast iron soil pipe with "Ty-Seal" gasket joints.

D. Acid Resistant Soil Pipe: Designated AR shall be corrosion acid resisting Pyrex glass and fittings, GSR "Fuseal" polypropylene, or Orion "Proxylene."

E. Exposed waste, vent and water piping connections to fixtures shall be chrome plated.

F. Potable Hot and Cold Water Piping: Above slab shall be Type “L” copper tubing with wrought copper solder fittings. Solder with Silvaloy, Stream line 122, Phos-copper or approved equal 95/5 solder. Below slab shall be Type "K" copper with wrought copper sweat fittings. Bed piping in sandfill all around. Solder with Silvaloy and insulate. Provide dielectric waterways Style #47 between ferrous and non-ferrous piping.

G. Oil Piping: Type "L" copper (soft drawn). All joints underground shall be soldered with silver solder.

H. Gas Piping: Shall be Schedule 40-A-120 black steel pipe with black banded malleable iron fittings. Use wrapped pipe underground.

I. Roof Drain Piping: Above grade - up to 3" - Schedule 40-A-120 galvanized steel pipe with galvanized banded fittings or cast iron soil pipe with no-hub fittings. Below grade and over 3" shall be service weight cast iron soil pipe and fittings.

J. Sewer Piping: Beyond 5'-0" from the building lines - SDR-35 PVC sewer pipe or concrete sewer pipe as approved by local code. Bed piping in sandfill.

K. Water Service Main: Ductile iron mechanical joint pipe to meet the local water company specifications or Class 200 PVC as approved by local code with cast iron mechanical joint fittings or Type "K" copper with silver brazed joints. Bed piping in 4 inch sandfill all around.

L. Hot Water Heating: (Nonpotable Use) Supply and Return Piping - Schedule 40-A-120 black steel piping. Ends of all pipe shall be reamed out before being made up into fittings. Use graphite and oil applied to male threads only in making up all pipe joint fittings. Fittings shall be standard weight 150 lb. malleable iron screwed pattern up to 2 ½". Fittings over 2 ½" shall be steel welding fittings. Victaulic pipe and fittings also acceptable. Submit to Engineer before installation.

M. Steam Supply Piping and chilled Water Piping: Schedule 40-A-120 black steel piping. Ends of all pipe shall be reamed out before being made up into fittings. Use graphite and oil applied to male threads only in making all pipe joint fittings. Fittings shall be standard weight 150 lb. malleable iron screwed pattern up to 2 ½". Piping over 2 ½" shall be welded with full weld fittings.

N. Condensate Piping: Schedule 80 black steel piping. Ends of all pipe shall be reamed out before being made up into fittings. Use graphite and oil applied to male threads only in making up all pipe joint fittings. Fittings shall be standard weight 300 lb. malleable iron screwed pattern up to 2 ½". Piping over 2 ½" shall be welded with full weld fittings.

O. Victaulic couplings and fittings may be used in lieu of welded, flanged or threaded connections on chilled water, condenser water and hot water heating systems. Grade "E" gaskets shall be used up to a maximum operating temperature of 230 deg. F. Where Victaulic couplings and fittings are used, Victaulic Services 700, 300, and 709 butterfly valves may also be used. All pipe grooving and installation shall be in accordance with manufacturer's latest recommendations.

P. Condensate Drain Piping: Type "M" copper with sweat fittings or Schedule 40 PVC pipe and fittings.

Q. Electro-Hydronic Piping Materials: Piping materials used may be Schedule 40 black steel pipe with cast iron fittings, Victaulic pipe and fitting system or thin wall Schedule 105 Type A-120 or A53 pressure rated steel pipe with Victaulic roll groove fittings or weld fittings. Victaulic press fit pressure rated pipe and fittings also acceptable. Pipe materials and system shall be submitted to the Engineer before installation. All piping and fittings shall be rated and tested to 150 psi.

R. Cooling Tower Piping and Tower Sump Piping: Schedule 40 PVC pipe and fittings. 4" and larger to be flanged fittings or Victaulic grooved with PVC pipe.

S. Compressed Air Piping: 40-A-120 black steel pipe with black banded 300 lb. malleable iron fittings and coupling or Victaulic press-fit system.

T. Oxygen, Vacuum, Nitrous Oxide, and Medical Use Compressed Air: Piping shall be Type "K" copper tubing with wrought copper solder fittings. Solder with Silvaloy, Streamline 122, Phos-

Copper, Sil-Fos, or approved equal silver solder. Pipe to be "pickled" and cleaned with caustic soda. Use flux and prepare joint in accordance with solder manufacturer's recommendations. Installation shall be in accordance with NFPA latest pamphlets. Testing and certification of piping for actual flow and use required.

2.3 PIPE HANGERS

A. Adjustable, malleable iron clevis type of a diameter adequate to support pipe size.

B. Approved Manufacturers:
1. B-Line Systems Fig. B3100
2. Grinnell No. 260
3. Kin-Line 455
4. Superstrut CL-710

2.4 INSULATING COUPLINGS

A. Suitable for at least 175 PSIG WP at 250 deg F.

B. Approved Manufacturers:
1. Central Plastics Co
2. Victaulic Co
3. Watts Regulator Co

2.5 EXPANSION JOINTS

A. Install at all building expansion joints and as shown on the drawings, flexible, or nipple/flexible coupling combinations for added expansion/deflection. Submit Manufacturer’s data.

B. Approved Manufacturers
1. Victaulic Style 155, 150
2. Grinnell - Gruv-Lok
3. Garlock Garlflex 8100
4. Vibration Mountings & Controls, Inc.

2.6 SLEEVES

A. Sleeves shall be standard weight galvanized iron pipe, Schedule 40 PVC, or 14 gauge galvanized sheet metal two sizes larger than pipe or insulation.

B. Steel or heavy steel metal of the telescoping type of a size to accommodate pipe and covering wherever it passes through floors, walls, or ceilings.

2.7 INTERMEDIATE ATTACHMENTS

A. Continuous threaded rod may be used wherever possible.

B. No chain, wire, or perforated strap shall be used.

2.8 FLOOR AND CEILING PLATES

A. Brass chrome plated

2.9 APPROVED MANUFACTURERS - Grinnell and Fee/Mason

A. Concrete Inserts: Grinnell Fig. 282

B. Pipe Hanger Flange: Grinnell Fig. 163

C. Vertical Pipe: Grinnell Fig. 261 or equal.

D. Cast Iron Pipe: Grinnell Fig. 260 clevis hanger or equal

E. Pipe Attachments for steel pipe with 1" or less of insulation:
1. Grinnell Fig. 108 ring
2. Grinnell Fig. 114 turnbuckle adjuster
3. Or equal

PART 3 - EXECUTION

3.1 INSTALLATION

A. Furnish and install complete system of piping, valved as indicated or as necessary to completely control entire apparatus. Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Contractor from responsibility for proper erection of systems of piping in every respect.

B. Properly support piping and make adequate provisions for expansion, contraction, slope, and anchorage.
1. Cut piping accurately for fabrication to measurements established at site and work into place without springing or forcing.
2. Do not use pipe hooks, chains, or perforated metal for pipe support.
3. Remove burr and cutting slag from pipes.
4. Make changes in direction with proper fittings.
5. Insulate hangers for copper pipe from piping by means of at least two layers of Scotch 33 plastic tape.
6. Support piping at 8 feet on center maximum for pipe 1-1/4 inches or larger and 6 feet on center maximum for pipe one inch or less. Provide support at each elbow. Install additional support as required.
7. Suspend piping from roof trusses or clamp to vertical walls using Unistrut and clamps (except underground pipe). Laying of piping on any building member is not allowed.

C. Arrange piping to not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings. Provide accessible, ground joint unions in piping at connections to equipment.

D. Make connections of dissimilar metals with insulating couplings.

E. Provide sleeves around pipes passing through floors, walls, partitions, or structural members.
1. Seal sleeves with plastic or other acceptable material.
2. Do not place sleeves around soil, waste, vent, or roof drain lines passing through concrete floors on grade.

F. Cap or plug open ends of pipes and equipment to keep dirt and other foreign materials out of system. Do not use plugs of rags, wool, cotton waste, or similar materials.

G. Install piping systems so they may be easily drained.

H. Grade soil and waste lines within building perimeter 1/4 inch fall per ft in direction of flow.

I. Insulate water piping buried within building perimeter.
   1. Do not use reducing bushings, street elbows, or close nipples.
   2. Bury water piping 6 inches minimum below bottom of slab and encase in 2 inches minimum of sand.
   3. Do not install piping in shear walls.

J. Valves
   A. Install all isolation shut-off valves in an accusable location.
   B. Install isolation valves at all each branch line serving multiple plumbing fixtures.
   C. Where valves are above hard ceilings, or in walls provide minimum 12 x 12 access door to service valves. Label door “Plumbing Valve Access.”
   D. If valves above access doors are not within “arms reach,” install minimum 24 x 24 access door for access.
   E. Access doors shall be equal to _____.

3.2 HORIZONTAL PIPING INSTALLATION

A. Locate hangers, supports, and anchors near or at changes in piping direction and concentrated loads.

B. Provide for vertical adjustment to maintain pitch required for proper drainage.

C. Allow for expansion and contraction of the piping.

3.3 PIPE SLEEVES AND INSERTS

A. Set sleeves before concrete is poured or floors finished.

B. Inserts for units should be placed in the concrete or masonry during construction to avoid cutting of finished work. When and if cutting becomes necessary, it must be done in accordance with the cutting and patching specifications.

3.4 FLOOR AND CEILING PLATES

A. Install on all pipes passing through floors, partitions, and ceilings.

3.5 UNIONS AND CONNECTIONS

A. Install malleable ground joint unions in hot and cold water piping throughout the system so that any portion can be taken down for repairs or inspections without injury to same or covering.

B. Running threads or long screws will not be permitted in jointing any pipe.

C. Provide dielectric waterways Style #47 between ferrous and non-ferrous metals.

3.6 FIRE STOPPING

A. Fire stop all penetrations of fire walls, fire barriers, fire petitions, and other fire rated walls and ceilings and floors as per IBC Section 711. See Specification 22 0800.

END OF SECTION 22 0503

SECTION 22 0553 - IDENTIFICATION FOR PLUMBING PIPES AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Includes but Not Limited To:
1. Furnish and install identification of plumbing piping and equipment as described in Contract Documents.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Paint:
1. One Coat Primer:
A. 6-2 Quick Drying Latex Primer Sealer over fabric covers.
B. 6-205 Metal Primer under dark color paint.
C. 6-6 Metal Primer under light color paint.
2. Finish Coats: Two coats 53 Line Acrylic Enamel.
3. Performance Standard: Paints specified are from Pittsburgh Paint & Glass (PPG), Pittsburgh, PA www.pittsburghpaints.com or PPG Canada Inc, Mississauga, ON (800) 263-4350 or (905) 238-6441.
4. Type Two Acceptable Products. See Section 01 6200.
A. Paint of equal quality from following Manufacturers may be submitted for Architect's approval before use. Maintain specified colors, shades, and contrasts.
1. Benjamin Moore, Montvale, NJ www.benjaminmoore.com or Toronto, ON (800) 304-0304 or (416) 766-1176.
2. ICI Dulux, Cleveland, OH or ICI Paints Canada Inc, Concord, ON www.dulux.com.
3. Sherwin Williams, Cleveland, OH www.sherwin-williams.com.

2.2 VALVE IDENTIFICATION

A. Make a list of and tag all valves installed in this work.
1. Valve tags shall be of brass, not less than 1"x2" size, hung with brass chains.
2. Tag shall indicate plumbing or heating service.

PART 3 - EXECUTION

3.1 SCHEDULES

A. Pipe Identification Schedule:
1. Apply stenciled symbols as follows:

Pipe Use	Abbreviation
Domestic Cold Water	CH
Domestic Hot Water	HW

END OF SECTION 22 0553

SECTION 22 0703 - MECHANICAL INSULATION AND FIRE STOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 05 01 apply to this Section.

1.2 SUMMARY

A. Furnish and install mechanical insulation and fire stopping as described in Contract Documents including but not limited to the following:
   1. Cold Water and Rain Drain Piping Insulation
   2. Hot Water Piping Insulation (Domestic)
   3. Fire Stopping

1.3 QUALITY ASSURANCE

A. Insulation shall have composite (insulation, jacket or facing and adhesive used to adhere facing or jacket to insulation) fire and smoke hazard ratings as tested by Procedure ASTM E-84, NFPA 255 and UL 723 not exceeding: Flame Spread of 25 and Smoke Developed of 50.

B. Insulation Contractor shall certify in writing, prior to installation, that all products to be used will meet the above criteria.

C. Accessories, such as adhesives, mastics, cements, and tapes, for fittings shall have the same component ratings as listed above.

D. Products, or their shipping cartons, shall bear a label indicating that flame and smoke ratings do not exceed above requirements.

E. Any treatment of jacket or facings to impart flame and smoke safety shall be permanent.

F. The use of water-soluble treatments is prohibited.

END OF SECTION 22 0703

SECTION 22 0705 - UNDERGROUND PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 05 01 apply to this Section.

1.2 SUMMARY

A. Furnish and install insulation on underground hot and cold water pipes within confines of building as described in Contract Documents.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Insulation:
   1. 1/2 inch thick Armaflex Standard Pipe Insulation
   2. Equal by Rubatex
   3. Equal by Imcolock

B. Joint Sealant:
   1. Armstrong 520

PART 3 - EXECUTION

3.1 INSTALLATION

A. Slip underground pipe insulation onto pipe and seal butt joints.

B. Where slip-on technique is not possible, slit insulation, apply to pipe, and seal seams and joints.

END OF SECTION 22 0705

SECTION 22 0710 - POTABLE WATER PIPE INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 05 01 apply to this Section.

1.2 SUMMARY

A. Furnish and install insulation on above ground hot and cold-water lines, fittings, valves, pump bodies, flanges, and accessories as described in Contract Documents.

PART 2 - PRODUCTS

2.1 INSULATION

A. One inch thick snap-on glass fiber pipe insulation.

B. Heavy density pipe insulation with factory vapor jacket equal to Fiberglass ASJ may be used.

C. Approved Manufacturers:
1. CTM
2. Manville
3. Owens-Corning
4. Knauf

2.2 PVC FITTING, VALVE, & ACCESSORY COVERS

A. Approved Manufacturers:
1. Knauf
2. Zeston

PART 3 - EXECUTION

3.1 APPLICATION

A. Piping:
1. Apply insulation to clean, dry piping with joints tightly butted.
2. Adhere "factory applied vapor barrier jacket lap" smoothly and securely at longitudinal laps with a white vapor barrier adhesive.
3. Adhere 3 inch wide self-sealing butt joint strips over end joints.

B. Fittings, Valves, & Accessories:
1. Insulate with same type and thickness of insulation as pipe, with ends of insulation tucked snugly into throat of fitting and edges adjacent to pipe insulation tufted and tucked in.
2. Cover insulation with one piece fitting cover secured by stapling or taping ends to adjacent pipe covering.

C. Pipe Hangers:
1. Do not allow pipes to come in contact with hangers.
2. Provide 16 ga x 6 inch long galvanized shields at each pipe hanger to protect pipe insulation from crushing by clevis hanger.

END OF SECTION 22 0710

SECTION 22 0711 - HANDICAPPED FIXTURES INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, and Section 22 05 00 apply to this Section.

1.2 SUMMARY

A. Furnish and install handicapped fixtures insulation as described in Contract Documents.

1.3 QUALITY ASSURANCE

A. Insulating device must comply with UBC-85 and federal accessibility standards.

B. Cover must meet federal standards for protection from burns and abrasions.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Insulating device shall be molded fire resistant foam, to encapsulate hot water piping, stop, and P-trap.
   1. Approved Manufacturers:
   2. TCI Products' Skal+Gard SG-100B

B. Safety cover with recloseable sealing strips which allow for removal and replacement for line maintenance may be used on drain and supply lines under lavatories.
   1. Approved Manufacturers:
   2. Handy-Shield
      A. Plumberex

C. Color shall be white.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install tamper-proof locking strap to discourage pilferage.

END OF SECTION 22 0711

SECTION 22 0800-- FIRE STOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 05 01 apply to this Section.

1.2 SUMMARY

A. Furnish and install fire stopping as described in Contract Documents.

1.3 QUALITY ASSURANCE

A. Fire stopping material shall meet ASTM E814, E84 and be UL listed.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Material shall be flexible, long lasting, intumescent acrylic seal to accommodate vibration and building movement.

B. Caulk simple penetrations with gaps of 1/4" or less with:
1. Dow Corning Fire Stop Sealant
2. Pensil 300

C. Caulk multiple penetrations and/or penetrations with gaps in excess of 1/4" with:
1. Dow Corning Fire Stop Foam
2. Pensil 200
3. IPC flame safe FS-1900
4. Tremco “Tremstop 1A”

PART 3 - EXECUTION

3.1 INSTALLATION

A. Follow manufacturer's installation instructions explicitly.

B. Seal penetrations of ductwork, piping, and other mechanical equipment through one-hour and two-hour rated partitions as shown on Architectural and Mechanical Drawings.

C. Install fire stopping material on clean surfaces to assure adherence.

END OF SECTION 22 0800

SECTION 22 1114-- NATURAL GAS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, and Section 22 0501 apply to this Section.

1.2 SUMMARY

A. Furnish and install gas piping and fittings within building including connection to meter.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Welders shall be certified and bear evidence of certification 30 days prior to commencing work on project. If there is doubt as to proficiency of welder, Owner's Representative may require welder to take another test. This shall be done at no cost to Owner. Certification shall be by Pittsburgh Testing Laboratories or other approved authority.

PART 2 - PRODUCTS

2.1 PIPE

A. Meet requirements of ASTM A 53-89a, "Specification for Pipe, Steel, Black & Hot-Dipped Zinc-Coated Welded & Seamless".

B. Carbon steel, butt welded, Schedule 40 black steel pipe.

2.2 FITTINGS

A. Black Pipe:
   1. Welded forged steel fittings meeting requirements of ASTM A 234-89a, "Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures", or standard weight malleable iron screwed.

2.3 VALVES

A. 125 psi bronze body ball valve, UL listed

B. Approved Manufacturers & Models:
   1. ConBraCo - "Apollo" series 80-100
   2. Jenkins - FIG-30-A
   3. Jomar - Model T-204
   4. McDonald - 3410
   5. PGL Corp - "Red Cap" gas ball valve
   6. Watts - Model B-6000-UL

2.4 PRESSURE REDUCING REGULATORS

A. Self- operated, spring loaded regulator with large diaphragm area.

B. Internal registration and relief.

C. Tamper-resistant adjustment with corrosion resistance brass for indoor or outdoor use.

D. ½″ to 1 ½ ″ Threaded NPT.

E. 2″ and Above Flanged.

F. Max Inlet Pressure 10 psi., Max Outlet Pressure 0.5 psi.

G. Temperature Capabilities - ~20 to 180° F.

H. Install with manual shut off cock.

I. Approved Manufactures and Models.
   1. Emerson Y600 AR.
   2. Maxitrol 3UP33.
   3. Or Approved Equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Pipe installed underground, through air plenums, in walls, and pipes 2-1/2 inches and larger shall have welded fittings and joints. Other pipe may have screwed or welded fittings.

B. Wrap and lay underground pipe in accordance with local gas utility company regulations and specifications.

C. Install gas cocks on lines serving boilers, furnaces, duct heaters, and water heaters adjacent to boiler, furnace, or heater on outside of boiler, furnace, or heater cabinet and easily accessible.

D. Do not use flexible pipe connections to boilers, furnaces, duct heaters, or hot water heaters.

E. Install dirt leg with pipe cap, 6 inches long minimum, on each vertical gas drop to heating equipment.

F. Use fittings for changes of direction in pipe and for branch runouts.

G. Paint exterior exposed gas piping with gray paint to match gas meter.

END OF SECTION 22 1114

SECTION 22 1116 – DOMESTIC WATER PIPING SYSTEMS (COPPER)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 05 01 apply to this Section.

1.2 SUMMARY

A. Furnish and install potable water piping complete with necessary valves, connections, and accessories inside building and connect with outside utility lines 5 feet from building perimeter.

B. Perform excavating and backfilling required by work of this Section.

1.3 SUBMITTALS

A. Quality Control:
   1. Submit written report of sterilization test to Architect.

PART 2 - PRODUCTS

2.1 PIPE

A. Type K copper for piping underground or beneath concrete slab. 3/4 inch minimum under slabs.

B. Type L hard drawn copper for above ground applications.

2.2 FITTINGS

A. Wrought copper.

2.3 CONNECTIONS:

A. Sweat copper type with 95/5 or 96/4 Tin-Antimony solder. Victaulic copper connection system with “FS” flush-seal gasket and zero-flex couplings.

B. Joints under slabs, if allowed by local codes, shall be brazed.

2.4 BALL VALVES

A. Use ball valves exclusively unless otherwise specified. Ball valves shall be by single manufacturer from approved list below. Valves shall be for 150 PSI SWP.

B. Approved Manufacturers:
   1. Nibco-Scott T595 or S595 or equal by
   2. ConBraCo (Apollo)
   3. Crane
   4. Hammond
   5. Jenkins
   6. Ohio Brass

7. Stockham
8. Walworth
9. Watts
10. Victaulic

2.5 STOP & WASTE VALVES

A. Approved Manufacturers:
   1. Mark II Oriseal stop & waste valve H15134 by Mueller
   2. Buffalo screw type curb box H-10350 complete with lid and H-10349 enlarged base by Mueller.

2.6 COMBINATION PRESSURE REDUCING VALVE/STRAINER

A. Integral stainless steel strainer, or separate 'Y' strainer installed upstream of pressure reducing valve.

B. Built-in thermal expansion bypass check valve.

C. Approved Manufacturers:
   1. Watts U5B or equal by
   2. Cash Valve
   3. Clayton Valve
   4. Spencer
   5. Thrush
   6. Wilkins

2.7 DOMESTIC WATER PRESSURE REGULATOR

A. Bronze body

B. Bronze trim

C. Heat resistant seat and diaphragm

D. Built-in monel strainer with separate cleanout plug

E. Stainless steel body seat

F. Screwed ends.

G. Install with manual shutoff valve on each side and 3/4" bypass line with gate valve.

H. Provide 0-200 psi pressure gauge on each side.

I. Approved Manufacturers:
   1. Cash-Acme Type E
   2. or approved equal

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install piping under slabs without joints where possible.

B. Locate cold water lines a minimum of 6 inches from hot water line.

C. Run main water pipe and branches to all fixtures.

D. Size piping as shown.

E. Run piping direct and concealed from view, unless otherwise shown.

F. Grade horizontal runs to allow for drainage.

G. Provide sufficient drains to draw water from entire domestic water system and sections thereof where cutoffs are shown.

H. Furnish and install complete hot and/or cold water to all fixtures as shown on drawings.

I. Run lines parallel to each other and parallel with the lines of the building.

J. Cut pipes accurately to required measurements and work into place without springing or forcing.

K. Provide for expansion and contraction of piping.

L. Paint exposed threads on underground piping one coat asphaltum varnish.

3.2 FIELD QUALITY CONTROL

A. Before pipes are covered, test systems in presence of Architect at 100 psi hydrostatic pressure for two hours and show no leaks.

B. Sterilize potable water system with solution containing 250 parts per million minimum of available chlorine. Introduce chlorinating materials into system in manner approved by Architect. Allow sterilization solution to remain for 24 hours and open and close valves and faucets several times during that time.

C. After sterilization, flush solution from system with clean water until residual chlorine content is less than 0.2 parts per million.

D. Water system will not be accepted until negative bacteriological test is made on water taken from system. Repeat dosing as necessary until such negative test is accomplished.

END OF SECTION 22 1116

SECTION 22 1118 – BACKFLOW PREVENTER VALVE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 05 01 apply to this Section.

1.2 SUMMARY

A. Furnish and install a backflow preventer valve as described in Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Designed to provide separation of radiant hot water heating system water from domestic cold water supply in accordance with Code.
   1. Rated flow at 30 psi pressure drop rated for 175 psi inlet pressure and 140 deg. F maximum operating temperature.
   2. Brass body construction with 3/4 inch NPT connections.

B. Approved Manufacturers:
   1. Beeco 12
   2. Watts 900
   3. Equal by Febco
   4. Equal by Conbraco

PART 3 - EXECUTION

3.1 INSTALLATION

A. Furnish and install a drain cup and pipe the waste line to the nearest floor drain or floor sink.

END OF SECTION 22 1118

SECTION 22 1313 – SOIL, WASTE, & VENT PIPING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 05 01 apply to this Section.

1.2 SUMMARY

A. Furnish and install soil, waste, and vent piping systems within building and connect with outside utility lines 5 feet out from building where applicable.

B. Perform excavation and backfill required by work of this Section.

PART 2 - PRODUCTS

2.1 BURIED LINES

A. Service weight, single-hub type cast iron soil pipe and fittings meeting requirements of ASTM A 74-87, "Specification for Cast Iron Soil Pipe & Fittings".
   1. Joint Material:
   2. Rubber gaskets meeting requirements of ASTM C 564-88, "Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings".
      A. No hub stainless steel clamps with neoprene gasket.

B. ABS-DWV or PVC-DWV plastic waste pipe and fittings as permitted by state and local plumbing code.

2.2 ABOVE GRADE PIPING & VENT LINES

A. Same as specified for buried lines except no-hub pipe may be used.

B. Vent lines 2-1/2 inches or smaller may be Schedule 40 galvanized steel.

C. Joint Material:
   1. Bell & Spigot Pipe - rubber gaskets meeting requirements of ASTM C 564-88, "Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings".
   2. No-Hub Pipe - Neoprene gaskets with stainless steel cinch bands.
   3. Galvanized Pipe - Screwed Durham tarred drainage fittings, or Victaulic.
   4. ABS-DWV solvent weld fittings

2.3 TRAP PRIMERS

A. Components:
   1. Drains And Drain Accessories:
      A. Floor Drain FD-1:
         1. Approved types with deep seal trap and chrome plated strainer.
         2. Provide trap primer connection and trap primer equal to Sioux Chief 695-01.
         3. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
            a) Josam: 30000-50-Z-5A.

b) J. R. Smith: 2010-A.
c) Sioux Chief: 832.
d) Wade: 1100.
e) Watts: FD-200-A.
f) Zurn: Z-415.

2.4 PRECISION TRAP PRIMERS:

A. Provide and install Precision Plumbing Products “prime-time” (or approved equal) trap priming assembly.

B. Complete assembly including:
1. Atmospheric vacuum breaker.
2. Pre-set 24 hour clock.
3. Manual over-ride switch.
4. 120v/220v solenoid valve.
5. ¾” FNPT connection with isolation valve.
6. Calibrated manifold for equal water distribution.
7. 5/8” outlet compression fittings (for ½” Pex piping connections).
8. Manifold outlets as specified on plans.
9. 12”x12”x4” Nema 1 metal cabinet with cover plate for surface mounting.

C. Operation:
1. Priming assembly will supply a minimum of 20 oz. of potable water at 20 psig at a preset factory setting of 10 seconds.
2. The entire unit is pre-assembled in a steel cabinet for surface mounting.
3. The priming assembly must be mounted above the finished floor.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Do not caulk threaded work.

B. Slope horizontal pipe at 1/4 in/ft.

C. Cleanouts:
1. Provide and set full size cleanouts at foot of each riser, and ends of branches from toilets, at points where a change of direction occurs, on exposed and accessible traps, at points where required to remove rust accumulation or other obstructions and as shown on plans. Set screw cap in cleanout with graphite paste. Cleanouts in walls shall be flush and covered with a chrome plated cleanout cover screwed into the cleanout plug. Cleanouts in floors shall be flush using Zurn, Josam, or Wade floor level cleanout fittings. Location of all cleanouts subject to approval of inspector.

D. Each fixture and appliance discharging water into sanitary sewer or building sewer lines shall have seal trap in connection with complete venting system so gasses pass freely to atmosphere with no pressure or syphon condition on water seal.

E. Vent entire waste system to atmosphere. Discharge 14 inches above roof. Join lines together in fewest practicable number before projecting above roof. Set back vent lines so they will not pierce roof near edge or valley.

F. Use torque wrench to obtain proper tension in cinch bands when using hubless cast iron pipe. Butt ends of pipe against centering flange of coupling.

G. Flash pipes passing through roof with 16 oz sheet copper flashing fitted snugly around pipes and calk between flashing and pipe with flexible waterproof compound. Flashing base shall be at least 24 inches square.
   1. Flashing may be 4 lb per sq ft lead flashing fitted around pipes and turned down into pipe 1/2 inch with turned edge hammered against pipe wall.

3.2 FIELD QUALITY CONTROL

A. Before piping is covered, conduct tests for leaks and defective work. Notify Architect prior to testing. Correct leaks and defective work. Fill waste and vent system to roof level with water, 10 feet minimum, and show no leaks for two hours.

END OF SECTION 22 1313

SECTION 23 5543 – ELECTRIC HEATERS

PART 4 - GENERAL

4.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 0100 apply to this Section.

4.2 SUMMARY

A. Furnish and install wall heaters as described in Contract Documents and scheduled on the drawings.

4.3 QUALITY ASSURANCE

A. Units shall be UL listed and comply with NEC.

PART 5 - PRODUCTS

5.1 MANUFACTURED UNITS – WALL HEATERS

A. Fan type for recess mounting in wall.

B. 20 gauge minimum sheet metal casing.

C. Heating element shall be encased in steel finned casting and protected by thermal switch.

D. Fan motor shall be heavy duty enclosed and permanently lubricated.

E. Fan shall be precision balanced and fan-motor assembly mounted to be vibration free.

F. Units shall be controlled automatically by integral thermostat when heater is in "ON" position.

G. Heater shall have built-in fan delay.

H. Finish - Baked-on enamel.

I. Approved Manufacturers:
   1. Q' Mark
   2. Berko
   3. Thermador
   4. Markel

END OF SECTION 23 5543

SECTION 22 3420 – GAS FIRED STORAGE TYPE WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 0501 apply to this Section.

1.2 SUMMARY

A. Furnish and install water heater as described in Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Glass lined storage tank, pressure tested and rated for 150 psi wp complete with thermostat, high limit control, gas valve, gas pressure regulator, 100% safety shut-off, and draft diverter. AGA approved.

B. 92 to 100 Gallon:
   1. With hand hole cleanout and non-prorated three year tank warranty.
   2. Approved Manufacturers:
      A. BT-197 by A O Smith
      B. MI-92T-199 by Bradford-White
      C. MA 199-100-1 by Mor.Flo/American
      D. RF 200-94 by Rheem
      E. RF 92-200-1 by Ruud GL
      F. SBT 100-199 NES by State Industries
      G. Paragon
      H. PVI

2.2 ACCESSORIES

A. Anchoring Components:
   1. One inch by 18 ga galvanized steel straps.
   2. No. 10 by 2-1/2 inch screws.

B. Thermal Expansion Absorbers:
   1. Bladder type for use with potable water systems.
   2. Acceptable Products:
      A. Therm-X-Trol ST-12 by Amtrol.
      B. Equal as approved by Architect before bidding. See Section 01600.

C. Mixing Valve:
   1. Solid brass construction and CSA B125 certified.
   2. Includes integral check valves and inlet screen. Features advanced paraffin-based actuation technology.
   3. Flow of 5.7 GPM with maximum 10 psi (69 kPA) pressure drop. Perform to minimum flow of 0.5 GPM (1.89 LPM) in accordance with ASSE 1016 and 1070.
   4. Set for 110 deg F (43 deg C) Service.
   5. Class One Quality Standard: Powers LM495. See Section 01 6200.

6. Acceptable Manufacturers: Leonard, Powers, Sloan, Symmons, and Watts.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Water heaters shall each have temperature-pressure relief valve sized to match heat input and set to relieve at 120 psi.

B. Install temperature-pressure relief valve on hot water heater and pipe discharge to directly above funnel of floor drain.

3.2 WATER TEMPERATURE

A. Contractor shall be responsible to verify and/or change temperature settings on water heaters supplied on this project to meet requirements of Life Safety and Health Department Codes. Any setting above 120 deg. F. shall require warning labels placed on outside of water heaters in conspicuous places indicating water temperature setting and fact that any temperature above 120 deg. F. may be a hazard.

END OF SECTION 22 3420

SECTION 22 4001 – PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 0501 apply to this Section.

1.2 SUMMARY

A. Furnish and install plumbing fixtures as described in Contract Documents.

B. Before fixtures are ordered, the Contractor shall submit a complete list of plumbing fixtures, giving the catalog number, cut and make, for approval. Fixtures shall not be ordered until this list is approved.

PART 2 - PRODUCTS

2.1 GENERAL

A. Interior exposed pipe, valves, and fixture trim shall be chrome plated.

B. Do not use flexible water piping.

C. Flow Control Fittings:
1. Vandal proof type and fit faucet spout of fixture used. Flow shall be controlled as required by local codes.

D. Furnish and install the necessary plumbing fixtures in quantity as shown on plans. Provide all necessary valves, chrome plated 17 gauge or cast "P" traps, stops with risers, fittings, and accessories to make the job complete with the fixtures specified on the drawings. Exposed stops to be equal to Brasscraft with compression inlet, chrome plated nipples, cross handles, ¼ turn ball valves and flexible risers.

E. Fixtures shall be PROFLO, Kohler, Sloan, Briggs, Eljer, American Standard, Chicago, Symmons, or an approved equal. Specialties shall be Zurn, Josam, MiFab, J. R. Smith, Wade, or Watts.

F. Toilet seat manufacturers shall be Beneke, Church, Olsonite, or Bemis.

G. Carrier and wall hydrant manufacturers shall be Smith, Zurn, Wade, Josam, or Watts.

H. Mop sink manufacturers shall be Stern-Williams or Fiat.

I. Stainless steel sink manufacturers shall be Elkay or Just.

J. Drinking fountain manufacturers shall be Elkay, Halsey Taylor, Haws, Cordley, Sunroc, or Oasis.

K. Pressure balance mixing valves shall be Powers, Lawler, Leonard, or Symmons.

L. Thermostatic mixing valves shall be Powers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fixtures including traps and accessories with accessible stop or control valve in each hot and cold water branch supply line.

B. Mounting – Refer to Architectural Elevations:
   1. Urinals:
   2. Standard - 20 inches from floor to bottom lip.
      A. Handicap - 17 inches from floor to bottom lip.

C. Make fixture floor connections with approved brand of cast iron floor flange, soldered or calked securely to waste pipe.

D. Make joints between fixtures and floor flanges tight with approved fixture setting compound or gaskets.

E. Caulk between fixtures and wall and floor with white butyl rubber non-absorbent caulking compound. Point edges.

F. Cleanouts: Provide and set full size cleanouts at foot of each riser, and ends of branches from toilets, at points where a change of direction occurs, on exposed and accessible traps, at points where required to remove rust accumulation or other obstructions and as shown on plans. Set screw cap in cleanout with graphite paste. Location of all cleanouts subject to approval of inspector.

G. Traps: Install "P" traps in branch lines from floor drains or where required. Traps installed in connection with threaded pipe shall be recess drainage pattern. Traps installed in connection with cast iron pipe shall be of the same quality and grade as the pipe. Traps installed in connection with fixtures shall have a seal of not less than 2" nor more than 4". Exposed traps shall be chrome plated cast brass or chrome plated 17 gauge tubular type. Provide trap primers as required by Code.

3.2 FIXTURE INSTALLATION

A. Provide stop valves and 18" minimum air chambers on all water connections to fixtures. Furnish and install wall carriers for wall mounted fixtures, wood backing, where necessary, to be installed by General Contractor at the direction of this Contractor. Provide exact locations, including proper mounting heights, obtained from details on drawings and from manufacturer's specifications. Provide hudee rims for countertop installations.

B. Interior exposed pipe, valves, and fixtures trim shall be chrome plated.

C. Complete installation of each fixture including trap and accessories with accessible stop or control valve in each hot and cold water branch supply line. Make fixture floor connections with approved brand of cast iron floor flange, soldered or caulked securely to waste pipe. Make joint between fixture and floor flange tight with approved fixture setting compound or gaskets.

D. Polish chrome finish at completion of project.

E. Caulk between fixtures and wall and floor with white butyl rubber non-absorbent caulking compound. Paint all edges.

F. Install fixtures and fittings as per local codes and manufacturer's instructions.

END OF SECTION 22 4001

SECTION 22 4703 – HANDICAP DRINKING WATER COOLING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 05 01 apply to this Section.

1.2 SUMMARY

A. Furnish and install handicap drinking water cooling system as described in Contract Documents.

PART 2 - PRODUCTS

2.1 HANDICAPPED FOUNTAIN

A. Vandal proof operating bar on front and both sides. 7-1/2 GPH of 50 deg F water with 90 deg F room temperature, 1/5 horsepower compressor motor, 120 V, 60 Hz, single phase. One piece stainless steel back splash and basin. Flexi-guard or chrome plated brass bubbler.

B. Approved Manufacturers:
1. Sunroc
2. Halsey Taylor
3. Haws
4. Elkay
5. Oasis
6. Murdock

2.2 HYDRATION STATION.

A. Touchless sensor activated, 1.5 GPM Quick Fill, with automatic 20 second shut-off timer. 120V, 60 HZ single phase.

B. Visual user interface display includes:
1. Innovative Green Ticker counting number of bottles saved from waste.
2. Filter moniter indicating when replacement is needed.

C. Water Sentry Plus Filler:
1. 3000 Gallon Capacity.
2. Quick ¼ turn for easy installation.
3. Polypropylene pre-filter mesh prevents coarse sediment from entering filter.
4. Made with activated carbon and patented ATS lead-removal media.
5. Final filter mesh prevents loose carbon from entering water.
6. ANSI/NSF Standard 42 and 53.

D. Approved Manufacturers:
1. Sunroc
2. Halsey Taylor
3. Haws
4. Elkay
5. Oasis

PART 3 - EXECUTION

3.1 INSTALLATION

A. Anchor bottom of fountain to wall.

B. Top surface to be 32 inches above floor unless required otherwise by local code.

C. Install 3/8 inch IPS union connection and Chicago No. 376 stop to building supply line.

D. Install 1-1/4 inch IPS slip cast brass "P" trap. Install trap so it is concealed.

END OF SECTION 22 4703

END OF DIVISION 22

DIVISION 23: HEATING, VENTILATING, AND AIR-CONDITIONING

END TABLE OF CONTENTS

SECTION 23 0501 – COMMON HVAC REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Furnish labor, materials, and equipment necessary for completion of work as described in Contract Documents.

B. It is the intent of these specifications that the systems specified herein are to be complete and operational before being turned over to the owner. During the bidding process, the contractor is to ask questions or call to the engineer's attention any items that are not shown or may be required to make the system complete and operational. Once the project is bid and the contractor has accepted the contract, it is his responsibility to furnish and install all equipment and parts necessary to provide a complete and operational system without additional cost to the owner.

C. Furnish and install fire stopping materials to seal penetrations through fire rated structures and draft stops.

D. Includes But Not Limited To:
   1. General procedures and requirements for HVAC.

E. Related Sections:
   1. Section 23 0593: Testing, Adjusting, and Balancing for HVAC.

1.3 SUBMITTALS

A. Substitutions: By specific designation and description, standards are established for specialties and equipment. Other makes of specialties and equipment of equal quality will be considered provided such proposed substitutions are submitted to the Architect for his approval, complete with specification data showing how it meets the specifications, at least 5 working days prior to bid opening. A list of approved substitutions will be published as an addendum.
   1. Submit a single copy of Manufacturer's catalog data including Manufacturer's complete specification for each proposed substitution.
   2. The Architect or Engineer is to be the sole judge as to the quality of any material offered as an equal.

B. Product Data, Shop Drawings: Within 30 days after award of contract, submit Manufacturer's catalog data for each manufactured item.
   1. Literature shall include enough information to show complete compliance with Contract Document requirements.
   2. Mark literature to indicate specific item with applicable data underlined.
   3. Information shall include but not be limited to capacities, ratings, type of material used, guarantee, and such dimensions as are necessary to check space requirements.
   4. When accepted, submittal shall be an addition to Contract Documents and shall be in equal force. No variation shall be permitted.

5. Even though the submittals have been accepted by the Engineer, it does not relieve the contractor from meeting all of the requirements of the plans and specifications and providing a complete and operational system.

C. Drawings of Record: One complete sets of blue line mechanical drawings shall be provided for the purpose of showing a complete picture of the work as actually installed.
1. These drawings shall serve as work progress report sheets. Contractor shall make notations neat and legible therein daily as the work proceeds.
2. The drawings shall be kept at the job at a location designated by the Mechanical Engineer.
3. At completion of the project these "as-built" drawings shall be signed by the Contractor, dated, and returned to the Architect.

D. Operating Instructions and Service Manual: The Mechanical Contractor shall prepare 2 copies of an Operation and Maintenance Manual for all mechanical systems and equipment used in this project. Manuals shall be bound in hard-backed binders and the front cover and spine of each binder shall indicate the name and location of the project. Use plastic tab indexes for all sections. Provide a section for each different type of equipment item. The following items shall be included in the manual, together with any other pertinent data. This list is not complete and is to be used as a guide.
1. Provide a master index at the beginning of the manual showing all items included.
2. The first section of the manual shall contain:
   a. Names, addresses, and telephone numbers of Architect, Mechanical Engineer, Electrical Engineer, General Contractor, Plumbing Contractor, Sheet Metal Contractor, and Temperature Control Contractor.
   b. List of Suppliers which shall include a complete list of each piece of equipment used with the name, address, and telephone number of vendor.
   c. General Description of Systems including –
      1) Location of all major equipment
      2) Description of the various mechanical systems
      3) Description of operation and control of the mechanical systems
      4) Suggested maintenance schedule
   d. Copy of contractor's written warranty
3. Provide a copy of approved submittal literature for each piece of equipment.
4. Provide maintenance and operation literature published by the manufacturer for each piece of equipment which includes: oiling, lubrication and greasing data; belt sizes, types and lengths; wiring diagrams; step-by-step procedure to follow in putting each piece of mechanical equipment in operation.
5. Include parts numbers of all replaceable items.
6. Provide control diagram and operation sequence, along with labeling of control piping and instruments to match diagram.
7. Include a valve chart indicating valve locations.

E. Include air balance and/or water balance reports.

1.4 SUBMITTALS FOR COMMON HVAC REQUIREMENTS

A. Samples: Sealer and gauze proposed for sealing ductwork.

B. Quality Assurance / Control:
1. Manufacturer’s installation manuals providing detailed instructions on assembly, joint sealing, and system pressure testing for leaks.
2. Specification data on sealer and gauze proposed for sealing ductwork.

C. Quality Assurance
1. Requirements: Construction details not specifically called out in Contract Documents shall conform to applicable requirements of SMACNA HVAC Duct Construction Standards.
2. Pre-Installation Conference: Schedule conference immediately before installation of ductwork.

1.5 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
1. Perform work in accordance with applicable provisions of local and state Plumbing Code, Gas Ordinances, and adoptions thereof. Provide materials and labor necessary to comply with rules, regulations, and ordinances.
2. In case of differences between building codes, state laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Promptly notify Architect in writing of such differences.

B. Applicable Specifications: Referenced specifications, standards, and publications shall be of the issues in effect on date of Advertisement for Bid.
1. "Heating, Ventilating and Air Conditioning Guide" published by the American Society of Heating and Air Conditioning Engineers.
2. "Engineering Standards" published by the Heating, Piping, and Air Conditioning Contractors National Association.
3. "2018 International Building Code", "2018 International Mechanical Code", “2018 International Plumbing Code” and "2018 International Fire Code" as published by the International Conference of Building Officials.
4. "National Electrical Code" as published by the National Fire Protection Association.
5. "2018 International Energy Conservation Code ".

C. Identification: Motor and equipment name plates as well as applicable UL and AGA labels shall be in place when Project is turned over to Owner.

1.6 INSPECTIONS AND PERMITS

A. Pay for permits, fees, or charges for inspection or other services. Local and state codes and ordinances must be properly executed without expense to Owner and are considered as minimum requirements. Local and state codes and ordinances do not relieve the Contractor from work shown that exceeds minimum requirements.

1.7 ADDITIONAL WORK:

A. Design is based on equipment as described in the drawing equipment schedule. Any change in foundation bases, electrical wiring, conduit connections, piping, controls and openings required by alternate equipment submitted and approved shall be paid for by this division. All work shall be in accordance with the requirements of the applicable sections.

PART 2 - PRODUCTS FOR COMMON HVAC REQUIREMENTS

A. Finishes, Where Applicable: Colors as selected by Architect.

B. Duct Hangers:
1. One inch 25 mm by 18 ga 1.27 mm galvanized steel straps or steel rods as shown on Drawings, and spaced not more than 96 inches 2 400 mm apart. Do not use wire hangers.

2. Attaching screws at trusses shall be 2 inch 50 mm No. 10 round head wood screws. Nails not allowed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Inspection:
1. Examine premises and understand the conditions which may affect performance of work of this Division before submitting proposals for this work.
2. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

B. Drawings:
1. Mechanical drawings show general arrangement of piping, ductwork, equipment, etc, and do not attempt to show complete details of building construction which affect installation. This Contractor shall refer to architectural, structural, and electrical drawings for additional building detail which affect installation of his work.
   a. Follow mechanical drawings as closely as actual building construction and work of other trades will permit.
   b. No extra payments will be allowed where piping and/or ductwork must be offset to avoid other work or where minor changes are necessary to facilitate installation.
   c. Everything shown on the mechanical drawings shall be the responsibility of Mechanical Contractor unless specifically noted otherwise.
2. Consider architectural and structural drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over mechanical drawings.
3. Because of small scale of mechanical drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions. Do not scale drawings for locations of equipment or piping. Refer to large scale dimensioned drawings for exact locations.

C. Insure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents.
1. If approval is received to use other than specified items, responsibility for specified capacities and insuring that items to be furnished will fit space available lies with this Division.
2. If non-specified equipment is used and it will not fit job site conditions, this Contractor assumes responsibility for replacement with items named in Contract Documents.

3.2 PREPARATION

A. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns, or trusses.
1. Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials.
2. Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.

3. Cutting, patching, repairing, and replacing pavements, sidewalks, roads, and curbs to permit installation of work of this Division is responsibility of Section installing work.

3.3 INSTALLATION

A. Arrange pipes, ducts, and equipment to permit ready access to valves, unions, traps, starters, motors, control components, and to clear openings of doors and access panels.

3.4 STORAGE AND PROTECTION OF MATERIALS:

A. Provide storage space for storage of materials and assume complete responsibility for losses due to any cause whatsoever. Storage shall not interfere with traffic conditions in any public thoroughfare.

B. Protect completed work, work underway, and materials against loss or damage.

C. Close pipe openings with caps or plugs during installation. Cover fixtures and equipment and protect against dirt, or injury caused by water, chemical, or mechanical accident.

3.5 EXCAVATION AND BACKFILL

A. Perform necessary excavation of whatever substance encountered for proper laying of all pipes and underground ducts.
1. Excavated materials not required for fill shall be removed from site as directed by Engineer.
2. Excavation shall be carried low enough to allow a minimum coverage over underground piping of 5'-0" or to be below local frost level.
3. Excess excavation below required level shall be backfilled at Contractor's expense with earth, sand, or gravel as directed by Engineer. Tamp ground thoroughly.
4. Ground adjacent to all excavations shall be graded to prevent water running into excavated areas.

B. Backfill pipe trenches and allow for settlement.
1. Backfill shall be mechanically compacted to same density as surrounding undisturbed earth.
2. Cinders shall not be used in backfilling where steel or iron pipe is used.
3. No backfilling shall be done until installation has been approved by the Engineer.

3.6 COOPERATION

A. Cooperate with other crafts in coordination of work. Promptly respond when notified that construction is ready for installation of work under Division 23000. Contractor will be held responsible for any delays which might be caused by his negligence or failure to cooperate with the other Contractors or crafts.

3.7 SUPERVISION

A. Provide a competent superintendent in charge of the work at all times. Anyone found incompetent shall be removed at once and replaced by someone satisfactory, when requested by the Architect.

3.8 INSTALLATION CHECK:

A. An experienced, competent, and authorized representative of the manufacturer or supplier of

each item of equipment indicated in the equipment schedule shall visit the project to inspect, check, adjust if necessary, and approve the equipment installation. In each case, the equipment supplier's representative shall be present when the equipment is placed in operation. The equipment supplier's representative shall revisit the project as often as necessary until all trouble is corrected and the equipment installation and operation is satisfactory to the Engineer.

B. Each equipment supplier's representative shall furnish to the Owner, through the Engineer, a written report certifying the following:
   1. Equipment has been properly installed and lubricated.
   2. Equipment is in accurate alignment.
   3. Equipment is free from any undue stress imposed by connecting piping or anchor bolts.
   4. Equipment has been operated under full load conditions.
   5. Equipment operated satisfactorily.

C. All costs for this installation check shall be included in the prices quoted by equipment suppliers.

3.9 CLEANING EQUIPMENT AND PREMISES

A. Properly lubricate equipment before Owner's acceptance.

B. Clean exposed piping, ductwork, equipment, and fixtures. Repair damaged finishes and leave everything in working order.

C. Remove stickers from fixtures and adjust flush valves.

D. At date of Substantial Completion, air filters shall be new, clean, and approved by Owner's representative.

E. Trap elements shall be removed during cleaning and flushing period. Replace trap elements and adjust after cleaning and flushing period.

3.10 TESTS

A. No piping work, fixtures, or equipment shall be concealed or covered until they have been inspected and approved by the inspector. Notify inspector when the work is ready for inspection.

B. All work shall be completely installed, tested as required by Contract Documents and the city and county ordinances and shall be leak-tight before the inspection is requested.

C. Tests shall be repeated to the satisfaction of those making the inspections.

D. Water piping shall be flushed out, tested at 100 psi and left under pressure of supply main or a minimum of 40 psi for the balance of the construction period.

3.11 WARRANTEE

A. Contractor shall guarantee work under Division 23 to be free from inherent defects for a period of one year from acceptance.
   1. Contractor shall repair, revise or replace any and all such leaks, failure or inoperativeness due to defective work, materials, or parts free of charge for a period of one year from final acceptance, provided such defect is not due to carelessness in operation or maintenance.

2. In addition, the Contractor shall furnish all refrigeration emergency repairs, emergency service and all refrigerant required due to defective workmanship, materials, or parts for a period of one year from final acceptance at no cost to the Owner, provided such repairs, service and refrigerant are not caused by lack of proper operation and maintenance.

B. In addition to warrantee specified in General Conditions, heating, cooling, and plumbing systems are to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.

3.12 SYSTEM START-UP, OWNER'S INSTRUCTIONS

A. Off-Season Start-up
1. If Substantial Completion inspection occurs during heating season, schedule spring start-up of cooling systems. If inspection occurs during cooling season, schedule autumn start-up for heating systems.
2. Notify Owner 7 days minimum before scheduled start-up.
3. Time will be allowed to completely service, test, check, and off-season start systems. During allowed time, train Owner's representatives in operation and maintenance of system.
4. At end of off-season start-up, furnish Owner with letter confirming that above work has been satisfactorily completed.

B. Owner's Instructions
1. Instruct building maintenance personnel and Owner Representative in operation and maintenance of mechanical systems utilizing Operation & Maintenance Manual when so doing.
2. Minimum instruction periods shall be as follows –
   a. Mechanical - Four hours.
   b. Temperature Control - Four hours.
   c. Refrigeration - Two hours.
3. Instruction periods shall occur after Substantial Completion inspection when systems are properly working and before final payment is made.
4. None of these instructional periods shall overlap another.

3.13 PROTECTION

A. Do not run air handling units, fan coil units, or other pieces of equipment used for moving supply air without proper air filters installed properly in system.

B. The mechanical systems are not designed to be used for temporary construction heat. If any equipment is to be started prior to testing and substantial completion, such equipment will be returned to new condition with full one year warranties, from date of substantial completion after any construction use. This includes, but is not necessarily limited to: Equipment, filters, ductwork, fixtures, etc.

3.14 COMMON HVAC REQUIREMENTS:

A. INSTALLATION
1. During installation, protect open ends of ducts by covering with plastic sheet tied in place to prevent entrance of debris and dirt.
2. Make necessary allowances and provisions in installation of sheet metal ducts for structural conditions of building. Revisions in layout and configuration may be allowed,

with prior written approval of Architect. Maintain required airflows in suggesting revisions.

3. Hangers And Supports:
   a. Install pair of hangers close to each transverse joint and elsewhere as required by spacing indicated in table on Drawings.
   b. Install upper ends of hanger securely to floor or roof construction above by method shown on Drawings.
   c. Attach strap hangers to ducts with cadmium-plated screws. Use of pop rivets or other means will not be accepted.
   d. Where hangers are secured to forms before concrete slabs are poured, cut off flush all nails, strap ends, and other projections after forms are removed.
   e. Secure vertical ducts passing through floors by extending bracing angles to rest firmly on floors without loose blocking or shimming. Support vertical ducts, which do not pass through floors, by using bands bolted to walls, columns, etc. Size, spacing, and method of attachment to vertical ducts shall be same as specified for hanger bands on horizontal ducts.

B. CLEANING
   1. Clean interior of duct systems before final completion.

END OF SECTION 23 0501

SECTION 23 0553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 0501 apply to this Section.

1.2 SUMMARY

A. Furnish and install identification of equipment and piping as described in Contract Documents.

B. Mechanical Contractor shall touch-up equipment where factory paint has been damaged. Repaint entire item where more than 20 percent of the surface is involved.

C. Primary painting of walls, ceilings, ductwork, piping and plenums is covered in the general painting section of these Contract Documents.

PART 2 - PRODUCTS

2.1 PAINT

A. Benjamin Moore Impervo or equivalent by Paint Manufacturer approved in Section 09 900.

B. Use appropriate primer.

2.2 LABELS

A. Black Formica with white reveal on engraving.

2.3 CODED BANDS

A. Using colored bands and arrows to indicate supply and return, with colored reflective tape, color code all piping installed in this contract at not more than 20-foot intervals, at equipment, at walls, etc., in accordance with ANSI Standards.

B. Approved Manufacturers:
   1. Seton
   2. Craftmark

2.4 PIPE IDENTIFICATION

A. In addition to the colored bands, stencil with black paint in 1/2 inch high letters a symbol and directional arrow for all fluids handled or use Seaton coded and colored pipe markers and arrows to meet ANSI Standards.

2.5 EQUIPMENT IDENTIFICATION

A. Provide an engraved plastic plate for each piece of equipment stating the name of the item, symbol number, area served, and capacity. Label all control components with plastic embossed mechanically attached labels. Sample:
   1. Supply Fan SF-1 - North Classrooms

2. 10,000 CFM @ 2.5"

2.6 VALVE IDENTIFICATION

A. Make a list of and tag all valves installed in this work.
   1. Valve tags shall be of brass, not less than 1"x2" size, hung with brass chains.
   2. Tag shall indicate plumbing or heating service.

PART 3 - EXECUTION

3.1 APPLICATION

A. Engraved Plates:
   1. Identify thermostats and control panels in mechanical rooms, furnaces, boilers and hot water heating specialties, duct furnaces, air handling units, electric duct heaters, and condensing units with following data engraved and fastened to equipment with screws –
      a. Equipment mark noted on Drawings (i.e., SF-1)
      b. Area served (i.e., North Classrooms)
      c. Capacity (10,000 CFM @ 2.5)

B. Stenciling:
   1. Locate identifying legends and directional arrows at following points on each piping system –
      a. Adjacent to each item of equipment and special fitting.
      b. At point of entry and exit where piping goes through wall.
      c. On each riser and junction.
      d. Every 50 feet on long continuous lines.
   2. Steam Pipe, Hot Water Heating, Chilled Water, Gas, & Valve Identification –
      a. Identify specific pipe contents by stenciling pipe with written legend and placing of arrows to indicate direction of flow.

C. Painting:
   1. Background Color - Provide by continuous painting of piping.

Symbol	Name	Color
STM	Steam Lines	Orange
COND	Steam Condensate Return Line	Lt Orange
HWH	Hot Water Heating	Green
CHW	Chilled Water	Blue
NG	Natural Gas	Yellow
LPG	Propane Gas	Yellow
FS	Fire Sprinkler	Red
AIR	Air	Blue

   2. Identification stenciling and flow arrows shall be following colors for proper contrast:

Arrows & ID Stenciling	Color Shade of Pipe
White	Red, Grays, & black
Black	Yellows, Oranges, Greens, & White

END OF SECTION 23 0553

SECTION 23 0593 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 23 0501 - Common HVAC Requirements and Basic Mechanical Materials and Methods Sections apply to work of this section.

1.2 SUMMARY SCOPE

A. This Section includes TAB to produce design objectives for the following:
   1. Air Systems.
      a. Furnaces.
      b. Exhaust Fans.
      c. Kitchen Hood.
      d. Laboratory Fume Hoods
   2. Hydronic Piping Systems.
      a. Primary - Secondary Systems
      b. Chiller
      c. Cooling Tower
      d. Pumps

1.3 SUBMITTALS

A. Agency Data:
   1. Submit proof that the proposed testing, adjusting, and balancing agency meets the qualifications specified below. The firm or individuals performing the work herein specified may not be the installing firm.

B. Engineer and Technicians Data:
   1. Submit proof that the Test and Balance Engineer assigned to supervise the procedures, and the technicians proposed to perform the procedures meet the qualifications specified below.

C. Procedures and Agenda: Submit a synopsis of the testing, adjusting, and balancing procedures and agenda proposed to be used for this project.

D. Sample Forms: Submit sample forms, if other than those standard forms prepared by the AABC or NEBB are proposed.

E. Certified Reports: Submit testing, adjusting, and balancing reports bearing the seal and signature of the Test and Balance Engineer. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Follow the procedures and format specified below.
   1. Draft Reports: Upon completion of testing, adjusting, and balancing procedures, prepare draft reports on the approved forms. Draft reports may be hand written, but must be complete, factual, accurate, and legible. Organize and format draft reports in the same

manner specified for the final reports. Submit 2 complete sets of draft reports. Only 1 complete set of draft reports will be returned.

2. Final Report: Upon verification and approval of draft reports, prepare final reports, type written, and organized and formatted as specified below. Submit 4 complete sets of final reports.
3. Report Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams and other data. Divide the contents of the binder into the below listed divisions, separated by divider tabs:
   a. General Information and Summary
   b. Air Systems
   c. Temperature Control System Verification.

F. Report Contents: Provide the following minimum information, forms, and data:
1. General information and Summary: Inside cover sheet to identify testing, adjusting, balancing agency, Contractor, Owner, Engineer, and Project. Include addresses and contact names and telephone numbers. Also include a certification sheet containing the seal and name, address, telephone number, and signature of the Certified Test and Balance Engineer. Include in this division a listing of the instrumentation used for the procedures along with the instrument calibration sheet.
2. The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC or NEBB, for each respective item and system. Prepare a schematic diagram for each item of equipment and system to accompany each respective report form. The report shall contain the following information, and all other data resulting from the testing, adjusting, and balancing work:
   a. All nameplate and specification data for all air handling equipment and motors.
   b. Actual metered running amperage for each phase of each motor on all pumps and air handling equipment.
   c. Actual metered voltage at air handling equipment (phase-to-phase for all phases).
   d. Fan RPM for each piece of air handling equipment.
   e. Total actual CFM being handled by each piece of air handling equipment.
   f. Actual CFM of systems by rooms.
3. Certify that all smoke and fire dampers operate properly and can be reset under actual system operating conditions.

G. Calibration Reports:
1. Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.

1.4 CERTIFICATION

A. Agency Qualifications:
1. Employ the services of a certified testing, adjusting, and balancing agency meeting the qualifications specified below, to be the single source of responsibility to test, adjust, and balance the building mechanical systems identified above, to produce the design objectives. Services shall include checking installations for conformity to design, measurement, and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, recording and reporting the results, and operation of all systems to demonstrate satisfactory performance to the owner.
2. The testing, adjusting, and balancing agency certified by National Environmental Balancing Bureau (NEBB) or Associated Air Balance Council (AABC) in those testing and balancing disciplines required for this project, and having at least one person certified

by NEBB or AABC as a Test and Balance supervisor, and a registered professional mechanical engineer, licensed in the state where the work will be performed.

B. Codes and Standard:
1. NEBB: “Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.”
2. AABC: “National Standards for Total System Balance.”
3. ASHRAE: ASHRAE Handbook, 1984 Systems Volume, Chapter 37, Testing, Adjusting, and Balancing.

1.5 PROJECT CONDITIONS

A. Systems Operation: Systems shall be fully operation and clean prior to beginning procedures.

1.6 SEQUENCING AND SCHEDULING

A. Test, adjust, and balance the air systems before hydronic, steam, and refrigerant systems within +10% to -5% of contract requirements.

B. The report shall be approved by the Engineer. Test and balance shall be performed prior to substantial completion.

PART 2 - NOT USED

PART 3 - EXECUTION

3.1 PRELIMINARY PROCEDURES FOR AIR SYSTEM BALANCING

A. Before operating the system, perform these steps.
1. Obtain design drawings and specifications and become thoroughly acquainted with the design intent.
2. Obtain copies of approved shop drawings of all air handling equipment, outlets (supply, return, and exhaust) and temperature control diagrams.
3. Compare design to installed equipment and field installations.
4. Walk the system from the system air handling equipment to terminal units to determine variations of installation from design.
5. Check filters for cleanliness and to determine if they are the type specified.
6. Check dampers (both volume and fire) for correct and locked position. Check automatic operating and safety controls and devices to determine that they are properly connected, functioning, and at proper operating setpoint.
7. Prepare report test sheets for both fans and outlets. Obtain manufacturer’s outlet factors and recommended procedures for testing. Prepare a summation of required outlet volumes to permit a cross-check with required fan volumes.
8. Determine best locations in main and branch ductwork for most accurate duct traverses.
9. Place outlet dampers in the full open position.
10. Prepare schematic diagrams of system “As-Built” ductwork and piping layouts to facilitate reporting.
11. Lubricate all motors and bearings.
12. Check fan belt tension.
13. Check fan rotation.

3.2 KITCHEN HOOD

A. A Performance test shall be conducted upon completion, and before final approval of the

installation of a ventilation system serving commercial cooking appliances. The test shall verify the rate of exhaust airflow of the capacity of the hood, make-up airflow required and proper operation. This test will be required to be provided to the HVAC Inspector prior to final inspection.

3.3 FUME HOOD BALANCE

A. GENERAL REQUIREMENTS

1. The fume hood, when properly installed in a laboratory and connected to an exhaust fan of the proper capacity, shall contain and remove fumes generated within the hood. The face velocity range shall be between 100-125 fpm as selected. The hood shall operate efficiently at any setting within this range. Hood design shall be such that it will exhaust light or heavy gases efficiently when the hood is used for ordinary laboratory work in a room free from cross drafts and without high thermal loads or other special conditions of this nature. No reverse flows of air will be allowed along the sides, top, bottom, or front of the hood. The owner and/or a designated representative shall view the tests and successful compliance results are contingent upon concurrence by the owner and/or the representative.

2. The performance test requirements listed in this section are also applicable for the establishment of baseline performance characteristics for comparison with periodic evaluations of existing laboratory chemical fume hoods.

3. The following instrumentation, equipment, and supplies shall be on hand for use in the performance tests:
   a. Alnor "Velometer" or approved equal, direct reading, with graduations from 0-350 feet/minute.
   b. Pitot tube and inclined manometer with graduations no greater than 0.02".
   c. One-half minute smoke bombs (3 dozen).
   d. Titanium tetrachloride (4 ounces). Titanium Tetrachloride and its hydrolysis products are highly toxic and irritating. Skin exposure may cause irritation and burns, and even brief contact with the eyes may cause irreversible damage (suppurating conjunctivitis and keratitis, followed by clouding of the cornea). For this reason, certain precautions should be taken when handling this material. These precautions include the wearing of eye protection and rubber gloves. Care should also be taken to avoid inhalation of aerosolized material.
   e. Supply of cotton throat swabs.

B. PERFORMANCE TEST PROCEDURES:

1. "Properly installed" means that the hood shall be installed in an area where there is at least 5 feet clear space in front for observation of the airflow pattern entering the hood. This area shall be without cross drafts or other air currents exceeding 20 fpm that would affect the hood performance in the area in front and around the hood.

2. Fume hood face velocities shall be verified as follows: with exhaust fan on, the quantity of air being exhausted shall be determined by measuring the velocity of air entering the hood face and multiplying this velocity by the square feet of hood opening. The hood sash shall be in the fully raised position. The air velocity shall be determined by averaging at least nine velocity readings taken at the hood face. Readings shall be taken in the center of a grid made up of 3 sections across the middle of the hood face and 3 sections each across the bottom and top of the hood face. Reading shall not vary more than ± 10 fpm from the average face velocity.

3. When the selected face velocity has been established, the following tests shall be made:
   a. Make a complete traverse of the hood face with a cotton swab dipped in titanium tetrachloride to demonstrate a positive flow of air is maintained into the hood over the entire hood face. No reverse air flows or dead air space shall be permitted.
   b. Paint a strip of titanium tetrachloride along each end and across the working surface of the hood, in a line parallel with the hood face and 6" back into the hood to demonstrate that no back flows of air exist at these points. The flow of smoke shall be directly to the rear of the hood without swirling turbulence or reverse flows.

4. Lower sash to a point 6 inches above work surface. Velocity, as measured at three points across the reduced face opening, shall be at least two times but less than three times the design face velocity when the sash was fully raised.

5. With the sash still at the lowered position, the exhaust air volume (indicated as a function of the average velocity determined in the duct with the pitot tube) shall be essentially the same as when the sash was fully raised. Now lower sash to fully closed position and measure exhaust flow. Total exhaust flow shall be essentially as measured previously with the different sash opening positions.

6. Check sash operation by raising and lowering sash. Sash shall glide smoothly and freely, and hold at any height without creeping, assuring proper counterbalance. No metal-to-metal contact shall be allowed between the sash and the sash tract.

3.4 PROCEDURES FOR HYDRONIC SYSTEMS

A. Measure water flow at pumps. Use the following procedures, except for positive-displacement pumps:
   1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
   2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.
   3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
   4. Report flow rates that are not within plus or minus 5 percent of design.

B. Set calibrated balancing valves, if installed, at calculated presettings.

C. Measure flow at all stations and adjust, where necessary, to obtain first balance.
   1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.

D. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than indicated flow.

E. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:
   1. Determine the balancing station with the highest percentage over indicated flow.

2. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.
3. Record settings and mark balancing devices.

F. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.

G. Measure the differential-pressure control valve settings existing at the conclusions of balancing.

3.5 MEASUREMENTS

A. Provide all required instrumentation to obtain proper measurements, calibrated to the tolerances specified in the referenced standards. Instruments shall be properly maintained and protected against damage.

B. Provide instruments meeting the specifications of the referenced standards.

C. Use only those instruments which have the maximum field measuring accuracy and are best suited to the function being measured.

D. Apply instrument as recommended by the manufacturer.

E. Use instruments with minimum scale and maximum subdivisions and with scale ranges proper for the value being measured.

F. When averaging values, take a sufficient quantity of readings which will result in a repeatability error of less than 5%. When measuring a single point, repeat readings until 2 consecutive identical values are obtained.

G. Take all readings with the eye at the level of the indicated value to prevent parallax.

H. Use pulsation dampeners where necessary to eliminate error involved in estimating average of rapidly fluctuation readings.

I. Take measurements in the system where best suited to the task.

3.6 PERFORMING TESTING, ADJUSTING, AND BALANCING

A. Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards. Balancing of the air systems and hydronic systems shall be achieved by adjusting the automatic controls, balancing valves, dampers, air terminal devices, and the fan/motor drives within each system.

B. Cut insulation, ductwork, and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.

C. Patch insulation, ductwork, and housings, using materials identical to those removed.

D. Seal ducts and piping, and test for and repair leaks.

E. Seal insulation to re-establish integrity of the vapor barrier.

F. Adjust timing relays of environmental equipment motor reduced voltage starters to the optimum

time period for the motor to come up to the maximum reduced voltage speed and then transition to the full voltage speed to prevent damage to motor, and to limit starting current spike to the lowest possible and practical.

G. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.

H. Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.

3.7 RECORD AND REPORT DATA

A. Record all data obtained during testing, adjusting, and balancing in accordance with, and on the forms recommended by the referenced standards, and as approved on the sample report forms.

B. Prepare report of recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.

C. Report shall be certified and stamped by a registered professional mechanical engineer employed by the agency and licensed in the state where the work will be performed.

D. Engineer is to provide a floor plan and test and balance contractor to include the plan in test and balance report and identify actual cfm on drawing or number the diffusers to match report.

3.8 DEMONSTRATION

A. If requested, testing, adjusting, and balancing agency shall conduct any or all of the field tests in the presence of the engineer.

B. Agency shall include a maximum of one (1) call back to the project within the one year warranty period to make additional adjustments if requested by the engineer.

END OF SECTION 23 0593

SECTION 23 0712 - MECHANICAL INSULATION AND FIRE STOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 0501 apply to this Section.

1.2 SUMMARY

A. Furnish and install mechanical insulation and fire stopping as described in Contract Documents including but not limited to the following:
   1. Chilled Water Cooling
   2. Ductwork Insulation
   3. Heating Piping Insulation
   4. Boilers, Tanks, Headers, and Breechings
   5. Refrigerant Piping
   6. Fire Stopping

1.3 QUALITY ASSURANCE

A. Insulation shall have composite (insulation, jacket or facing and adhesive used to adhere facing or jacket to insulation) fire and smoke hazard ratings as tested by Procedure ASTM E-84, NFPA 255 and UL 723 not exceeding: Flame Spread of 25 and Smoke Developed of 50.

B. Insulation Contractor shall certify in writing, prior to installation, that all products to be used will meet the above criteria.

C. Accessories, such as adhesives, mastics, cements, and tapes, for fittings shall have the same component ratings as listed above.

D. Products, or their shipping cartons, shall bear a label indicating that flame and smoke ratings do not exceed above requirements.

E. Any treatment of jacket or facings to impart flame and smoke safety shall be permanent.

F. The use of water-soluble treatments is prohibited.

END OF SECTION 23 0712

SECTION 23 0716 - DUCTWORK INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, and Section 23 0501 apply to this Section.

1.2 SUMMARY

A. Furnish and install insulation on air ducts outside building insulation envelope as described in Contract Documents.

B. Furnish and install insulation on fresh air ducts and combustion air ducts within building insulation envelope as described in Contract Documents.

C. Furnish and install insulation on other air ducts where indicated on Drawings.

PART 2 - PRODUCTS

2.1 INSULATION

A. 1-1/2 inch thick fiberglass with aluminum foil scrim kraft facing and have a density of one lb/cu ft.

B. Approved Manufacturers:
1. Manville Microlite FSK
2. CSG Type IV standard duct insulation
3. Owens-Corning FRK
4. Knauf (Duct Wrap FSK)

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct wrap in accordance with Manufacturer's recommendations.

B. Do not compress insulation except in areas of structural interference.

C. Completely seal joints.

END OF SECTION 23 0716

SECTION 23 0717 – ROUND SUPPLY DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 0501 apply to this Section.

1.2 SUMMARY

A. Furnish and install round supply duct insulation as described in Contract Documents.

1.3 QUALITY ASSURANCE

A. Insulation shall be UL rated with FSK (foil-skrim-kraft) facing.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Fiberglass blanket insulation

B. Approved Manufacturers:
1. Johns-Manville R-4 Microlite (R-4 does not include the vapor barrier material).
2. Owens-Corning faced duct wrap insulation FRK-25 ED-150
3. Certainteed Standard Duct Wrap.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Insulate round air supply ducts.

B. Facing shall overlap 2" at joints and shall be secured with outward clinch staples on 4" centers.

C. Ducts over 30" in width shall have spot application of adhesive, weld pins or metal screws and caps on not more than 18" centers applied to underside.

D. 3" wide vapor barrier paper shall be applied over seams and sealed with vapor barrier adhesive.

E. Insulate attenuators.

F. Insulate high and low pressure flex ducts.

END OF SECTION 23 0717

SECTION 23 0718 - DUCT LINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, and Section 23 0501 apply to this Section.

1.2 SUMMARY

A. Furnish and install acoustic lining in following above ground metal ductwork as described in Contract Documents unless detailed otherwise:
   1. Supply air
   2. Return air
   3. Mixed air
   4. Transfer air
   5. Relief air
   6. Elbows, fittings, and diffuser drops greater than 12 inches in length.
   7. Plenums

B. Furnish and install lining in concrete underfloor boxes.

1.3 SYSTEM DESCRIPTION

A. Duct dimensions shown on Drawings are for free area inside insulation. Allowance must be made for insulation, where applicable.

1.4 RATINGS:

A. Material shall have maximum air friction correction factor of 1.10 at 1000 FPM velocity and have a minimum sound absorption coefficient NRC of .60.

PART 2 - PRODUCTS

2.1 DUCT LINER

A. One inch thick, 1-1/2 lb density fiberglass, factory edge coated.

B. Duct lining materials are to meet the requirements of UL 181 for mold, humidity, and erosion resistance.

C. Approved Manufacturers:
   1. Certainteed Ultralite 150 Certa Edge Coat
   2. Knauf - Type M
   3. Manville - Lina-Coustic
   4. Owen Corning Fiberglas - Aeroflex

2.2 ADHESIVE

A. Water Base Type:
   1. Cain - Hydrotak
   2. Duro Dyne - WSA

3. Kingco - 10-568
4. Miracle - PF-101
5. Mon-Eco - 22-67
6. Techno Adhesive - 133

B. Solvent Base (non-flammable) Type:
1. Cain - Safetak
2. Duro Dyne - FPG
3. Kingco - 15-137
4. Miracle - PF-91
5. Mon-Eco - 22-24
6. Techno Adhesive - 'Non-Flam' 106

C. Solvent Base (flammable) Type:
1. Cain - HV200
2. Duro Dyne - MPG
3. Kingco - 15-146
4. Miracle - PF-96
5. Mon-Eco - 22-22
6. Techno Adhesive - 'Flammable' 106

2.3 FASTENERS

A. Adhesively secured fasteners not allowed.

B. Approved Manufacturers:
1. AGM Industries Inc - "DynaPoint" Series DD-9 pin
2. Cain
3. Duro Dyne
4. Omark dished head "Insul-Pins"
5. Grip nails may be used if each nail is installed by "Grip Nail Air Hammer" or by "Automatic Fastener Equipment" in accordance with Manufacturer's recommendations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install mat finish surface on air stream side. Secure insulation to cleaned sheet metal duct with continuous 100% coat of adhesive and with 3/4 inch long mechanical fasteners 12 inches on center maximum unless detailed otherwise on Drawings. Pin all duct liner.

B. Accurately cut liner and thoroughly coat ends with adhesive. Butt joints tightly. Top and bottom sections of insulation shall overlap sides. If liner is all one piece, folded corners shall be tight against metal. Ends shall butt tightly together.

C. In casings and plenums further contain insulation with wire mesh.

3.2 FIELD QUALITY CONTROL

A. If insulation is installed without longitudinal and end joints butted together, installation will be rejected and work removed and replaced with work that conforms to this Specification.

B. Insulation shall be installed in accordance with Duct Liner Application Standard SMACNA

Manual 15.

3.3 ADJUSTING, CLEANING

A. Keep duct liner clean and free from dust. At completion of project, vacuum duct liner if it is dirty or dusty.

END OF SECTION 23 0718

SECTION 23 0719 - EXTERIOR DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, and Section 23 0501 apply to this Section.

PART 2 - NOT USED

PART 3 - EXECUTION

3.1 INSTALLATION

A. Insulate all heating and air conditioning sheet metal ductwork outdoors, exposed to the weather with 2 inch thick rigid Fiberglass Type 705, standard faced insulation.

B. Insulation shall be cut and fit tightly between standing seams. Secure insulation with Mechanical Fasteners on the sides and bottom, spaced at rate of one fastener per 2 square feet. Secure insulation to top of duct with Insulation Bonding Adhesive.

C. Cover all joints and fastener penetrations with two 1/8 inch wet coats of Vapor Barrier Mastic reinforced with Glass Fabric, lapping all joints a minimum of 2 inches.

D. Cover all exterior duct insulation with 26 gage embossed aluminum cover with cinch bands. Overlap each joint a minimum of 2” and caulk seams exposed to weather.

END OF SECTION 23 0716

SECTION 23 0720 - REFRIGERANT PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 0501 apply to this Section.

1.2 SUMMARY

A. Furnish and install insulation on above ground refrigerant suction piping and fittings, including thermal bulb, from thermal expansion valve as described in Contract Documents.

1.3 QUALITY ASSURANCE

A. Insulation shall have flame-spread rating of 25 or less and a smoke density rating of 50 or less as tested by ASTM E-84 method.

B. Ratings:
1. Upper rating of =210 deg. F.
2. Lower rating of -110 deg. F.
3. UV stabilized for ten year life.
4. Thermal conductivity of 0.24.
5. Water vapor transmission of .03 perms per inch.
6. Material to be polyolefin food grade.

PART 2 - PRODUCTS

2.1 FLEXIBLE FOAMED PIPE INSULATION

A. Thickness:
1. 1/2 inch for one inch outside diameter and smaller pipe.
2. 3/4 inch for 1-1/8 through 2 inch outside diameter pipe.
3. One inch for 2-1/8 inches outside diameter and larger pipe (two layers of 1/2 inch).
4. One inch sheet for fittings as recommended by Manufacturer.

B. Approved Manufacturers:
1. Armaflex
2. Halstead "Insul-tube"
3. Rubatex
4. Therma-Cel

2.2 JOINT SEALER

A. Approved Manufacturers:
1. Armaflex 520
2. BFG Construction Adhesive #105
3. Therma-Cel 950.

2.3 MANUFACTURED UNITS

A. Nominal 3/4" wall thickness

B. Approved Manufacturers:
   1. ImcoLock Pipe Insulation
   2. or approved equal

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install insulation in snug contact with pipe and in accordance with Manufacturer's recommendations.

B. Insulation shall be slipped onto pipe prior to connection or applied after pipe is installed, at contractor's option.

C. Close butt joints and miter joints.
   1. Approved Manufacturers:
      a. IMCOA's Fuse-Seal joining system
      b. or factory approved contact adhesive

D. Insulation shall be installed according to manufacturer's recommended procedures.

E. Exterior exposed Insulation shall be finished with two coats of factory approved finish. Color shall be selected by the Owner's representative.

F. Stagger joints on layered insulation.

G. Slip insulation on tubing before tubing sections and fittings are assembled keeping slitting of insulation to a minimum.

H. Seal joints in insulation.

I. Insulate flexible pipe connectors.

J. Insulate thermal expansion valves with insulating tape.

K. Insulation exposed outside building shall have "slit" joint seams placed on bottom of pipe.

L. Insulate fittings with sheet insulation and as recommended by Manufacturer.

END OF SECTION 23 0720

SECTION 23 0800 – FIRE STOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 0501 apply to this Section.

1.2 SUMMARY

A. Furnish and install fire stopping as described in Contract Documents.

1.3 QUALITY ASSURANCE

A. Fire stopping material shall meet ASTM E814, E84 and be UL listed.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Material shall be flexible, long lasting, intumescent acrylic seal to accommodate vibration and building movement.

B. Caulk simple penetrations with gaps of 1/4" or less with:
   1. Dow Corning Fire Stop Sealant
   2. Pensil 300

C. Caulk multiple penetrations and/or penetrations with gaps in excess of 1/4" with:
   1. Dow Corning Fire Stop Foam
   2. Pensil 200
   3. IPC flame safe FS-1900
   4. Tremco “Tremstop 1A”

PART 3 - EXECUTION

3.1 INSTALLATION

A. Follow manufacturer's installation instructions explicitly.

B. Seal penetrations of ductwork, piping, and other mechanical equipment through one-hour and two-hour rated partitions as shown on Architectural and Mechanical Drawings.

C. Install fire stopping material on clean surfaces to assure adherence.

END OF SECTION 23 0800

SECTION 23 3114 - LOW-PRESSURE STEEL DUCTWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 0100 apply to this Section.

1.2 SUMMARY

A. Furnish and install above-grade ductwork and related items as described in Contract Documents.

PART 2 - PRODUCTS

2.1 DUCTS

A. Fabricate of zinc-coated lockforming quality steel sheets meeting requirements of ASTM 653A/653M, "Specification for Sheet Steel Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock Forming Quality", with G 60 coating.

B. Use of aluminum, non-metallic, or round ducts is not permitted. [Specification writer: Use of aluminum ducts in areas with high chlorine content (eg.: ventilation for pools, spas, etc.) should be considered on a per job basis.]

2.2 DUCT JOINTS

A. Ducts with sides up to and including 36 inches shall be as detailed in the SMACNA manual.

B. Duct sizes over 36 inches shall be fabricated using SMACNA T-24 flange joints or pre-fabricated systems as follows:
   1. Ducts with sides over 36 inches to 48 inches:
      a. transverse duct joint system by Ductmate/25, Nexus, Ward, or WDCI (Lite) (SMACNA "E" or "G" Type connection).
      b. Ducts 48 inches & larger:
      c. Ductmate/35, Nexus, or WDCI (Heavy) (SMACNA "J" Type connection).
      d. Approved Manufacturers:
      e. Ductmate Industries Inc, 10760 Bay Meadows Drive, Sandy, UT 84092 (801) 571-5308
      f. Nexus, Exanno Corp, P O Box 729, Buffalo, NY 14206 (716) 849-0545
      g. Ward Industries Inc, 1661 Lebanon Church Road, Pittsburg, PA 15236 (800) 466-9374
      h. WDCI, P O Box 10868, Pittsburg, PA 15236 (800) 245-3188

2.3 ACCESS DOORS IN DUCTS

A. At each manual outside air damper and at each motorized damper, install factory built insulated access door with hinges and sash locks. Locate doors within 6 inches of installed dampers. Construction shall be galvanized sheet metal, 24 ga minimum.

B. Fire and smoke damper access doors shall have a minimum clear opening of 12" x 12" or as specified on Drawings to easily service fire or smoke damper. Doors shall be within 6 inches of fire and smoke dampers and in Mechanical Room if possible.

C. Identify each door with 1/2" high letters reading “smoke damper” or “fire damper”.

D. Approved Manufacturers:
1. AirBalance - Fire/Seal #FSA 100
2. Air Control Products - HAD-10
3. Cesco-Advanced Air - HAD-10
4. Elgen - Model 85 A
5. Kees Inc - ADH-D.
6. Louvers & Dampers - #SMD-G-F
7. Nailor-Hart Industries Inc - Series 0831
8. National Controlled Air Inc - Model AD-FL-1

2.4 FLEXIBLE EQUIPMENT CONNECTIONS

A. 30 oz closely woven UL approved glass fabric, double coated with neoprene.

B. Fire retardant, waterproof, air-tight, resistant to acids and grease, and withstand constant temperatures of 250 deg F.

C. Approved Manufacturers:
1. Cain - N-100
2. Duro Dyne - MFN
3. Elgen - ZLN
4. Ventfabrics - Ventglas

2.5 CONCEALED CEILING DAMPER REGULATORS

A. Approved Manufacturers:
1. Cain
2. Duro Dyne
3. Metco Inc
4. Vent-Lock - #666
5. Young - #303

2.6 VOLUME DAMPERS

A. In Main Ducts:
1. 16 gauge galvanized steel, opposed blade type with 3/8 inch pins and end bearings. Blades shall have 1/8 inch clearance all around.
2. Damper shall operate within acoustical duct liner.
3. Provide channel spacer equal to thickness of duct liner.
4. Approved Manufacturers:
   a. Air Balance - Model AC-2
   b. Air Control Products - CD-OB
   c. American Warming - VC-2-AA
   d. Greenheck - VCD-1100
   e. NCA, Safe Air
   f. Vent Products - 5100

B. In Sheet Metal Branch Ducts:
   1. Extruded aluminum, opposed blade type. When in open position, shall not extend beyond damper frame.
   2. Maximum blade length 12 inches.
   3. Damper Regulator shall be concealed type with operation from bottom or with 90 deg miter gear assembly from side.
   4. Approved Manufacturers:
      a. Air Control Products - TCD-OB
      b. Air Guide - OB
      c. Arrow - OBDAF-207
      d. CESCO - CDA
      e. Reliable Metals - OBD-RO
      f. Tuttle & Bailey - A7RDDM
      g. Safe Air
      h. Young - 820-AC

C. Dampers above removable ceiling and in Mechanical Rooms shall have locking quadrant on bottom or side of duct. Otherwise, provide concealed ceiling damper regulator and cover plate.

2.7 MOTORIZED OUTSIDE AIR DAMPERS

A. Damper Blades:
   1. 18 gauge galvanized steel or equivalent aluminum with replaceable rubber blade edges, 9 inches wide maximum.
   2. End seals shall be flexible metal compression type.
   3. Opposed blade type.

B. Make provision for damper actuators and actuator linkages to be mounted external of air flow.

C. Approved Manufacturers & Models:
   1. Air Balance - AC-2
   2. American Warming - VC-2-AAVA
   3. Arrow - OBDAF-207
   4. Greenheck - VCD-2100
   5. Honeywell - D641
   6. Johnson - D1300
   7. Louvers & Dampers - TSD400
   8. Ruskin - CD36 or CD60
   9. Safe Air - 610
   10. Vent Products - 5800

2.8 BACKDRAFT DAMPER

A. Backdraft blades shall be nonmetallic and shall be neoprene coated fiberglass.

B. Stop shall be galvanized steel screen or expanded metal, 1/2 inch mesh.

C. Frame shall be galvanized steel or extruded aluminum alloy.

D. Approved Models & Manufacturers:
   1. Air Control Products - FBD
   2. American Warming - BD-15
   3. CESCO - FBD 101

4. Ruskin - NMS2
5. Safe Air

2.9 DUCT HANGERS

A. 1" x 18 gauge galvanized steel straps or steel rods as shown on Drawings, and spaced not more than 8 feet apart. Do not use wire hangers.

B. Attaching screws at trusses shall be 1-1/2 inch No. 10 round head wood screws. Nails not allowed.

2.10 DIRTY FILTER MANOMETERS

A. Dwyer No. 451F.

2.11 MAGNEHELIC GAUGE

A. Dwyer Series 2001-AF complete with standard accessories and vent valves.

2.12 DUCT SILENCERS

A. Air Filter Corp - AIRSAN

B. Industrial Acoustic Co

C. Titus Products Div

D. United McGill Corp

2.13 DUCT SEALER

A. Cain - Duct Butter or Butter Tak

B. Design Polymerics - DP 1010

C. DSC - Stretch Coat

D. Duro Dyne - S2

E. Hardcast - #601 Iron-Grip or Peel-N-Seal Tape
1. Kingco - 15-325
2. Mon-Eco - 44-41
3. Trans-Continental Equipment Co - Multipurpose Duct Sealant
4. United - Sheet Metal duct-sealer

PART 3 - EXECUTION

3.1 INSTALLATION

A. Ducts:
1. Straight and smooth on inside with joints neatly finished unless otherwise directed.
2. Duct panels through 48 inch dimension having acoustic duct liner need not be crossbroken or beaded.
3. Crossbreak unlined ducts and duct panels larger than 48 inch or bead 12 inches on center.

4. Securely anchor ducts to building structure with specified duct hangers attached with screws. Do not hang more than one duct from a duct hanger.
5. Brace and install ducts so they shall be free of vibration under all conditions of operation.
6. Ducts shall not bear on top of structural members.
7. Make duct take-offs to branches, registers, grilles, and diffusers as detailed on Drawings.
8. Ducts shall be large enough to accommodate inside acoustic duct liner. Dimensions shown on Drawings are net clear inside dimensions after duct liner has been installed.
9. Properly flash where ducts protrude above roof.
10. Install internal ends of slip joints in direction of flow. Make joints air tight using specified duct sealer.
11. Cover horizontal and longitudinal joints on exterior ducts with two layers of Hardcast tape installed with Hardcast HC-20 adhesive according to Manufacturer's recommendations.
12. Paint ductwork visible through registers, grilles, and diffusers flat black.

B. Install flexible inlet and outlet duct connections to each furnace, fan, fan coil unit, and air handling unit.

C. Install concealed ceiling damper regulators.
1. Paint cover plates to match ceiling tile.
2. Damper regulators will not be required for dampers located directly above removable ceilings or in Mechanical Rooms.

D. Provide each take-off with an adjustable volume damper to balance that branch.
1. Anchor dampers securely to duct.
2. Install dampers in main ducts within insulation.
3. Dampers in branch ducts shall fit against sheet metal walls, bottom and top of duct, and be securely fastened. Cut duct liner to allow damper to fit against sheet metal.
4. Where concealed ceiling damper regulators are installed, provide a cover plate.

E. Install grilles, registers, and diffusers. Level floor registers and anchor securely into floor.

F. Air Turns:
1. Permanently installed, consisting of single thickness curved metal blades with one inch straight trailing edge to permit air to make abrupt turn without appreciable turbulence, in 90 degree elbows of above ground supply and return ductwork.
2. 4-1/2 inch wide minimum vane rail. Do not use junior vane rails.
3. Double thickness vanes not acceptable.
4. Quiet and free from vibration when system is in operation. See SMACNA Manual

G. Dirty Filter Manometer or Magnehelic Gauge:
1. Install on each air-handling unit housing adjacent to filters.
2. Provide pressure sensing tips with connecting tubing on each side of filter.
3. Provide required oil for manometer.

H. Install motorized dampers

END OF SECTION 23 3114

SECTION 23 3346 - FLEX DUCT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 0100 apply to this Section.

1.2 SUMMARY

B. Furnish and install supply air branch duct runouts to diffusers as described in Contract Documents.

PART 2 - PRODUCTS

2.1 DUCTS

A. Formable, flexible, circular duct which shall retain its cross-section, shape, rigidity, and shall not restrict air flow after bending.

B. Nominal 1-1/2 inches thick, 3/4 lb/cu ft density fiberglass insulation with air-tight, polyehtylene or polyester core, sheathed in seamless vapor barrier jacket factory installed over flexible assembly.

C. Assembly, including insulation and vapor barrier, shall meet Class I requirement of NFPA 90A and be UL 181 rated, with flame spread of 25 or less and smoke developed rating of 50 or under.

D. Length of flexible ductwork shall not exceed 8'-0".

2.2 APPROVED MANUFACTURERS

A. ANCO-FLEX - 4625

B. Flex-Aire - PF/UPC #090

C. Hart & Cooley - F114

D. Thermaflex - G-KM

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct in fully extended condition free of sags and kinks.

B. Make duct connections by coating exterior of duct collar for 3 inches with duct sealer and securing duct in place over sheet metal collar with 1/2 inch wide metal cinch bands and sheet metal screws.

END OF SECTION 23 3346

SECTION 23 3400 - EXHAUST FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 0501 apply to this Section.

1.2 SUMMARY

A. Furnish and install exhaust fans as described in Contract Documents.

1.3 QUALITY ASSURANCES

A. Requirements of Regulatory Agencies:
   1. Bear AMCA seal and UL label.

PART 2 - PRODUCTS

2.1 CEILING MOUNTED EXHAUST FANS

A. Acoustically insulated housings.

B. Sound level rating of 4.6 sones maximum for fan RPM and CFM listed on Drawings.

C. Include chatterproof integral back-draft damper with no metal to metal contact.

D. True centrifugal wheels.

E. Entire fan, motor, and wheel assembly shall be easily removable without disturbing housing.

F. Suitably ground motors and mount on rubber-in shear vibration isolators.

G. Provide wall or roof cap, as required.

H. Approved Manufacturers:
   1. Cook-Gemini
   2. Greenheck Sp
   3. Pace
   4. Penn Zephyr
   5. Twin City

2.2 ROOF MOUNTED EXHAUST FANS

A. Direct drive or have adjustable pitch V-belt as noted on Drawings.

B. Wheels shall be backward curved and housing shall be removable or hinged aluminum.

C. Isolate motor with vibration dampeners.

D. Provide quiet type back-draft dampers.

E. Insulated, pre-fabricated metal roof curb shall be for flat or sloped roof as shown on Drawings.

F. Approved Manufacturers:
   1. Fans:
      a. Penn
      b. Centri-Master
      c. Cook
      d. Greenheck G, GB
      e. Twin City
      f. Standard curbs:
      g. Penn
      h. Cook
      i. Greenheck
      j. Sound attenuating curbs:
      k. Penn
      l. Greenheck

2.3 CENTRIFUGAL IN-LINE FANS

A. Non-overloading design and of arrangement indicated.

B. Constructed of low carbon steel and painted with an approved rust resistant coating or all aluminum as shown.

C. Fan performance shall be based on tests conducted in accordance with the AMCA Standard test code of air moving devices and shall be licensed to bear the AMCA Certified Air and Sound Rating Seal. Fans shall have a sharply rising pressure characteristic extending through the operating range and continuing to rise well beyond the efficiency peak to assure quiet and stable operation under all conditions. Horsepower characteristics shall be truly self-limiting and shall reach a peak in the normal selection area.

D. Wheel diameters shall be in accordance with the standard sizes adopted by AMCA for centrifugal in-line type fans. Inlets shall be fully streamlined and housings shall be suitably braced to prevent vibration or pulsation. Housings shall be arc welded steel throughout.

E. Fan wheel shall include die formed AIRFOIL blades designed for maximum efficiency and quiet operation. Blades shall be continuously welded to back plate and welded to wheel cone. Class 2 fan with inlet and outlet bell fittings.

F. Wheels shall be statically and dynamically balanced and assembled fan shall be tested for balance at specified speed at the factory prior to shipment. Such tests shall be performed with an IRD analyzer to measure radial and axial displacements.

G. Bearings are to be ball or roller anti-friction type, and shall be equipped with extended lubrication lines to grease fittings outside of the fan housing. Shafts shall operate at no more than 70% of first critical speed to assure smooth operation.

H. Accessories for in-line fans to include belt guard, inlet and outlet flanges, and other accessories as called for in the plans.

I. All fans shall be equipped with an adjustable motor base integral with the fan housing. This motor base shall be completely welded and consist of frame and reinforcing side sheets to assure maximum strength and rigidity.

J. Submittals for approval of equipment shall include copies of outline drawings, AMCA Certified

Sound Ratings, and percentage pressure-volume performance curves showing point of operation.

K. Approved Manufacturers:
1. Barry
2. Cook
3. Penn

PART 3 - EXECUTION

3.1 INSTALLATION

A. Anchor fan units securely to structure or curb.

END OF SECTION 23 3400

SECTION 23 3713 - AIR OUTLETS & INLETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 0100 apply to this Section.

1.2 SUMMARY

A. Furnish and install wall supply registers, transfer grilles, return air grilles, soffit grilles, ceiling diffusers, louvers connected to ductwork, and registers as described in Contract Documents.

PART 2 - PRODUCTS

2.1 GRILLES & REGISTERS

A. Approved Manufacturers:
1. Price
2. Anemostat
3. Krueger
4. Titus
5. Tuttle & Bailey

2.2 SPIN-IN FITTINGS

A. Low pressure round take-offs to diffusers shall be made with spin-in fittings. They shall incorporate a manual balancing damper. The damper shall be spring loaded and a positive locking wing nut shall secure the damper position.

B. Approved Manufacturers:
1. Sheet metal fittings: Genflex DB-1DEL, Hercules

2.3 LOUVERS

A. Extruded aluminum, with blades welded or screwed into frames and 1/2 inch mesh 16 gauge aluminum bird screen.

B. Frames shall have mitered corners.

C. Louvers shall be recessed, flanged, stationary, or removable as noted on Drawings.

D. Approved Manufacturers:
1. Airolite
2. American Warming
3. Arrow
4. Industrial Louvers
5. Ruskin
6. Vent Products

2.4 ROOF MOUNTED INLETS AND OUTLETS

A. FABRICATION
1. Penthouse type of extruded aluminum complete with roof curb to fit slope of roof and ½ inch mesh 16 gauge aluminum bird screen.

B. APPROVED MANUFACTURERS & MODELS
1. Tiered Type:
a. Model TRE extruded aluminum ventilator by Loren Cook Company, Springfield Missouri
b. Louvered Penthouse
c. Penn “Penhouse”
d. Model WRH by Greenheck Fan Corporation, Schofield, WI
e. Model MPH by Jenn-Air Industries Inc., Indianapolis, IN

PART 3 - EXECUTION

3.1 INSTALLATION

A. Anchor securely into openings.

B. Install with screws to match color and finish of grilles and registers.

C. Touch-up any scratched finish surfaces.

D. Install in accordance with manufacturer's instructions.

E. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

F. Install diffusers to ductwork with air tight connection.

G. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

H. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09 9000.

END OF SECTION 23 3713

SECTION 23 4200 - GAS DETECTION AND ALARM

PART 4 - GENERAL

SECTION INCLUDES

Commercial series gas detectors.

4.1 Combo Carbon Monoxide/Nitrogen Dioxide. (CX-6) (CX-12)

Detection ventilation control panels.

Analog to digital converter.

Horns and strobes.

RELATED SECTIONS

Division 26 - Electrical.

REFERENCES

Intertek Group (ETL).

National Electrical Manufacturers Association (NEMA):

4.1 NEMA 1 - Enclosures constructed for indoor use.

4.2 NEMA 4x - Enclosures constructed for outdoor use and offer a superior level of protection from corrosion and extreme environments.

Underwriters Laboratories (UL):

4.1 UL 2017 - Standard for Safety General-Purpose Signaling Devices and Systems.

SUBMITTALS

Submit under provisions of Section 01 30 00 - Administrative Requirements.

Product Data:

4.1 Manufacturer's data sheets on each product to be used.

4.2 Preparation instructions and recommendations.

4.3 Storage and handling requirements and recommendations.

4.4 Typical installation methods.

Shop Drawings: Include details of materials, construction and finish. Include relationship with adjacent construction.

QUALITY ASSURANCE

Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.

Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.

Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

PRE-INSTALLATION CONFERENCE

Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

DELIVERY, STORAGE, AND HANDLING

Store and handle in strict compliance with manufacturer's written instructions and recommendations.

Protect from damage due to weather, excessive temperature, and construction operations.

PROJECT CONDITIONS

Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

WARRANTY

Manufacturer's standard limited warranty unless indicated otherwise.

PART 5 - PRODUCTS

MANUFACTURERS

Acceptable Manufacturer: Aerionics Inc dba Macurco Gas Detection, which is located at: 3601 N. St. Paul Ave.; Sioux Falls, SD 57104; ASD Toll Free Tel: 877-367-7891; Fax: 605-951-9616; Email:quotes@macurco.com; Web:https://macurco.com/

Substitutions:

5.1 RKI
5.2 MSA
5.3 Honeywell E3 point

COMMERCIAL SERIES GAS DETECTORS

Features:

5.1 Certifications: ETL Listed. See detector manual for additional certifications.
5.2 Size: 4-1/2 x 4 x 2-1/8 inch (114 X 102 X 54 cm). Weight: 1 pound (0.45 kg).
5.3 Mounting: 4 x 4 inch (101 x 101 mm) electrical box.
5.4 User selectable settings with default to industry standards via two button interface.
5.5 LED Display: Can turn on/off. Easily shows gas concentrations.
5.6 End of life notification.
5.7 Fan Relay: 5 Amp SPDT.
5.8 Alarm Relay: 0.5 Amp. Control fans, valves, louvers, horn and strobes.
5.9 Outputs: 4 to 20 mA. Controls VFDs and to send to BMS. User adjustable settings.
5.10 Operating Temperature: 0 to 125 degrees F (minus 18 to 52 degrees C) unless otherwise specified.
5.11 Ambient Humidity: 10 to 90 percent RH Noncondensing.
5.12 Current Loop: Analog 4 to 20 mA, Digital with MRS-485 Adapter Digital Modbus.
5.13 Housing Color: Grey.
5.14 Housing Color: White.
5.15 Warranty Two Year Limited Warranty.
5.16 Accessories:
A. Control Panel: DVP-120.
B. Control Panel: DVP-120M.
C. Control Panel: DVP-120B.

D. Control Panel: DVP-120C.
E. Control Panel: DVP-1200.
F. Addressable Adapter MRS-485.
G. Horn and Strobe: HS-A. Color: Amber.
H. Horn and Strobe: HS-B. Color: Blue.
I. Horn and Strobe: HS-R. Color: Red.
J. Horn and Strobe: HS-C. Color: Clear.
K. Duct Mount Kit: DMK-1.
L. Field Calibration Kits: Based on gas type.
M. Weatherproof Housing Kit: WHK-1.
N. Power Supply:
O. Model PS-24. Standalone plug in 24 VDC transformer.
1. Size: 2.8 x 1.3 x 1.9 inches (71 x 33 x 48 mm).
2. Input: 90 to 264 VAC.
3. Output Voltage: 24 VDC. Output Current: 1.05 Amps.
4. Operating Temperature: Minus 4 to 104 degrees F (Minus 20 to 40 degrees C).

Gas Type: Carbon Monoxide/Nitrogen Dioxide. Model: CX-12.
5.1 Carbon Monoxide Range: 0 to 200 ppm.
5.2 Nitrogen Dioxide Range: 0-20 ppm.
5.3 Low Level Alarm; Adjustable: 0, 15, 25, 35 (default), 50 or 100 ppm.
5.4 High Level Alarm; Adjustable: 0, 50, 100, 150 or 200 (default) ppm.
5.5 Nitrogen Dioxide Low Level Alarm; Adjustable: 0, 0.5, 0.7, 1.0, 1.2, 1.5, 1.7, 2.0, 2.2, 2.5 (default), 2.7, 3.0, 3.2, 3.5, 3.7, 4.0, 4.2, 4.5, 4.7, 5.0 ppm.
5.6 Nitrogen Dioxide High Level Alarm; Adjustable: 0 to 20 ppm; (5 ppm default).
5.7 Expected Life of Replaceable Sensor: 2 years.
5.8 Recommended Coverage Area: 5000 sq ft (454.5 sq m).
5.9 Voltage and Current: 12-Series.
A. Power: 100 to 240 VAC (50 to 60 Hz).
B. Current: 1.0 A maximum.

DETECTION VENTILATION CONTROL PANELS

Model: DVP-120B. BACnet - 99 Digital Connections. BACnet MSTP output.
5.1 Settings: Customizable, default is per OSHA.
5.2 LCD Display: 2 rows of 16 characters with backlight.
5.3 Settings: External keypad for user selection of transducer and alarm display and setting the configuration.
5.4 Relays: Three 10 Amp, 240 VAC SPDT fan and alarm.
5.5 Status Indicators: (LED): Power, Alarm and warning, hush, Relay 1, 2, and 3.
5.6 Alarms: Drivers for external Horn and Strobe, externally visible system, alarm and relay status indicators.
5.7 Enclosure: Lockable NEMA 1 type enclosure.
5.8 Mounting: Mounting holes in each corner.
5.9 Warranty: Two year limited warranty.
5.10 Accessories:
A. Model MRS-485. Addressable Adapter; 6 series only.
B. Horn and Strobe: Model HS-A. Color: Amber.
C. Horn and Strobe: Model HS-B. Color: Blue.
D. Horn and Strobe: Model HS-R. Color: Red.
E. Horn and Strobe: Model HS-C. Color: White/Clear.
F. Power Supply: Model MAC6AMP-4. Application: System.
1. Size: 13.5 x 13 x 3.3 inches (342 x 330 x 83 mm).

2. Input: 115 VAC.
3. Output Voltage: 12 to 24 VDC. Output Current: 6 A.
4. Operating Temperature: 32 to 120 degrees F (0 to 49 degrees C).
5. Number of Outputs: 4.

G. Power Supply: Model MAC10AMP-4. Application: System.
1. Size: 15.5 x 12 x 4.5 inches (394 x 305 x 114 mm).
2. Input: 115 VAC.
3. Output Voltage: 24 VDC. Output Current: 10 A.
4. Operating Temperature: 32 to 120 degrees F (0 to 49 degrees C).
5. Number of Outputs: 4.

REMOTE RELAY

Model RR-24: Remote Relay box allowing flexibility in the field.
5.1 Modbus addressable relay.
5.2 Compatible with Macurco DVP-1200 Control Panel.
5.3 Enclosure: Wall mount NEMA 4X.
5.4 Dry Contact Relays: Two, 10 Amp, 250 VAC SPDT
5.5 Input: 24 VDC, 0.5 Amp.
5.6 Status Indicators (LED): Power, communication, relay 1, relay 2.
5.7 Size: 8.48 x 6.36 x 3.94 inches (215 X 161 X 100 mm).
5.8 Input: 24 VDC, 0.5 Amp.
5.9 Operating Temperature: 32 to 104 degrees F (0 to 40 degrees C).

HORNS AND STROBES

Model HS-Series, Horn and Strobe as manufactured by Macurco. Flexible optic design to meet or exceed the light output on vertical/horizontal dispersion.
5.1 Strobe Candela: Adjustable at 15, 30, 75 or 110 cd; based on test result with clear lens cover.
5.2 Adjustable Two Audible Tone Settings; (high/low) and Temporal four; (high/low).
5.3 Size: 5-1/2 x 4-3/4 x 2 inches (140 x 121 x 51 mm).
5.4 Pulse Duration: 20 milliseconds.
5.5 Low current draw.
5.6 High power cool white LED.
5.7 Strobe Flash Rate: 1 flash per second.
5.8 Nominal Voltage: Regulated 24 VDC.
5.9 Operating Voltage: 16 to 33 VDC.
5.10 Operating Environment: 32 to 120 degrees F (0 to 49 degrees C). 10 to 93 percent RH.

PART 6 - EXECUTION

EXAMINATION

Do not begin installation until substrates have been properly constructed and prepared.

If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.

PREPARATION

Clean surfaces thoroughly prior to installation.

Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

INSTALLATION

Install in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.

FIELD QUALITY CONTROL

Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.

Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.

CLEANING AND PROTECTION

Clean products in accordance with the manufacturers recommendations.

Touch-up, repair or replace damaged products before Substantial Completion.

END OF DIVISION 23 4200

SECTION 23 6220 – ROOFTOP HEATING-COOLING UNIT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 0501 apply to this Section.

1.2 QUALITY ASSURANCE

A. Unit shall be AGA certified.

1.3 WARRANTY

A. Provide five-year warranty on compressors.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Unit shall be one piece combination air-to-air DX mechanical cooling system and gas fired heating system complete with automatic controls.

B. Equipment shall be shipped completely assembled, pre-charged, piped and wired internally ready for field connections.

C. Roof mounting frame shall be furnished and installed. Frame shall be steel and mate to bottom perimeter of equipment. When flashed into roof, it shall make a unit mounting curb and provide weather-proof duct connection and entry into conditioning area.

D. Power Saver: (Fresh Air Dampers)
1. Provide complete with all controls and air mixing damper assembly, including fresh air, recirculated air, and exhaust air dampers.
2. Fresh air section shall be equipped with air filters.
3. Mixing box sections shall contain low leakage dampers with edge seals and inflatable blade seals.

E. Cooling System:
1. Coils shall be non-ferrous construction with aluminum fins mechanically bonded to seamless copper tubes.
2. Condenser coil shall have sub-cooling rows.
3. Compressor shall be resiliently mounted, have built-in 3-mode crankshaft lubrication, crankcase heater, discharge temperature limiter, current and temperature sensing motor overloads.
4. Cooling system shall be protected by high and low pressure switches and compressor timed off control.
5. Internal condensate drains shall have water level monitoring device inside the primary drain pan and shall shut down unit in the event that the primary drains becomes restricted.

F. Heating System:
1. Automatic controls furnished to give 50/50 2-stage operation.

2. Cylindrical tube and drum exchanger constructed of Duraglas coated steel or stainless steel.
3. Stainless steel burner listed for operation at low outdoor air temperatures.
4. Visual inspection of burner flame possible through observation port at rear of heat exchanger.
5. Power vented.

G. Air Movers:
1. Twin centrifugal conditioned air blowers with permanently lubricated ball bearings, adjustable belt drive or direct drive as shown on drawings.
2. Condenser fans shall be direct driven.
3. Motors shall have inherent protection devices.

H. Frame and Casing:
1. Frame shall be welded construction.
2. Casing shall be galvanized panels with baked-on outdoor enamel finish.
3. Entire cabinet shall be insulated with 1" thick fiberglass.
4. Provide coil guards on exposed condenser coils.

I. Furnish two sets of 2" throw away filters.

J. Provide with 7-day programmable thermostat equal to Honeywell T-7350.

K. Approved Manufacturers:
1. Carrier

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Provide manufacturer's startup and warranty.

END OF SECTION 23 6220

SECTION 23 8127 - MINI SPLIT-SYSTEM HEATING AND COOLING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Indoor ductless fan & coil units.

1.2 RELATED REQUIREMENTS

A. Section 22 1005 - Plumbing Piping: Indoor coil condensate drain.

B. Section 26 0519 – Line-Voltage Electrical Power Conductors and Cables: Electrical characteristics and wiring connections and installation and wiring of thermostats and other controls components.

1.3 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 2008.

B. AHRI 270 - Sound Rating of Outdoor Unitary Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 2008.

C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2010 (ANSI/ASHRAE Std 15).

D. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2009, Revision 1 - 2010.

E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2009.

F. UL 207 - Refrigerant-Containing Components and Accessories, Nonelectrical; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 3300 – for submittal procedures.

B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

D. Design Data: Indicate refrigerant pipe sizing.

E. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

G. Warranty: Submit manufacturer’s warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Substitutions: See Section 01 2500.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years of experience and approved by manufacturer.

1.6 WARRANTY

A. See Section 01 7700 - Closeout Procedures, for additional warranty requirements.

B. Provide five year manufacturer’s warranty for compressors.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Mitsubishi: www.mitsubishi.com.

B. Sanyo: www.sanyo.com.

C. Daikin: www.dainkin.com.

D. LG: www.lg.com.

E. Substitutions: See Section 01 2500

2.2 SYSTEM DESIGN

A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
   1. Heating and Cooling: Air-source electric heat pump located in outdoor unit with evaporator.
   2. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.

B. Performance Requirements: See Drawings for additional requirements.
   1. Efficiency:
      a. Seasonal Energy Efficiency Ratio: 10.0, minimum.
      b. Energy Efficiency Ratio: 12.
      c. Heating Seasonal Performance Factor: 6.8, minimum.

2.3 INDOOR UNITS FOR DUCTLESS SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and wall mounted controls; wired for single power connection with control transformer.
   1. Location: Ceiling or wall.
   2. Power: Run from outdoor unit.
   3. Cabinet: Galvanized steel.

a. Finish: White.

4. Fan: Line-flow fan direct driven by a single motor.
5. Filter return air with washable, antioxidant pre-filter and a pleated anti-allergy enzyme filter.

B. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
1. Construction and Ratings: In accordance with AHRI 210/240 and UL listed.
2. Manufacturer: System manufacturer.

C. Remote: Wall mounted controller/thermostat.

2.4 OUTDOOR UNITS

A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
1. Comply with AHRI 210.
2. Refrigerant: R-410A.
3. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
4. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL listed.
5. Sound Rating: 69 dBA, when measured in accordance with AHRI 270.

B. Compressor: AHRI 520; hermetic, two speed 1800 and 3600 rpm, resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling and rapid speed changes.

C. Air Cooled Condenser: ARI 520; Aluminum fin and copper tube coil, with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
1. Condenser Fans: Direct-drive propeller type.
2. Condenser Fan Motor: Enclosed, 1-phase type, permanently lubricated.

D. Coil: Air-cooled, aluminum fins bonded to copper tubes.

E. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gage ports, thermometer well (in liquid line).
1. Provide thermostatic expansion valves.
2. Provide heat pump reversing valves.

F. Operating Controls:

1. Control by room thermostat to maintain room temperature setting.
2. Low Ambient Kit: Provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig (1965 kPa) and off when pressure drops below 140 psig (965 kPa) for operation to 0 degrees F (-18 degrees C).

G. Mounting Pad: Roof mounted curb to maintain units 12 inches above roofing. Cover curb with roofing material and maintain roof integrity.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available and in correct location.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.

B. Install in accordance with NFPA 90A and NFPA 90B.

C. Install refrigeration systems in accordance with ASHRAE Std 15.

END OF SECTION 23 8127

END OF DIVISION 23

DIVISION 26 - ELECTRICAL

END OF TABLE OF CONTENTS

SECTION 26 0501 - COMMON ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. General electrical system requirements and procedures.
   2. Perform excavating and backfilling work required by work of this Division as described in Contract Documents.
   3. Make electrical connections to equipment provided under other Sections.
   4. Furnish and install Penetration Firestop Systems at electrical system penetrations as described in Contract Documents.

B. Related Sections:
   1. Division 07: Quality of Penetration Firestop Systems to be used on Project and submittal requirements.

1.2 SUBMITTALS

A. Product Data:
   1. Provide following information for each item of equipment:
      a) Catalog Sheets.
      b) Assembly details or dimension drawings.
      c) Installation instructions.
      d) Manufacturer's name and catalog number.
      e) Name of local supplier.
   2. Furnish such information for following equipment:
      a) Section 26 2417: Panelboards
      b) Section 26 2726: Wiring devices.
      c) Section 26 2816: Enclosed switches and circuit breakers.
      d) Section 26 5100: Interior & Exterior lighting fixtures.
   3. Do not purchase equipment before approval of product data.
   4. Submit in electronically in PDF format, Submittals shall be divided into Specification Sections and shall be electronically organized. Submittals shall specifically indicate items that are to be used, Generic submittals will be rejected.

B. Quality Assurance / Control:
   1. Report of site tests, before Substantial Completion.

1.3 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
   1. NEC and local ordinances and regulations shall govern unless more stringent requirements are specified.

2. Material and equipment provided shall meet standards of NEMA or UL, or ULC, CSA, or EEMAC and bear their label wherever standards have been established and label service is available.

B. Materials and equipment provided under following Sections shall be by same Manufacturer:
1. Sections 26 2416, 26 2816, and 26 2913: Panelboards, Enclosed Switches And Circuit Breakers, and Enclosed Controllers.

C. Contractor shall obtain all permits and arrange all inspections required by local codes and ordinances applicable to this Division.

1.4 OWNER'S INSTRUCTIONS

A. Provide competent instructor for time required to adequately train maintenance personnel in operation and maintenance of electrical equipment and systems. Factory representatives shall assist this instruction as necessary. Schedule instruction period at time of final inspection.

1.5 OPERATION AND MAINTENANCE MANUALS

A. Prepare and submit (4) four complete copies of the O & M Manuals—manuals to contain information listed below. Place each manual in a tabbed three-ring binder upon completion of the project.
1. Operation and Maintenance manual must contain the following items:
a) Copies of reviewed shop drawings.
b) Letter of 1-year guarantee of workmanship.
c) Copy of voltage and ammeter readings.
d) Copy of letter verifying owner’s receipt of spare parts.

1.6 GUARANTEE

A. The following guarantee is a part of this specification and shall be binding on the part of the Contractor:

“The Contractor guarantees that this installation is free from mechanical defects. He agrees to replace or repair, to the satisfaction of the Owner’s Representative, any part of this installation which may fail or be determined unacceptable within a period of one (1) year after final acceptance.”

1.7 RECORD DRAWINGS

A. During the course of construction, the Electrical Contractor shall maintain a set of drawings upon which all deviations from the original layout are recorded. These marked-up prints shall be turned over to the Architect/Engineer at the conclusion of the work.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

A. All relocations, reconnections, and removals are not necessarily indicated on Drawings. All such work shall be included without additional cost to Owner.

B. Confirm dimensions, ratings, and specifications of equipment to be installed and coordinate these with site dimensions and with other Sections.

3.2 INSTALLATION

A. General:
   1. Locations of electrical equipment shown on Drawings are approximate only. Field verify actual locations for proper installation.
   2. Coordinate electrical equipment locations and conduit runs with those providing equipment to be served before installation or rough-in.
      a. Notify Architect of conflicts before beginning work.
      b. Coordinate locations of power and lighting outlets in mechanical rooms and other areas with mechanical equipment, piping, ductwork, cabinets, etc, so they will be readily accessible and functional.
   3. Work related to other trades which is required under this Division, such as cutting and patching, trenching, and backfilling, shall be performed according to standards specified in applicable Sections.

B. Install Penetration Firestop System appropriate for penetration at electrical system penetrations through walls, ceilings, and top plates of walls.

3.3 FIELD QUALITY CONTROL

A. Site Tests: Test systems and demonstrate equipment as working and operating properly. Notify Architect before test. Rectify defects at no additional cost to Owner.

B. Measure current for each phase of each motor under actual final load operation, i.e. after air balance is completed for fan units, etc. Record this information along with full-load nameplates current rating and size of thermal overload unit installed for each motor.

END OF SECTION

SECTION 26 0502 - ELECTRICAL DEMOLITION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

B. Includes But Not Limited To
   1. Demolition involving electrical system as described in Contract Documents.

C. Related Sections
   1. Section 260501 – Common Electrical Requirements
   2. New and replacement work specified in appropriate specification Section.

PART 3 - EXECUTION

3.1 EXAMINATION

A. All relocations, reconnections, and removals are not necessarily indicated on Drawings. All such work shall be included without additional cost to Owner.

3.2 PREPARATION

A. Disconnect equipment that is to be removed or relocated. Carefully remove, disassemble, or dismantle as required, and store in approved location on site, existing items to be reused in completed work.

B. Were affected by demolition or new construction, relocate, extend, or repair raceways, conductors, outlets, and apparatus to allow continued use of electrical system. Use methods and materials as specified for new construction.

3.3 PERFORMANCE

A. Perform drilling, cutting, block-offs, and demolition work required for removal of necessary portions of electrical system. Do not cut joists, beams, girders, trusses, or columns without prior written permission from Architect.

B. Remove concealed wiring abandoned due to demolition or new construction. Remove circuits, conduits, and conductors that are not to be re-used back to next active fixture, device, or junction box.

C. Patch, repair, and finish surfaces affected by electrical demolition work, unless work is specifically called for under other Sections of the specifications.

3.4 CLEANING

A. Remove obsolete raceways, conductors, apparatus, and lighting fixtures promptly from site and dispose of legally.

SECTION 26 0503 - EQUIPMENT WIRING SYSTEMS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Electrical connections to equipment specified under other sections or funished by Owner.

1.02 RELATED WORK

A. In the even of conflict regarding equipment wiring system requirements between this Section and any other section, the provisions of this Section shall govern.

PART 2 - PRODUCTS

As described in the related sections.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 PREPARATION

A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections, voltage, number of phases, and ampacity. Coordinate details of equipment connections with supplier and installer.

3.03 INSTALLATION

A. Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit in damp or wet locations and for connections to vibrating equipment. Make flexible connections to vibrating equipment of sufficient length to form a loop to restrict transmission of noise to structural elements or to the air.

C. Install prefinished cord set or use attachment plug with suitable strain-relief clamps. Refer to Section 26 2726, Wiring Devices, for details.

D. Make wiring connections in control panel or in wiring compartment of prewired equipment in accordance with manufacturer’s instructions. Provide interconnecting wiring where indicated. Tag all interconnecting wiring to identify source and destination equipment and terminal numbers. Refer to Section 26 0553, Electrical Identification, for details.

END OF SECTION

SECTION 26 0519 - LINE VOLTAGE CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Quality of conductors used on Project except as excluded below.

B. Related Sections:
   1. Section 26 0501: Common Electrical Requirements.

1.2 DEFINITIONS

A. Line Voltage: Over 70 Volts.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Line Voltage Conductors:
   1. Copper with AWG sizes as shown:
      a. Minimum size shall be No. 12 except where specified otherwise.
      b. Conductor size No. 8 and larger.
   2. Insulation:
      a. Standard Conductor Size No. 10 And Smaller: 600V type THWN or XHHW (75 deg C).
      b. Standard Conductor Size No. 8 And Larger: 600V Type THW, THWN, or XHHW (75 deg C).
      c. Higher temperature insulation as required by NEC or local codes.
      d. Type TC cable is acceptable for use in cable trays only.
   3. Colors:
      a. Refer to Section 26 0553 Electrical Identification for colors for conductors.
      b. Conductors size No. 10 and smaller shall be colored full length. Tagging or other methods for coding of conductor's size No. 10 and smaller not allowed.
      c. For feeder conductors larger than No. 10 at pull boxes, gutters, and panels, use painted or taped band or color tag color-coded as specified above.

B. Line Voltage Cables:
   1. Metal Clad Cable (MC) may be used as restricted below.
      a. Shall NOT be used in areas open to structure; Shop, etc.
      b. Copper Conductors
      c. Use only indoor, dry locations where:
         1) Not subject to damage.
         2) Not in contact with earth.
      d. Not in concrete.
      e. Is allowed by local codes.

f. Not Allowed for Homeruns (Homeruns shall be Conduit with Conductors).

C. Standard Connectors:
1. Conductors No. 8 And Smaller: Steel spring wire connectors.
2. Conductors Larger Than No. 8: Pressure type terminal lugs.
3. Connections Outside Building: Watertight steel spring wire connections with waterproof, non-hardening sealant.

D. Terminal blocks for tapping conductors:
1. Terminals shall be suitable for use with 75 deg C copper conductors.
2. Acceptable Products:
a. 16323 by Cooper Bussmann, St Louis, MO www.bussmann.com
b. LBA363106 by Square D Co, Palatine, IL www.squared.com.
c. Equal as approved by Engineer before bidding.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
1. Conductors and cables shall be continuous from outlet to outlet.
2. Do not use direct burial cable.

B. Line Voltage Conductors (Over 70 Volts):
1. Install conductors in raceway except where specifically indicated otherwise. Run conductors of different voltage systems in separate conduits.
2. Route circuits at own discretion, however, circuiting shall be as shown in Panel Schedules. Group circuit homeruns to panels as shown on Drawings.
3. Multi-wire Branch Circuits (Common Neutral) shall **NOT** be utilized, a dedicated neutral shall be ran with every homerun circuit.
4. Pulling Conductors:
a. Do not pull conductors into conduit until raceway system is complete and cabinets and outlet boxes are free of foreign matter and moisture.
b. Do not use heavy mechanical means for pulling conductors.
c. Use only listed wire pulling lubricants.

END OF SECTION

SECTION 26 0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install grounding for electrical installation as described in Contract Documents except as excluded below.

B. Related Sections:
   1. Section 26 0501: Common Electrical Requirements.

1.2 QUALITY ASSURANCE

A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 03 3111.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Size materials as shown on Drawings and in accordance with applicable codes.

B. Grounding And Bonding Jumper Conductors: Bare copper or with green insulation.

C. Make grounding conductor connections to ground rods and water pipes using approved bolted clamps listed for such use.

D. Service Grounding Connections and Cable Splices:
   1. Make by compression type connectors designed specifically for this purpose.
   2. Acceptable Products:
      a. Burndy
      b. Thomas & Betts.
      c. Equal as approved by Architect before bidding.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Interface With Other Work: Coordinate with Section 03 3111 in installing grounding conductor and placing concrete. Do not allow placement of concrete before Architect's inspection of grounding conductor installation.

B. Grounding conductors and bonding jumper conductors shall be continuous from terminal to terminal without splice. Provide grounding for following.
   1. Electrical service, its equipment and enclosures.

2. Conduits and other conductor enclosures.
3. Neutral or identified conductor of interior wiring system.
4. Main panelboard, power and lighting panelboards.
5. Non-current-carrying metal parts of fixed equipment such as motors, starter and controller cabinets, instrument cases, and lighting fixtures.

C. Grounding connection to main water supply shall be accessible for inspection and made within 6 inches of point of entrance of water line to building. Provide bonding jumpers across water meter and valves to assure electrical continuity.

D. Provide concrete-encased electrode system by embedding 20 feet minimum of No. 2/0 bare copper conductor in concrete footing, 2 inches minimum below concrete surface. Extend No. 2/0 copper conductor to main panel as shown on Drawings.

E. Ground identified common conductor of electrical system at secondary side of main transformer supplying building. Ground identified grounded (neutral) conductor of electrical system on supply side of main service disconnect.

F. Pull grounding conductors in non-metallic raceways, in flexible steel conduit exceeding 72 inches in length, and in flexible conduit connecting to mechanical equipment.

G. Provide grounding bushings on all feeder conduit entrances into panelboards and equipment enclosures.

H. Bond conduit grounding bushings to enclosures with minimum #10 AWG conductor.

I. Connect equipment grounds to building system ground.
1. Use same size equipment grounding conductors as phase conductors up through #10 AWG.
2. Use NEC Table 250-122 for others unless noted otherwise in Drawings.

J. Run separate insulated grounding cable from each equipment cabinet to electrical panel. Do not use intermediate connections or splices. Affix directly to cabinet.

K. On motors, connect ground conductors to conduit with approved grounding bushing and to metal frame with bolted solderless lug.

L. Ground each separately derived system neutral to nearest ground per NEC and local inspector.

M. Provide and install a #6 ground conductor from main service ground to telephone board. Terminate ground at board on a grounding bar.

N. Provide a separate, insulated equipment green grounding conductor in all feeder and branch circuits. Terminate each end on a grounding lug, bus, or bushing and to all metallic enclosures. A conduit ground is not acceptable. Install grounding bushings on both ends of all feeder conduit and bond to ground system.

3.2 FIELD QUALITY CONTROL

A. Inspections: Notify Architect for inspection two days minimum before placing concrete over grounding conductor.

SECTION 26 0533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Quality of material and installation procedures for raceway, boxes, and fittings used on Project but furnished under other Divisions.
   2. Furnish and install raceway, conduit, and boxes used on Project not specified to be installed under other Divisions.
   3. Furnish and install main telephone service raceway as described in Contract Documents and to comply with telephone company requirements.
   4. Furnish and install main electrical service raceway to comply with electrical utility company requirements.

B. Related Sections
   1. Section 26 0501: General Electrical Requirements.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Raceway And Conduit:
   1. Minimum Sizes:
      a. 3/4 inch for exterior underground use.
      b. 3/4 inch minimum Homeruns, 1/2" minimum elsewhere, unless indicated otherwise.
   2. Types: Usage of each type is restricted as specified below by product.
      a. Galvanized rigid steel (RMC) or galvanized intermediate metal conduit (IMC) is allowed for use in all areas. Where in contact with earth or concrete, wrap buried galvanized rigid steel and galvanized IMC conduit and fittings completely with vinyl tape.
      b. Galvanized Electrical Metallic Tubing (EMT):
         1) Allowed for use only in indoor dry locations where it is:
            a) Not subject to damage.
            b) Not in contact with earth.
            c) Not in concrete.
         2) Flexible steel conduit or metal-clad cable required for final connections to indoor mechanical equipment.
      c. Schedule 40 Polyvinyl Chloride (PVC) Conduit:
         1) Allowed for use only underground or below concrete with galvanized rigid steel or IMC elbows and risers.
      d. Listed, Liquid-Tight Flexible Metal Conduit:
         1) Use in outdoor final connections to mechanical equipment, length not to exceed 36 inches.
   3. Prohibited Raceway Materials:
      a. Aluminum conduit.

b. Armored cable type AC (BX) cable.

B. Raceway And Conduit Fittings:
1. Rigid Steel Conduit And IMC: Threaded and designed for conduit use.
2. EMT:
a. Compression type (Outdoor locations)
b. Steel set screw type (Indoor/Dry locations).

3. PVC Conduit:
a. PVC type. Use PVC adapters at all boxes.
b. PVC components, (conduit, fittings, cement) shall be from same Manufacturer.
4. Flexible Steel Conduit: Screw-in type.
5. Liquid-tight Flexible Metal Conduit: Sealtite type.
6. Expansion fittings shall be equal to OZ Type AX sized to raceway and including bonding jumper.
7. Prohibited Fitting Materials:
a. Crimp-on, tap-on, indenter type fittings.
b. Cast set-screw fittings for EMT.
c. Spray (aerosol) PVC cement.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
1. Provide metal supports and other accessories for installation of each box.
2. Equip ceiling and bracket fixture boxes with fixture studs where required.
3. Equip outlets in plastered, paneled, and furred finishes with plaster rings and extensions to bring box flush with finish surface.
4. Telephone / data outlet boxes shall be 4 11/16” deep boxes with required mudring, refer to symbol schedule on drawings for additional information.

2.2 MANUFACTURERS

A. Contact Information:
1. Cooper B-Line, Highland, IL www.bline.com.
2. Hubbell Incorporated, Milford, CT www.hubbell-wiring.com.
3. Square D, Palatine, IL www.squared.com.
4. Steel City, Div Thomas & Betts, Memphis, TN www.tnb.com.
5. Thomas & Betts, Memphis, TN www.tnb.com.
6. Walker Systems Inc, Williamstown, www.wiremold.com.
7. Wiremold Co, West Hartford, CT www.wiremold.com.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Confirm dimensions, ratings, and specifications of materials to be installed and coordinate these with site dimensions and with other Sections.

3.2 INSTALLATION

A. Interface With Other Work:

1. Coordinate with Divisions 22 and 23 for installation of raceway for control of plumbing and HVAC equipment.
2. Before rough-in, verify locations of boxes with work of other trades to insure that they are properly located for purpose intended.
   a. Coordinate location of outlet for water cooler with Division 22.
   b. Coordinate location of outlets adjacent to or in millwork with Division 06 before rough-in. Refer conflicts to Architect and locate outlet under his direction.
3. Coordinate installation of floor boxes in carpeted areas with carpet installer to obtain carpet for box doors.
4. Install pull wires in raceways installed under this Section where conductors or cables are to be installed under other Divisions.

B. Conduit And Raceway:
   1. Conceal raceways within ceilings, walls, and floors, except at Contractor's option, conduit may be exposed on walls or ceilings of mechanical equipment areas and above acoustical panel suspension ceiling systems. Install exposed raceway runs parallel to or at right angles to building structure lines.
   2. Keep raceway runs 6 inches minimum from hot water pipes.
   3. Make no more than four quarter bends, 360 degrees total, in any conduit run between outlet and outlet, fitting and fitting, or outlet and fitting.
      a. Make bends and offsets so conduit is not injured and internal diameter of conduit is not effectively reduced.
      b. Radius of curve shall be at least minimum indicated by NEC.
   4. Cut conduit smooth and square with run and ream to remove rough edges. Cap raceway ends during construction. Clean or replace raceway in which water or foreign matter have accumulated.
   5. Install insulated bushings on each end of raceway 1-1/4 inches in diameter and larger, and on all raceways where low voltage cables emerge. Install expansion fittings where raceways cross building expansion joints.
   6. Run two spare conduits from each new panelboard to ceiling access area or other acceptable accessible area and cap for future use.
   7. Route conduit through roof openings for piping and ductwork where possible; otherwise. All roof penetrations shall be flashed, counter flashed and sealed per Roofing Contractor. Coordinate all roof penetrations with the Roofing Contractor.
   8. Provide nylon pull string with printed footage indicators secured at each end of each empty conduit, except sleeves and nipples. Identify with tags at each end the origin and destination of each empty conduit, and indicate same on all empty or spare conduits on the as-built drawings.
   9. Install expansion-deflection joints where conduit crosses building expansion, seismic, or structural isolation break (SIB) joints.
   10. Where conduit penetrates fire-rated walls and floors, seal opening around conduit with UL-listed foamed silicone elastomer compound. Fill void around perimeter of conduits with nonmetallic nonshrink grout in all concrete or masonry walls.
   11. Bend PVC conduit by hot box bender and, for PVC 2 inches in diameter and larger, expanding plugs. Apply PVC adhesive only by brush.
   12. Installation In Framing:
      a. Do not bore holes in joists or beams outside center 1/3 of member depth or within 24 inches of bearing points. Do not bore holes in vertical framing members outside center 1/3 of member width.
      b. Holes shall be one inch diameter maximum.
   13. Underground Raceway And Conduit:
      a. Bury underground raceway installed outside building 24 inches deep minimum.

b. Bury underground conduit in planting areas 18 inches deep minimum. It is permissible to install conduit directly below concrete sidewalks, however, conduit must be buried 18 inches deep at point of exit from planting areas.

14. Conduit And Raceway Support:
    a. Securely support raceway with approved straps, clamps, or hangers, spaced as required.
    b. Do not support from mechanical ducts or duct supports without Architect's written approval. Securely mount raceway supports, boxes, and cabinets in an approved manner by:
        1) Expansion shields in concrete or solid masonry.
        2) Toggle bolts on hollow masonry units.
        3) Wood screws on wood.
        4) Metal screws on metal.
15. Prohibited Procedures:
    a. Use of wooden plugs inserted in concrete or masonry units for mounting raceway, supports, boxes, cabinets, or other equipment.
    b. Installation of raceway that has been crushed or deformed.
    c. Use of torches for bending PVC.
    d. Spray applied PVC cement.
    e. Boring holes in truss members.
    f. Notching of structural members.
    g. Supporting raceway from ceiling system support wires.

C. Boxes:
1. Boxes shall be accessible and installed with approved cover.
2. Do not locate device boxes that are on opposite sides of framed walls in the same stud space. In other wall construction, do not install boxes back to back.
3. Locate boxes so pipes, ducts, or other items do not obstruct outlets.
4. Install outlets flush with finished surface and level and plumb.
5. Support switch boxes larger than two-gang with side brackets and steel bar hangers in framed walls.
6. At time of substantial completion, install blank plates on uncovered outlet boxes that are for future use.
7. Install air / vapor barrier back boxes behind outlet boxes that penetrate vapor barrier.
8. Location:
    a. Install boxes at door locations on latch side of door, unless explicitly shown otherwise on Drawings. Verify door swings shown on electrical drawings with architectural drawings, and report discrepancies to Architect before rough-in. Distance of switch boxes from jamb shall be within 6 inches of door jamb.
    b. Arrange boxes for ceiling light fixtures symmetrically with respect to room dimensions and structural features.
    c. Properly center boxes located in walls with respect to doors, panels, furring, trim and consistent with architectural details. Where two or more outlets occur, space them uniformly and in straight lines with each other, if possible.
    d. Center ceramic tile boxes in tile.

END OF SECTION

SECTION 26 0553 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Nameplates and labels.

B. Wire and cable markers.

1.02 RELATED WORK

A. This Section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total requirements for electrical identification.

1. Section 26 0501 - Basic Electrical Requirements

B. In the event of conflict regarding electrical identification requirements between this Section and any other section, the provisions of this Section shall govern.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Nameplates: Engraved three-layer laminated plastic, minimum 3/16 inch high white letters on a black background.

B. Nameplates (Emergency Equipment): Engraved three-layer laminated plastic, minimum 3/16 inch high white letters on a red background.

C. Wire and Cable Markers: Split sleeve or tubing type. Cloth or wraparound adhesive types not approved.

D. Conductor-color Tape: Colored vinyl electrical tape.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Degrease and clean surfaces to receive nameplates.

B. Install nameplates and labels parallel to equipment lines.

C. Secure nameplates to equipment fronts. Secure nameplate to outside face of panelboard doors.

D. Embossed tape will not be permitted for any application.

E. Electrical Contractor shall write the circuit number to which each device is connected on the inside of the box (clearly visible when device is removed) and on the backside of each coverplate. Use a permanent black marker.

3.02 WIRE IDENTIFICATION

A. Conductors for power circuits to be identified per the following schedule.

	System Voltage	
Conductor	480Y/277V	208Y/120V
Phase A	Brown	Black
Phase B	Orange	Red
Phase C	Yellow	Blue
Neutral	Grey	White
Grounding	Green	Green
Isolated Ground	Green with yellow stripe	Green with yellow stripe
Switchleg (lighting)	Purple	Pink
0-10V Dimming	Purple/Pink	Purple/Pink

3.03 NAME PLATE ENGRAVING SCHEDULE

A. Provide nameplates of minimum letter height as scheduled below.

B. Panelboards, Switchboards and Motor Control Centers:
1. 1st Line - Equpment Name: 1/4 inch Lettering.
2. 2nd Line - Voltage Rating: 3/16 inch Lettering
3. 3rd Line - Feed Source: 3/16 inch Lettering
4. 4th Line - Available Fault Current: 3/16 inch Lettering
5. Nameplate Examples:

PANEL: HA
480Y/277V
FEED FROM:
MSB-2
FAULT
CURRENT: 18,560
AMPS

SWBD: MSB
480Y/277V
FEED FROM:
UTIL.
FAULT
CURRENT:
35,680 AMPS

MCC-A: SEC. 1
480V-3P
FEED FROM:
MSB-2
FAULT
CURRENT: 18,560
AMPS

C. Individual Circuit Breakers, Switches, and Motor Starters in Switchboards, and Motor Control Centers:
   1. 1st Line - Load Served: 1/4 inch Lettering.
   2. 2nd Line - Location of Load: 3/16 inch Lettering
   3. Nameplate Examples:

PUMP: P-1 **MECH. RM** **112**

D. Individual Circuit Breakers, Enclosed Switches, and Motor Starters:
   1. 1st Line - Load Served: 1/4 inch Lettering.
   2. 2nd Line - Voltage Rating: 3/16 inch Lettering
   3. 3rd Line - Feed Source: 3/16 inch Lettering
   4. Nameplate Examples:

FAN: F-1 **480V-3P** **FEED FROM: HM-1,3,5**

E. Transformers: 3/16 inch; identify equipment designation. 1/8 inch; identify primary and secondary voltages, primary source, and secondary load and location.
   1. 1st Line - Equpment Name: 3/16 inch Lettering.
   2. 2nd Line - Voltage Rating: 1/8 inch Lettering
   3. 3rd Line - Feed Source: 1/8 inch Lettering
   4. 4th Line - Available Fault Current: 3/16 inch Lettering
   5. Nameplate Example:

XFMR:TA **480-208Y/120V** **FEED FROM: HA-2** **SUPPLIES: PNL LA** **FAULT CURRENT: 18,560 AMPS**

END OF SECTION

SECTION 26 2417 - PANELBOARDS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Distribution panelboards.
B. Lighting and appliance branch circuit panelboards.

1.02 RELATED WORK

A. This Section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total requirements for panelboards.
   1. Section 26 0501 - Basic Electrical Requirements.
   2. Section 26 0553 - Electrical Identification.

B. In the event of conflict regarding panelboard requirements between this Section and any other section, the provisions of this Section shall govern.

1.03 SUBMITTALS

A. Provide the following in addition to the standard requirements: Include outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

1.04 SPARE PARTS

A. Keys: Furnish two each to Owner.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Square D: I-Line, NQ and NF Series
B. General Electric (GE): Spectra & A Series.
C. Cutler-Hammer (Eaton): Pow-R-Line Series

2.02 DISTRIBUTION PANELBOARDS

A. Panelboards: NEMA PB 1; circuit breaker type: FS W-P-115; Type I, Class I.

B. Enclosure: NEMA PB 1; Type and Mounting as indicated on panel schedule.

C. Provide cabinet front with concealed trim clamps and hinged door with flush lock. Finish in manufacturer’s standard gray enamel.

D. Provide Dist. panelboards with following:
   1. Bussing: Aluminum or Copper
   2. Rating: as indicated in panel Schedule
   3. Ground & Neutral Bus in all panelboards.
   4. Intergral Surge Protection Device as indicated in schedules
E. Minimum Integrated Short Circuit Rating: as indicated in panel schedule.

F. Molded Case Circuit Breakers: NEMA AB 1; provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as type HACR for air conditioning equipment branch circuits.

G. All Dist. Panelboards with circuit breakers rated 1200A or higher shall be furnished with Arc Energy Reduction Means as defined per NEC 240.87

H. Nameplates: Engraved three-layer laminated plastic, minimum 3/16 inch high white letters on a black background. Label to include panel identification, voltage and source. Label to be attached with screws.

2.03 LIGHTING & BRANCH CIRCUIT PANELBOARDS

A. Lighting and Appliance Branch Circuit Panelboards: NEMA PB 1; circuit breaker type.

B. Enclosure: NEMA PB 1; Type and Mounting as indicated on panel schedule.

C. Cabinet Size: 5-3/4 inches deep; 20 inches wide for 240 volt and less panelboards, 20 inches for 480 bolt panelboards.

D. Provide flush surface cabinet front with typewritten directory, concealed trim clamps, concealed hinge and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

E. Provide panelboards with the following:
1. Bussing: Aluminum or Copper
2. Rating: as indicated in panel Schedule
3. Ground and Nuetral Bus in all panelboards.
4. Intergral Surge Protection Device as indicated in schedules

F. Minimum Integrated Short Circuit Rating: as indicated in panel schedule.

G. Molded Case Circuit Breakers: NEMA AB 1, FS W-C-375; bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled on Drawings. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

H. Nameplates: Engraved three-layer laminated plastic, minimum 3/16 inch high white letters on a black background. Label to include panel identification and voltage. Label to be attached with screws.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install panelboards plumb in conformance with NEMA PB 1.1.

B. Height: 78 inches to top.

C. Adjust trim to cover all openings.

D. Provide filler plates for unused spaces in panelboards.

E. Provide typed circuit directory for each branch circuit panelboard and Distribution panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

3.02 FIELD QUALITY CONTROL

A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multiwire branch circuits.

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

END OF SECTION

SECTION 26 2726 - WIRING DEVICES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Wall switches.
B. Receptacles.
C. Device plates and box covers.
D. Cords and caps.

1.02 RELATED WORK

A. This Section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total requirements for wiring devices.
   1. Section 26 0501 - Basic Electrical Requirements.

B. In the event of conflict regarding requirements for wiring devices between this Section and any other section, the provisions of this Section shall govern.

1.03 DESIGN REQUIREMENTS

A. FS W-C-596 - Electrical Power Connector, Plug, Receptacle, and Cable Outlet.

B. FS W-S-896 - Switch, Toggle.

C. NEMA WD 1 - General Requirements for Wiring Devices.

D. NEMA WD 6 - Wiring Devices - Dimensional Requirements.

PART 2 - PRODUCTS

2.01 WALL SWITCHES

A. Basis of Design:

MFG.	1-Pole	3-Way	4-Way	Pilot Light
Hubbell	1221-*	1223-*	1234-*	1221-P1 *

B. Acceptable Manufacturers:
   1. Pass & Seymor
   2. Leviton
   3. Cooper

C. Wall Switches for Lighting Circuits shall meet Federal Spec WS-896.
   1. AC general use snap switch with toggle rocker handle, Screw type terminals only.
   2. 20 Amperes and 120-277 Volts AC rated .
   3. *Color: As selected by Owner/Architect, Red if connected to an Emergency Circuit. (Standard colors shall include brown, gray, ivory, black or a white for all devices.)

D. Pilot Light Type: Red pilot handle; handle lighted when switch is ON.

E. Provide 3-way and 4-way switches of matching style, appearance and specification as indicated on drawings.

2.02 RECEPTACLES

A. Basis of Design:

STANDARD				
MFG	**Duplex**	**GFI**	**USB**	**Tamper**
Hubbell	HBL5352*	GFRST20*	USB20A5*	BR20*TR

B. Acceptable Manufacturers:
1. Pass & Seymor
2. Leviton
3. Cooper

C. Convenience and Straight-blade Receptacles: NEMA WD 1, Heavy Duty Specifiction Grade.
1. Utilize UL Tamper-Resistant and Weather-Resistant Receptacles at locations specified by the most current NEC.

D. Locking-Blade Receptacles: NEMA WD 5.

E. Convenience Receptacle Configuration: NEMA WD 1; Type 5-20R.
1. *Color: As selected by Owner/Architect. Receptacles on Emergency circuit shall be Red in color. (Standarad colors shall include brown, gray, ivory, black and white for all devices.)

F. Weatherproof Receptacles: GFI, UL weather-resistant listed Receptacle mounted in a cast steel box with gasketed, weatherproof device plate and In-Use Cover.

G. Specific-use Receptacle Configuration: NEMA WD 1 or WD 5; type as indicated on Drawings, brown nylon face.

H. GFCI Receptacles: Duplex convenience receptacle with integral ground fault current interrupter. NEMA Type 5-20R.
1. *Color: As selected by Owner/Architect. Receptacles on Emergency circuit shall be Red in color. (Standarad colors shall include brown, gray, ivory, black and white for all devices.)
2. Feed-through type for downstream device protection.
3. All receptacles indicated to be installed in a toilet room, bathroom, roof top, and outdoors or within 6 feet of a sink, basin, tub or floor sink shall be GFCI protected

2.03 SPECIFIC PURPOSE RECEPTACLES

A. NEMA WD 1 or WD 5; type as indicated on Drawings.

B. Isolated Ground Type: Straight blade type 5-20R as indicated on the Drawings. Grey nylon face.

C. Twist lock type. NEMA configuration as shown on the Drawings.

2.04 WALL PLATES

A. Material:
   1. Finished Spaces: Stainless Steel.
   2. Unfinished Spaces: Galvanized Steel

B. All isolated ground receptacle covers shall bear the engraved phrase “ISOLATED GROUND”.

C. Engraved Plates: Same plate as specified herein. Provide with engraved characters 1/8 inch high characters (all letters in upper case) with filler of black color.

D. Weatherproof Cover Plate: Gasketed cast metal with hinged gasketed device covers.

2.05 CORDS AND CAPS

A. Acceptable Manufacturers:
   1. Hubbell.
   2. Leviton.
   3. Pass and Seymour.
   4. Cooper

B. Straight-blade Attachment Plug: NEMA WD 1.

C. Locking-blade Attachment Plug: NEMA WD 5.

D. Attachment Plug Configuration: Match receptacle configuration at outlet provided for equipment.

E. Cord Construction: Oil-resistant thermoset insulated Type SO multiconductor flexible cord with identified equipment grounding conductor, suitable for hard usage in damp locations.

F. Cord Size: Suitable for connected load of equipment and rating of branch circuit overcurrent protection.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install wall switches 48 inches AFF, OFF position down.
B. Install convenience receptacles 18 inches AFF, 4 inches above backsplash, or as noted, in a vertical position with grounding pole down.
C. Install specific-use receptacles at heights shown on Contract Drawings.
D. Install convenience receptacles in 4 square box in a vertical position with the ground pole down.

END OF SECTION

SECTION 26 2816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Fusible Disconnect switches.
B. Nonfusible Disconnect switches.
C. Enclosures.

1.02 RELATED WORK

A. This Section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total requirements for disconnect switches.
   1. Section 26 0501 - Basic Electrical Requirements.
   2. Section 26 0526 - Grounding.

B. In the event of conflict regarding individually enclosed low-voltage protective device requirements between this Section and any other section, the provisions of this Section shall govern.

1.03 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessor, and component indicated. Include dimensioned elevations, sections, weights, and manufacturer's technical data on features, performance, electrical characteristics, ratings, accessories and finishes.

1.04 QUALITY ASSURANCE

A. Source Limitations: Optain enclosed switches and circuit breakers, overcurrent protective devices, components and accessories within same product category from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Compenents, Devices and Accessories: Listed and labeled as defined in NFPA 70 by a qualified testing agency and marked for intended location and application.

D. Comply with NFPA 70.

1.05 COORDINATION

A. Coodinate layout and installation of switches, circuit breakers and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.06 SPARE PARTS

A. Provide fuses for switches, as required of classes, types and ratings needed to fulfill electrical requirements for services indicated. Provide spare fuses amounting to one spare fuse for each 10 installed but not less than three of any one type and size.

PART 2 - PRODUCTS

2.01 FUSIBLE SWITCHES

A. Manufacturer: Subjects to compliance with requirements, provide products of one of the following (for each type of switch):
   1. Square D Company
   2. General Electric (GE)
   3. Cutler-Hammer (Eaton)

B. Type HD, Heavy Duty, Single Throw, 240 or 600 VAC, 1200A and smaller: UL98 and NEMA KS 1, horsepower rated with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept two padlocks and interlocked with cover in closed position.

C. Accessories:
   1. Equipment Ground Kit: Internally mounted and labeled for copper or aluminum conductors.
   2. Neutral Kit (where required): Internally mounted, insulated; capable fo being grounded and bonded; labeled for copper and aluminum neutral conductors.
   3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
   4. Lugs: Mechanical type, suitable for number, size and conductor material.

2.02 NONFUSIBLE SWITCHES

A. Manufacturer: Subjects to compliance with requirements, provide products of one of the following (for each type of switch):
   1. Square D Company
   2. General Electric (GE)
   3. Cutler-Hammer (Eaton)

B. Type HD, Heavy Duty, Single Throw, 240 or 600 VAC, 1200A and smaller: UL98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks and interlocked with cover in closed position.

C. Accessories:
   1. Equipment Ground Kit: Internally mounted and labeled for copper or aluminum conductors.
   2. Lugs: Mechanical type, suitable for number, size and conductor material.

2.03 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

A. Manufacturer: Subjects to compliance with requirements, provide products of one of the following (for each type of switch):

1. Square D Company
2. General Electric (GE)
3. Cutler-Hammer (Eaton)

B. Molded-Case Circuit Breaker: NEMA AB 1 with interrupting capacity to meet available fault cureents.
   1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantanuous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frams sizes 250A and larger.

C. Molded-Case Circuit Breaker Features and Accessories:
   1. Standard frame sizes, trip ratings and number of poles.
   2. Lugs: Mechanical style with compression lug kits suitable for number, size, trip ratings and conductor material.
   3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning and refrigerating equipment.

2.04 ENCLOSURES

A. NEMA AB 1 AND NEMA KS 1 to meed environmental conditions of installed location.
   1. Indoor Locations: NEMA 250, Type 1
   2. Outdoor Locations: NEMA 250, Type 3R
   3. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
   4. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine elements and surfaces to recieve enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

3.02 INSTALLATION

A. Comply with applicable portions of NECA 1, NEMA PB 1.1 and NEMA PB 2.1 for installations of enclosed switches and circuit breakers.

B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. (Maximum Height: 78" to top of enclosure AFF). Anchor floor-mounting switches to concrete base.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels and brackets and temporary blocking of mobing parts from enclosures and components.

3.03 IDENTIFICATION

A. Enclosure Nameplates: Label each enclosure with engrabed nameplate as specified in Section 26 0553 Electrical Identification.

3.04 FIELD QUALITY CONTROL

A. Provide the following acceptance testing:
1. Inspect mechanical and electrical connections.
2. Verify switch and relay type and labeling verification.
3. Inspect proper installation of type, size, quantity and arrangement of mounting or anchorage devices complying with manufactuer's certification.

3.05 ADJUSTING

A. Set field-adjustable switches and circuit breaker trip ranges.

3.06 CLEANING

A. On completion of installation vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.
B. Inspect exposed surfaces and repair damaged finishes.

END OF SECTION

SECTION 26 5100 – INTERIOR & EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SUMMARY

A. SECTION INCLUDES

1. Interior luminaires and accessories
2. Emergency lighting & Exit Signs
3. Exterior lighting

B. DEFINITIONS:

1. Luminaire: A luminaire is a complete lighting unit including light source(s) and parts required to distribute the light, position and protect the light source(s), and connect the light source(s) to the power supply.
2. Average Life: The time after which 50 percent will have failed and 50 percent will have survived under specified operating and starting condition.

1.2 SUBMITTALS

A. Submit the following in accordance with project submittal procedures:

1. Interior Fixture Catalog Data: Submit catalog data describing luminaires, lamps, and ballasts. Include data substantiating that materials comply with specified requirements. Arrange data for luminaires in the order of fixture designation.
2. Exterior Fixture Catalog Data: Submit catalog data describing poles, luminaires, lamps, ballasts, and pole and luminaire finishes. Include data substantiating that materials comply with specified requirements. Arrange data for luminaires in the order of luminaire designation.
3. Performance Curves/Data:
   a. Submit certified photometric data for each type of luminaire.
   b. Submit supply-air, return-air, heat-removal, and sound performance data for air handling luminaires.
4. Drawings: Submit shop drawings for luminaries.

1.3 QUALITY ASSURANCE

A. Interior Lighting

1. Comply with the *National Electrical Code* (NEC) and the *International Building Code (IBC)* for installation requirements.
2. Provide luminaires listed and labeled by a nationally recognized testing laboratory (NRTL)

3. Use manufacturers that are experienced in manufacturing luminaires, lamps and ballasts similar to those indicated for this Project and have a record of successful in-service performance.

4. Coordinate luminaires, mounting hardware and trim with the ceiling system.

B. Emergency Lighting

1. Comply with ANSI/NFPA 70 - National Electrical Code (NEC), NFPA 101 - Life Safety Code, and the International Building Code (IBC) for components and installation.

2. Emergency lighting units and exit signs shall be NRTL-listed and labeled for their indicated use, and location on this project, by a Nationally Recognized Testing Laboratory (NRTL) in accordance with UL 924–Emergency Lighting and Power Equipment.

3. Use manufacturers that are experienced in manufacturing emergency lighting units similar to those indicated for this Project and have a record of successful in-service performance.

C. Exterior Lighting

1. Comply with the following codes and standards:

a. National Electrical Code (NEC) for components and installation.

b. International Building Code

2. Provide luminaires listed and labeled by a nationally recognized testing laboratory (NRTL) for the application, installation condition, and the environments in which installed.

3. Use manufacturers that are experienced in manufacturing poles, luminaires, lamps and drivers similar to those indicated for this Project and have a record of successful in-service performance.

1.4 RECEIVING, STORING AND PROTECTING

A. Receive, store, and protect, and handle products according to the following NECA National Electrical Installation Standards:

1. NECA/IESNA 500, *Recommended Practice for Installing Indoor Commercial Lighting Systems* (ANSI).

1.5 WARRANTY

A. Submit a warranty, mutually executed by the LED luminaire manufacturer and the installer, agreeing to replace LED luminaires that fail in materials or workmanship within five years, beginning on the date of substantial completion of project.

B. Manufacturer shall replace any luminaires that fail to operate properly within 60 months of the substantial completion date of project . Lens yellowing or hazing will be considered a failure.

C. Manufacturer shall replace any luminaries that experience housing or finish failure within 5 years of the substantial completion date of project

PART 2 PRODUCTS

2.1 SEISMIC PERFORMANCE REQUIREMENTS

A. The luminaires shall remain in place without separation of any parts when subjected to the design basis earthquake per Section 01 8734, *Seismic Qualification of Nonstructural Components (IBC)*

2.2 INTERIOR LUMINAIRES

A. Furnish interior luminaires that comply with requirements specified below, indicated on the Drawings, and as required to meet conditions of installation.

B. Metal parts shall be free from burrs and sharp corners and edges.

C. Metal components shall be formed and supported to prevent sagging and warping.

D. Steel parts shall be finished with manufacturer's standard finish applied over a corrosion-resistant primer. Finish shall be free from runs, streaks, stains, holidays or defects.

E. Doors and frames shall be smooth operating and free from light leakage under operating conditions. Relamping shall be possible without the use of tools. Doors, frames, lenses and diffusers shall be designed to prevent accidental falling during relamping and when secured in the operating position.

F. Lenses, diffusers, covers and globes shall be 100 percent virgin acrylic unless specified otherwise on the Drawings. Lenses shall have 0.125 inches minimum thickness. Lenses for fluorescent troffers shall be injection molded.

G. Luminaires shall conform to UL 1598 - *Luminaires*. Provide product with damp location listing or wet location listing as required by installation location.

H. Light diffusers, other than those made of metal or glass, used in air-handling light fixtures shall be listed and marked “Fixture Light Diffusers for Air-Handling Fixtures.”

2.3 INTERIOR LED LUMINAIRES

A. For LED lighting in interior spaces, use NRTL-listed 120V or 277V luminaires with the performance characteristics listed below:

1. Minimum luminaire efficacy per IES LM-79, *Approved Method: Electrical and Photometric Measurement of Solid-State Lighting Products*:

   a. 90 lumens/watt for general lighting,

   b. 50 lumens/watt for accent and display lighting, down-lighting, and special purpose lighting.

2. Correlated color temperature (CCT) per IES LM-79 and ANSI/NEMA/ANSLG C78.377, *Specification for the Chromaticity of Solid-State Lighting (SSL) Products*:

   a. As indicated in the fixture schedule

3. LED Design life (L70): Not less than 50,000 hours per IES LM-80, *Approved Method: Measuring Lumen Maintenance of LED Light Sources*.

4. Driver System Design Life: Not less than the LED design life; note that the driver system includes all associated components, not just the driver integrated circuit. Driver system design life is defined as when 2 percent of the systems would have failed.

5. Power factor: 0.90 or better.

6. Design ambient temperature: 35 °C (95 °F); note that this is the ambient temperature surrounding the luminaire, not the LED or driver heat-sink temperature.

7. EMI/RFI: Meet FCC 47 CFR Part 15.

8. Minimum dimming provisions or capability:

   a. 0-10V dimming down to 1%.

B. For emergency battery packs shall be factory installed, unless noted otherwise.

C. Provide NRTL-listed luminaire disconnect assembly for each driver. Manufacturer: IDEAL “PowerPlug”, Thomas & Betts “Sta-Con.”

2.4 LUMINAIRE ACCESSORIES

A. Provide stud supports, mounting brackets, frames, plaster rings and other accessories required for luminaire installation.

B. Furnish hangers as specified below and as required by conditions of installation:

1. Stem hangers shall be made of 1/2-inch steel tubing with 45 degrees swivel ball hanger fitting and ceiling canopy. Finish the same as the luminaire.

2. Rod hangers shall be made of 1/4 inch threaded zinc-plated steel rod.

3. For Highbay LED fixtures provide, power cord and locking type plug. Provide a safety chain or cable for each luminaire that will attach to the building structure, and to the reflector/diffuser assembly.

C. Use NRTL-listed T-bar safety clips for lay-in luminaires.

D. Where indicated on the Drawings or where lamp breakage is detrimental, such as above food counters, provide open fluorescent luminaires with:

1. Self-locking sockets or lamp retainers, two per lamp, and

2. Clear polycarbonate protective lamp sleeves with end caps over each lamp. Sleeve shall have a light transmission of 95 percent and shall be rated for the thermal profile of the lamp and ballast.

2.5 EMERGENCY LIGHTING & EXIT SIGNS

A. Emergency LED driver

1. Battery packs shall be factory installed in fixtures whenever possible.

2. Non Factory installed battery packs shall be as follows:

   a. NRTL-listed, self-diagnostic, fully automatic, battery pack in each luminaire indicated on the Drawings.

   b. maintenance-free, sealed high-temperature nickel-cadmium or nickel-metal hydride battery with an expected service life of not less than 7 years.

   c. Upon interruption of normal AC power, the internal controller shall automatically switch the emergency lighting load to the battery. The battery shall supply the driver with power to produce 1100 to 1400 lumens of emergency light output for a minimum of 90 minutes.

   d. Shall have an LED charging indicator lamp and a push to test switch for installation on the luminaire at locations and positions that will be visible from the floor and operable without removing or opening luminaire lenses or covers.

   e. Manufacturer: Bodine, IOTA, or approved equal.

B. LED Emergency Exit Sign

1. Furnish a NRTL-listed, self-diagnostic, fully automatic, LED illuminated emergency exit sign at each location indicated on the Drawings.

2. LED emergency exit sign shall be connectable for operation at either 120 or 277 volts and suitable for indoor dry locations with a temperature range of 32 to 104 degrees F.

3. Shall have stencil face letters, and universal mounting capability with all necessary components for each wall, ceiling, or end mounting application.

4. Shall be single face or double face with field-selectable chevron knockouts as indicated on the Drawings or as required for each location.

5. Shall have a maintenance-free battery, either nickel-cadmium or nickel-metal hydride. Battery shall be field-replaceable and shall have an expected service life of not less than 7 years.

6. Upon interruption of normal AC power, or brownout conditions exceeding a 20% drop from nominal voltage, the internal controller shall automatically switch the emergency exit sign lighting load to the battery. Emergency power will be provided for a minimum of 90 minutes. During emergency operation, the battery shall be protected from deep discharge by a low-voltage battery disconnect circuit.

7. Visibility of exit sign during normal or emergency operation shall be not less than that required in UL 924.

8. Exit sign shall provide exterior visual indication of AC power status, all self-diagnostic test cycles, and unit malfunctions including:

   a. Battery fault

b. Charger fault

2.6 EXTERIOR LIGHTING

A. Finishes

1. Furnish luminaires, poles, and accessories with finishes as scheduled that are resistant to fading, chalking, and other changes due to aging and exposure to heat and ultraviolet light. Acceptable finishes for metals are:

a. Hot-dipped galvanized steel: ASTM A 123/A 123M.

b. Brushed natural aluminum

c. Anodized aluminum: AAMA 611, Anodized Architectural Aluminum, Class I.

d. Powder coated aluminum: Fluorocarbon polymer powder coating per AAMA 2605, Superior Performing Organic Coatings over chrome phosphate conversion coated aluminum.

e. Powder coated steel: Fluorocarbon polymer powder coating per AAMA 2605, Superior Performing Organic Coatings over zinc phosphate conversion coated shot-blasted steel.

2. Reject luminaires, poles, and accessories with finish having runs, streaks, stains, holidays and defects.

3. Replace luminaires, poles, and accessories showing evidence of yellowing, fading, chalking, and other changes indicating failure during warranty period.

4. Use stainless steel for exposed hardware.

B. Exterior Luminaires - General

1. Furnish exterior luminaires that comply with requirements specified in this Section and in the luminaire schedule on the Drawings.

2. Luminaires shall be NRTL-listed as conforming to UL 1598 - Luminaires.

3. Luminaire housing shall be primarily metal.

a. Metal parts shall be free from burrs and sharp corners and edges.

b. Sheet metal components shall be fabricated from corrosion-resistant aluminum, formed and supported to prevent sagging and warping.

c. Exposed fasteners: Stainless steel.

4. Doors and frames shall be smooth operating and free from light leakage under operating conditions.

a. Doors, frames, lenses and diffusers shall be designed to prevent accidental falling during and when secured in the operating position.

b. Door: Removable for cleaning or replacing lens.

5. Provide lenses, diffusers, covers and globes as scheduled on the Drawings fabricated from materials that are UV stabilized to be resistant to yellowing and other changes due to aging or exposure to heat and ultraviolet radiation.

6. Doors shall have resilient gaskets that are heat-resistant and aging-resistant to seal and cushion lens and refractor.

C. LED Luminaires

1. Conform to UL 1598 and to UL 8250 – Safety Standard for Light-Emitting Diode (LED) Light Sources for Use in Lighting Products.

2. Lead and mercury free.

3. Photometric characteristics: Established using IESNA LM-79-08, IESNA Approved Method for the Electrical and Photometric Measurement of Solid-State Lighting Products.

4. Ingress protection for optical assembly: IP65 or better in accordance with ANSI/IEC 60529 - Degrees of Protection Provided by Enclosures.

5. Color characteristics as follows in accordance with ANSI C78.377 – Specifications for the Chromaticity of Solid State Lighting Products:

a. Color temperature (deg K): 4000

b. Color rendering index: not less than 70

6. LED and driver cooling system: Passive and shall resist the buildup of debris.

7. LED luminaire output after 50,000 hours of operation: Not less than 70 percent of the initial lumen output when determined in accordance with IESNA LM-80-08 – IESNA approved Method for Measuring Lumen Maintenance of LED Lighting Sources.

8. LED luminaire electrical characteristics:

a. Supply voltage: 120 V, 208 V, 240 V, 277 V, or 480 V as indicated on the Drawings. Provide step-down transformers if required to match driver input voltage rating.

b. Total harmonic distortion (current): Not more than 20 percent

c. Power factor: Not less than 90%

d. RF interference: Meet FCC 47 CFR Part 15/18

e. Driver input surge protection device: UL 1449 3rd Edition recognized component meeting IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits, Category C, High Exposure.

D. Poles and Accessories

1. Furnish poles and accessories that comply with requirements specified in this Section and the luminaire schedule on the Drawings.

2. Pole, base, and anchorage shall carry the luminaires, supports, and appurtenances at the indicated height above grade without deflection or whipping.

3. Mountings, fastenings and other appurtenances shall be fabricated from corrosion-resistant materials that are compatible with poles and luminaires and will not cause galvanic action at contact points. Mountings shall correctly position luminaires to provide scheduled light distribution.

4. A reinforced access handhole, minimum 2.5 x 5 inches, shall be located in the wall of each metal pole.

5. A welded 1/2-inch grounding lug shall be accessible through the handhole of each metal pole. Grounding connection shall be designed to prevent electrolysis when used with copper ground wire.

6. Metal poles shall have anchor type bases and galvanized steel anchor bolts, leveling nuts and bolt covers.

7. Where poles are indicated as “breakaway” type on the Drawings, each pole shall have a frangible aluminum transformer base that meets the requirements of AASHTO LTS-5.

8. Each non-breakaway metal pole shall have a metal base cover that covers the entire base plate and anchorage.

9. Protect painted, anodized, or brushed pole finishes during shipment and installation. Minimum protection shall consist of spirally wrapping each pole shaft with protective paper secured with tape, and shipping small parts in boxes.

10. Steel poles shall be fabricated from tubing having minimum 7-gage steel with minimum yield/strength of 48,000 psi.

    a. Poles shall be anchor bolt mounted type.

    b. Poles shall be one-piece construction up to 40 feet in length. Poles over 40 feet in length may be in two or more sections with overlapping joints.

    c. Poles shall be tapered, either round in cross section or polygonal. Poles shall have a continuous taper not less than 0.14 inch of diameter per foot of length.

    d. Poles shall be welded construction with no bolts, rivets, or other means of fastening except as specifically approved.

    e. Tops of shafts shall be fitted with a round or tapered cover.

    f. Pole markings shall be approximately 3 to 4 feet above grade and shall include manufacturer, year of manufacture, top and bottom diameters, and length.

    g. Provide poles with finish color indicated on the Drawings and conforming to FINISHES article of this Section. If pole is not galvanized, coat inside of pole with suitable rust-inhibiting finish.

h. Base covers for steel poles shall be structural-quality, hot-rolled carbon-steel plate having a minimum yield of 36,000 psi. Finish shall be the same as the corresponding poles.

E. Lighting Control Equipment

1. Furnish lighting control relay panel with astronomical timeclock to control exterior lighting unless indicated otherwise on Drawings.

a. Lighting Control Relay Panel shall be: Acuity Brands ARP Series with required # of relay's or pre-approved equal.

b. Program on/off times of exterior lighting as directed by Owner.

2. Where photoelectric relays are mounted on luminaires use products that conform to UL 733, Plug-in, Locking Type Photocontrols for Use with Area Lighting with single-pole single-throw contacts arranged to fail in the "ON" position. For each luminaire provide a luminaire-mounted locking-type receptacle conforming to IEEE C136.10.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas, spaces, and surfaces to receive exterior luminaire (s) or poles for compliance with installation tolerances and other conditions affecting performance of the product. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Interior Lighting

1. Install interior lighting system in accordance with the NEC, manufacturer's installation instructions, approved shop drawings, and the following NECA National Electrical Installation Standards:

a. NECA/IESNA 500, Recommended Practice for Installing Indoor Commercial Lighting Systems (ANSI)

2. Have the manufacturer's installation instructions available at the Project site.

3. Mounting heights specified or indicated on the Drawings are to the bottom of the luminaire for ceiling-mounted fixtures and to the center of the luminaire for wall-mounted fixtures.

4. Where the ceiling forms the protective membrane of a fire-resistive assembly, install protective coverings over luminaires in accordance with NRTL requirements.

5. Install slack safety wires as described below for luminaires in or on suspended ceilings.

a. Wire shall be minimum 12 gauge galvanized soft annealed steel wire conforming to ASTM A641.

b. Attach wire to the building structure directly above the attachment point on the box or luminaire; make trapezes of framing channel material as required to span obstacles

c. Secure wire(s) at each end with not less than three tight turns in 1-1/2 inches.

6. Install emergency luminaires in suspended ceilings as follows:

a. Fasten the four corners of each luminaire to the suspended ceiling main channels or framing members.

b. Use sheet metal screws or bolts to fasten luminaires above exit pathways.

c. Use NRTL listed clips, sheet metal screws, or bolts or to fasten luminaires that are not above exit pathways.

d. Install two independent slack safety wires per luminaire with dimensions not exceeding 2 ft x 4 ft. Install four independent slack safety wires per luminaire with dimensions exceeding 2 ft x 4 ft. Attach wires to the luminaire not more than 6 inches from the luminaire corners.

7. Support pendant-mounted or cable-supported luminaires directly from the structure above using a 9 gauge wire or an approved alternate support without using the ceiling suspension system for direct support.

a. Install seismic restraints for pendant-mounted and cable-supported luminaires.

b. Pendants, rods, cables, or chains 4 ft or longer shall be braced to prevent swaying using three cables at 120 degrees separation.

8. Connect luminaires in suspended ceilings using 6 ft. lengths of flexible wiring method arranged accommodate not lea than 4 inches of differential seismic movement in any direction. Refer to Section 26 0533 - Raceways and Boxes for Electrical Systems.

B. Emergency Lighting & Exit Signs

1. Install emergency lighting system in accordance with the NEC, NECA/IESNA 500, Recommended Practice for Installing Indoor Commercial Lighting Systems (ANSI), the manufacturer's instructions, and approved shop drawings. Have the manufacturer’s installation instructions available at the construction site.

2. Mount exit signs and unit emergency lights with bottom of fixture not less than 6'-8" or more than 12'-0" above finished floor.

3. Connect each emergency power system outlet box using a minimum 2 ft length of flexible wiring method to accommodate not less than 4 inches of differential seismic movement in any direction between the outlet box and the non-flexible raceway system. Refer to Section 26 0533 - Raceways and Boxes for Electrical Systems.

4. Install slack safety wires as described below for emergency luminaires and exit signs on suspended ceilings.

a. Wire shall be minimum 12 gage galvanized soft annealed steel wire conforming to ASTM A641.

b. Attach wire to the building structure directly above the attachment point on the box or luminaire; make trapezes of framing channel material as required to span obstacles

c. Secure wire(s) at each end with not less than three tight turns in 1-1/2 inches.

d. Use connection devices at the supporting structure, outlet box, and luminaire that are capable of carrying not less than 100 pounds.

5. Install branch circuits for emergency lighting and exit signs in accordance with Article 700 of the National Electrical Code.

6. Connect unit emergency lighting equipment to a branch circuit that serves the general lighting in the area and ahead of any local or remote switches.

C. Exterior Lighting

1. Install products in accordance with manufacturer's instructions, NECA/IESNA 501, and approved shop drawings.

2. Locations of luminaires and poles shown on the Drawings are diagrammatic. Coordinate luminaire locations with building finishes, building structure, paving and striping, utility piping, security fences, and existing trees.

3. Set poles and luminaires plumb, square, level and secure.

4. Install surface mounted luminaires directly to an outlet box which is supported from structure.

5. Install lamps in luminaires in accordance with manufacturer's instructions.

3.3 CONCRETE FOUNDATIONS

A. Construct concrete foundations with exterior 4000 psi concrete and reinforcing conforming to Section 03 3001, Reinforced Concrete.

B. Comply with details on the Drawings and manufacturer's recommendations for foundation dimensions, reinforcing, anchor bolts, nuts and washers.

C. Position power conduits and ground rod to terminate within the pole shaft area and one inch above the top of the foundation; refer to Section 26 0533, Raceways and Boxes for Electrical Systems.

D. Cure concrete foundations for 7 full curing days before erecting poles.

3.4 POLE ERECTION

A. Do not install poles without luminaires.

B. Use fabric web slings to raise and set poles.

C. Use leveling nuts or shims to make poles plumb. When leveling nuts are used, set the lower nuts not more than 1 inch from the concrete foundation.

D. Tighten anchor bolt nuts and other pole hardware to torque recommended by manufacturer.

E. After pole is leveled, pack non-shrink grout between anchor base and concrete foundation to provide a full bearing surface. Use a short piece of 1/2-inch diameter pipe to make a drain hole through grout; arrange to drain condensation from interior of pole.

F. Set embedded poles to depth indicated on the Drawings, but not less than 1/6 of pole length below finish grade.

1. Auger holes large enough to permit the use of tampers the full depth of the hole.

2. Backfill in 6-inch layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of the undisturbed earth.

3.5 GROUNDING

A. Install grounding for exterior lighting using materials and methods specified in Section 26 0526, Grounding and Bonding for Electrical Systems.

B. Connect ground lug of metal pole to ground rod using a 6 AWG copper conductor.

C. Connect ground lug of metal pole to circuit equipment grounding conductor.

3.6 FIELD QUALITY CONTROL

A. Make electrical connections, clean interiors and exteriors of luminaires, install lamps, energize and test luminaires, inspect interior lighting system, and deliver spare parts in accordance with manufacturer's instructions and the following NECA National Electrical Installation Standards:

1. NECA/IESNA 500, *Recommended Practice for Installing Indoor Commercial Lighting Systems* (ANSI)

B. Test electronic dimming drivers for full range dimming capability.

1. Check for visually detectable flicker over the full dimming range.

C. Provide factory certified programming and commissioning of the Lighting control systems, occupancy sensors and Daylight sensors.

D. Aim lamps on wall-mounted emergency lighting units to obtain the following illumination of exit pathway:

1. 1 ft-candle average

2. 0.1 ft-candle minimum

3. Maximum-to-minimum uniformity ratio not exceeding 40 to 1.

E. Test emergency lighting equipment in accordance with the manufacturer's instructions and NECA/IESNA 500.

F. Inspect each installed lighting unit for damage. Replace damaged luminaires, poles, and components.

G. Test installed luminaires for proper operation.

1. Replace or repair malfunctioning luminaires and components then re-test.

2. Repeat procedure until all luminaires operate properly.

H. Replace inoperative fixtures.

3.7 ADJUSTING AND CLEANING

A. Clean each luminaire inside and out, including plastics and glassware. Use methods and materials recommended by manufacturer.

B. Aim adjustable luminaires to provide required light intensities as indicated on the Drawings.

END OF SECTION

SECTION 26 6100 - AUXILIARY SYSTEMS

PART 1 - GENERAL

A. The Auxiliary Systems of this specification are sections that have numbers between 26 6100 – 26 6900. This specification will include the Auxiliary Sections that are relative to
this project.

B. Each system mentioned herein is a complete system. Each network is a new system, an extension of an existing and/or a new system that incorporates an existing system into the new. Whatever the condition, the contractor shall provide all the equipment, materials, labor, etc. for a complete and operable network. Each system is specified to perform a definite function. The function and operation of a system is the final objective and whatever the requirement to accomplish that objective shall be included. If for any reason the specifications do not complete the network, the bidder and/or manufacturers representative shall call the deficiencies to the attention of the engineer by facsimile five (5) days prior to the bid date, so they can be included in the addendum. Failure to submit this information to the attention of the engineer does not relieve the bidder from supplying and installing the equipment needed for a complete and operable system.

C. Walk through the system when the project is complete and each auxiliary system has been tested and ready to be set into operation, the contractor, the owner's and manufacturer's representative shall test each component of each system for normal operation and report in writing to the architect and engineer that the system meets all the conditions and functions of the specifications for normal operation.
   1. Example: In the case of the Fire Detection and Alarm System, the people mentioned above plus the local Fire Marshall (or his representative) shall check out the Fire Alarm System. Each component (break glass station, heat detector, ionization detector, alarms, etc.) shall be tested individually to prove their function in the total system. Any and all defective components shall be repaired and/or replaced.
   2. Likewise each of the other auxiliary systems, one by one (sound, F.A., telephone, computer, etc.) shall be tested and written reports made on the results of the test.

D. Return visits: Six months after the system has been accepted by the owner, the factory representative shall return to the project and check-out the system to determine the condition of operation, answer any questions of the operator and/or administrator, make repairs, etc., to determine if the system is operating to its full potential.

E. The factory representative shall review with the operator and administrator on their use of the equipment making sure the equipment is used to the ultimate.

F. Each auxiliary system shall carry a one year warranty from the date of acceptance by the owner.

END OF SECTION

SECTION 266210 – DATA SYSTEM CABLING

PART 1 - GENERAL

1.1 See drawings for additional system requirements.

1.2 Basis of design is Ortronics, the following are approved alternate manufacturers:
a. Hubbell
b. Leviton

1.3 The following specification and its associated drawings are intended to provide a set of instructions and materials needed to furnish and install Telecommunications Cabling, within parameters set by industry standards.

A. The information is modular in nature.
1. Each facility will have one or more of each module discussed.
2. Specifically included in this specification are cables, connecting hardware requirements to provide a Category 6+ compliant link to each data port of the workstations.

B. Some of the information contained in the following is directed to the owner's architects, electrical, mechanical, and structural engineers. This information points toward ideal conditions and may vary by site depending on actual conditions.

1.4 CODES AND STANDARDS COMPLIANCE

A. All materials shall comply with the applicable sections of the following Codes for installation of telecommunications cabling:
1. International Building Code (IBC)
2. National Electrical Code (NEC/NFPA 70)
3. National Electrical Safety Code (NESC IEEE C 2)
4. Local Codes, amendments, and ordinances.

B. All materials and installation practices shall comply with the applicable sections of the following Telecommunications Industry Standards:
1. ANSI/TIA/EIA-568-C.1, Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements.
2. ANSI/TIA/EIA-568-C.2, Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted-Pair Cabling Components.
3. ANSI/TIA/EIA-568-C.3, Commercial Building Telecommunications Cabling Standard, Part 3: Optical Fiber Cabling Components Standard.
4. ANSI/TIA/EIA-569-A-2001 (Including 5 addendums), Commercial Building Standards for Telecommunications Pathways and Spaces
5. ANSI/EIA/TIA-570-1991, Residential and Light Commercial Telecommunications Wiring Standard
6. ANSI/TIA/EIA-606-1993, The Administration Standard for the Telecommunications infrastructure of Commercial Building
7. ANSI/TIA/EIA-607-1994, Commercial Building Grounding and Bonding Requirements for Telecommunications

C. Installers shall have read the above documents and shall be familiar with the requirements that pertain to this installation. The documents may be obtained from:
   1. Global Engineering Documents, 15 Inverness Way East, Englewood, CO, 80112-5776, 800-854-7179, fax: 303-397-2740, http://global.his.com/
   2. IEEE-Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, NY, 10017-2394, 800-678-IEEE, fax: 732-981-9667, http://standards.ieee.org/

D. This document does not replace any Code, local or otherwise. The contractor must be aware of local Codes that may impact this project.

   1. The Telecommunications Contractor shall be an approved Ortronics CIP (Certified Installer Plus) OR approved Hubbell Premise Wiring CI (Certified Installer).
   2. A copy of the certification documents shall be submitted with the quote.

   3. The owner reserves the right to require the Contractor to remove from the project any such employee the Owner deems to be incompetent, careless or insubordinate.
   4. All clean up activity related to work performed will be the responsibility of the Low Voltage Contractor and must be completed daily before leaving the site.

E. Pre-Installation Conference:
   1. Schedule a conference a minimum of five calendar days prior to beginning work of this Section. Attendees should include Owner's Rep., Engineer, GC, EC and Cabling Sub.
   2. Agenda: Clarify questions related to work to be performed; data rack layout, scheduling, coordination, etc.
   3. Minutes of the meeting shall be kept by the EC and sent to all attendees.

F. Warranty
   1. A 15 Year Product Warranty covering all components, equipment and workmanship shall be submitted in writing with system documentation. The warranty period shall begin on the system's first use by the owner. Warranty shall be vendor supplied. Contractor warranty alone is unacceptable
   2. The project must be pre-registered with Manufacturer before installation has begun.

PART 2 - PRODUCTS

2.1 COMMUNICATIONS EQUIPMENT ROOMS

A. Equipment Racks:
1. Supply and install all patch panels, rack mounting kits for switches and hubs, wire management components, and patch cables for each equipment rack.
2. Provide quantity of racks as needed to accomplish described scope of work:

MDF (ELEC RM 36)			
FLOOR MOUNTED RACKS			
QTY	**DESCRIPTION**	**MFG**	**PART#**
1	19" X 7' Floor Mounted Racks	Ortronics	OR-MM6706
ACCESSORIES			
1	20A Vertical Power Strip	Ortronics	OR-MMCPB12018-01
2	Vertical Wire Management	Ortronics	OR-MM6VMD710
*	2U Dual-hinged, horizontal wire management	Ortronics	OR-MM6HM62RU

* Provide and install a unit above, between and below each installed each patch panel.

IDF ROOMS (IT ROOM 11)			
FLOOR MOUNTED RACKS			
QTY	**DESCRIPTION**	**MFG**	**PART#**
3	19" X 7' Floor Mounted Racks	Ortronics	OR-MM6706
ACCESSORIES			
3	20A Vertical Power Strip	Ortronics	OR-MMCPB12018-01
4	Vertical Wire Management	Ortronics	OR-MM6VMD710
*	2U Dual-hinged, horizontal wire management	Ortronics	OR-MM6HM62RU

* Provide and install a unit above, between and below each installed each patch panel.

2.2 HORIZONTAL CABLING REQUIREMENTS

A. Copper Cabling

2.3 HORIZONTAL UTP CABLE

A. Cable Solution: CAT 6+

B. Approved Manufacturer(s):
1. Superior Essex
2. Mohawk Cable

C. Confirm and provide CMP (Plenum rated) or CMR (Riser) type cable where applicable.

D. Install cables as indicated on the drawings and terminate on patch panels that are rated the same as the cable solution indicated above.

E. Cables shall be labeled on both ends.

2.4 PATCH CORDS:

A. For every new cable and data jack installed, the contractor shall supply the owner with (1) patch cord 50% 3ft. 50% 5ft. Color of patch cords shall be determined by the Owner.

2.5 PATCH PANELS

A. Provide and install angled 110-Style, 48-Port patch panels, quantity as required with 20% spare capacity.

B. Provide patch panels rated the same as the Cable solution specified.

C. All patch panels shall be labeled depicting location.

RATING	MFG	PART #
CAT 6	Ortronics	OR-PHA66U48

2.6 COAXIAL CABLE

A. Cable Type: RG6 cable. 75 Ohm.

B. Cables shall be terminated on a Multimedia patch panels. Terminate cable on both ends using F-Type Connectors. See drawings.

1. Multimedia Patch Panels:
   a) Ortronics P/N OR-PHAPJU48
2. F-Type Connectors:
   a) ICM digital P/N 574794
   b) Hubbell P/N SFFWX

2.7 TELECOMMUNICATIONS OUTLET JACKS AND FACEPLATES

A. Telecommunication Jacks (*Jack color shall match cable color):

1. Provide jacks rated the same as the cable solution specified above.

RATING	MFG	PART #
CAT 6	Ortronics	OR-TJ600

B. Telecommunications Faceplates:

1. Material & Color: To match electrical wiring devices, refer to Section 26 2767.
2. Face Plates shall be provided with ID Windows and labeled depicting location.
3. Provide minimum of 6-port faceplates and install blank inserts as needed.
4. Faceplates shall be compatible with Telecommunications jacks.

2.8 FIBER OPTIC CABLING AND EQUIPMENT

A. Cabling requirements:

1. Backbone Cabling
   a) 12-Strand, Single-Mode, 900 Micron, Corning Glass, OFNP, Plenum, Indoor/Outdoor rated.
2. Provide and terminate all fiber optic cabling on patch panels utilizing SC type connectors.

B. Patch Panels & Adapter Plates:

1. Provide and install patch panels and adapter plates as required for termination of all cables, provide +20% spare capacity. Provide all required accessories for a complete installation and functional system.

2. Provide a 3 meter, fiber patch cables, 1 per termination
   a) 50/125 Single-mode, Duplex (riser), connectors to match cabling above.

3. Patch Panels (Quantity and Size as required for terminations):
   a) Ortronics: OptiMo FC Series

4. Adapter Plates (Quantity and Size as required for terminations):
   a) Ortronics
   b) Hubbell
   c) Leviton

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS:

A. Provide and install floor mounted racks as described above. Leave adequate slack cable to allow proper operation and maintenance in the racks.

B. EC shall ground all trays, ladder racks and equipment racks to local ground bar, per TIA/EIA 607.

C. Provide and install 18" wide ladder tray up wall from service entrance conduits, around and then over the top of the equipment racks to the cable tray entrance point for cable management. Provide and install "waterfall" components where cables exit tray.

D. Equipment shall be installed in accordance with attached drawings.

E. Horizontal workstation and vertical riser cable termination, order of termination, color coding, grouping, numbering, and labeling shall be performed in accordance with Owner's conventions.

F. All horizontal cable shall be installed using either cable trays, conduit or J-hooks. All cable supports shall be in place prior to cable installation.

G. Cables shall never be pulled or installed directly across suspended ceiling tiles or fluorescent lights.

H. Maximum spacing between "J" hooks shall not exceed four feet. All cable supports shall be in place prior to cable installation.

I. Tie wraps/electrical tape shall not be used to bundle the cables, velcro straps will be used instead.

J. At no time should pulling tension exceed 24 lbs. on horizontal or vertical cables.

K. No intra-building telecommunications cable shall be run adjacent and parallel to power cabling.

L. A minimum of 12 inches distance is required from any fluorescent lighting fixture or power line over 2 kVA and 24 inches from any power line over 5 kVA. Similarly cable should be routed and terminated as far as possible from sources of EMF, such as generators, motors, etc.

M. Install cable supports at the top of each vertical run using cable support Kellum grips or equal support system.

N. Cables shall never be anchored or supported by staples.

3.2 LABELING: (Coordinate all labeling and labeling schemes with Owner, Prior to any labeling).

A. Hand written labels are not acceptable.

B. MDFs will use an M as its designator. The IDF's will use I# (I1,I2,I3) as specified by Owner.

C. Patch panels in the rack will be labeled "A" for the top most panel and "B" for the second.

D. Cable labels shall be Laser printed on Brady type labeler.

E. The cable name will consist of the distribution frame, patch panel and port number that the cable connects to: ie M-A24, I2-B48

F. All cables shall be labeled at each end with the cable name, type, and manufacturer: ie M-A06 (6+-SPSX), I3-B34 (6+-SPSX).

G. The labels will be placed 4 to 6 inches from the cable end and visible in the data jack box.

H. Data jack face plates shall be laser printed on Brady type labels.

I. All data jack face plates shall be labeled with the cable name: ie M-A06.

J. Each optical fiber cable segment shall be labeled at each end with the IDF number that it is supporting with an A for the first cable and a B for the second etc. ie I3-A

K. Each fiber interconnect device shall be labeled with its respective IDF identifier.

L. Each copper backbone cable shall be labeled at each end with its respective IDF number with an A for the first cable and a B for the second. ie I3-A, I3-B

3.3 GENERAL UTP CABLE INSTALLATION:

A. Where UTP cable enters an MDF or IDF it shall be affixed to the ladder try where applicable. All cable shall be neatly bundled, combed, and tied. All cable runs, within the MDF or IDF, shall be horizontal or vertical, and bends shall comply with minimum specified cable bending radii, as dictated by applicable industry standards.

B. Horizontal UTP cable installation, from the IDF to the work area, shall be installed in accordance with EIA/TIA-568-C specified installation practices, manufacturer specified installation practices, terminated to T 568-B. The entire work station cable system, including wiring blocks, cable, and telecommunications outlets shall be tested for the Category of cable specified compliance.

1. All UTP cable supports shall be installed prior to cable installation.
2. All UTP cables shall be routed parallel with the building structures. Cables shall not route diagonally across a concealed space.

3.4 TESTING:

A. UTP CABLES AND LINKS

1. All UTP cabling will be certified to meet and or exceed the specifications as set forth in TIA/EIA-568-C.1 using a level IV field tester. Certifications shall include the following parameters for each pair of each cable installed:

a) Wire map (pin to pin connectivity)
b) Length (in feet)
c) Attenuation
d) Near End Crosstalk (NEXT)
e) PSNEXT
f) Far End Crosstalk (FEXT)
g) ELFEXT (ACRF)
h) PSELFEXT (PSACRF)
i) Return Loss
j) Propagation Delay
k) Delay Skew

B. OPTICAL FIBER CABLES
1. After terminating optical fiber cables the system shall be tested using Tier 1 test format. Tier 1 testing is mandatory. Tier 2 testing, (OTDR testing), is optional.
2. Multimode optical fiber attenuation shall be tested on all individual fibers of each cable segment with a nCompass approved certification tester (DTX-1800 with DTX-EFM2 Modules) using a LED light source. Test set up and performance shall be in accordance with ANSI/TIA-526-14-B. To fully comply with ANSI/TIA-526-14-B, use of a controlled launch or "Encircled Flux" is REQUIRED. Test results should include location identification, link attenuation loss, link length and polarity. These tests shall be performed at the 850nm and 1300nm windows in both directions

C. Test results will be handed over at the end of the project and shall provide an electronic and printed record of these tests

D. Owner reserves the right to hire an independent testing company to spot check the test results. If the results vary more than 10% from the results provided by the Contractor, the Contractor will be required to prove his results are correct or retest the entire system.

3.5 TEST RESULTS ACCEPTANCE:
A. Documentation:
1. Contractor shall provide documentation that will include test results and as-built drawings.

B. Test Results:
1. All test results will be supplied to the Owner in an Electronic and printed format. Each individual test result will fit on a single 8.5 X 11 inch sheet of paper. All test results will be compiled and bound in a neat and logical manner. All Electronic test results will also be supplied to the Owner in electronic format.

C. As-Built Drawings:
1. Contractor will be provided with electronic copies of the drawings depicting the data communications system. Contractor shall modify the electronic drawing to produce a new drawing(s) depicting the following information: data outlet locations as they were installed and labeled, actual cable routing, innerduct locations and number, conduit locations and numbers, and Cable TV routing and numbering. The As-Built electronic drawings shall then be provided to the Owner in an AUTOCAD version 2009 or higher format.

3.6 TRANSFER OF OWNERSHIP

A. Final acceptance and payment of the data communications system, by Owner, shall be based upon receipt of the following items:
   1. Results of Testing:
      a) All UTP data cables must meet the criteria established in 3.1.
   2. Receipt of Documentation:
      a) All documentation shall be submitted to the District, before final acceptance is declared. Refer to Section 3.2.A.
   3. Walk Through:
      a) A site inspection or "Walk Through" will be conducted. Representatives from the Owner and the Vendor are to be present. The site will be inspected to ensure that the wiring has been installed to the specification outline in this document.

END OF SECTION

SECTION 26 6411 – NETWORK FIRE DETECTION AND ALARM SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. 24 VDC, analog/addressable, multiprocessor-based, fire alarm system.
   1. System shall include, but not be limited to:
      a. Control equipment.
      b. Control panel.
      c. Analog addressable sensors.
      d. Addressable modules.
      e. Audible and visual notification appliances.
      f. Accessories necessary to provide complete and operable system.
      g. Conduit, wiring, and fittings.

1.2 RELATED SECTIONS

A. Section 26 6412 – Intelligent VESDA Air Sampling System.

1.3 REFERENCES

A. National Fire Protection Association (NFPA):
   1. NFPA 13 - Installation of Sprinkler Systems.
   2. NFPA 70 - National Electrical Code.
   3. NFPA 72 - National Fire Alarm Code.
   4. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.

B. Underwriters Laboratories (UL):
   1. UL 268A - Standard for Smoke Detectors for Duct Application.
   2. UL 864 9th Edition- Standard for Control Units and Accessories for Fire Alarm Systems.

1.4 CODES AND STANDARDS

A. Equipment shall be listed by Underwriters Laboratories, Inc., approved by Factory Mutual Research, or as accepted by the Authority Having Jurisdiction (AHJ).

B. Codes: The fire alarm system in its entirety shall be in compliance with all applicable fire and electrical codes and comply with requirements of the local Authority Having Jurisdiction over said systems.

C. UL Standards: System shall comply with applicable provisions of the following UL standards and classifications:
   1. UL 864 9th Edition.
   2. UOJZ, Control Units, System.
   3. SYZV Control Units, Releasing Device.
   4. UOXX, Control Unit Accessories, System.
   5. SYSW Accessories, Releasing Device Service.

D. NFPA Standards: System shall comply with applicable provisions of the following NFPA standards:
1. NFPA 72.
a. Central Station Fire Alarm Systems.
b. Local Fire Alarm Systems.
c. Auxiliary Fire Alarm Systems.
d. Remote Station Fire Alarm Systems.
e. Proprietary Fire Alarm Systems.
2. NFPA 90A.
3. NFPA 101.

1.5 SYSTEM DESCRIPTION

A. Multiprocessor-Based:
1. The system shall be of multiprocessor design to allow maximum flexibility of capabilities and operation.

B. Field Programmable:
1. The system shall be capable of being front-panel programmed or by means of Field Configuration Program (FCP) allowing programming to be downloaded via portable computer.

C. RS-232C Serial Output:
1. A supervised RS-232C serial port shall be provided to operate remote printers and/or video terminals, accept downloaded program from portable computer, or provide 80-character readout of alarms, troubles, location descriptions, time, and date.
2. Communication shall be the standard ASCII code operating at 9600-baud rate.

D. Control-by-Event (CBE) Program:
1. Operation of manual station or automatic activation of any smoke sensor, heat sensor, or waterflow zone shall activate system control-by-event program to cause:
a. All notification appliances to sound in a temporal pattern and strobes to flash.
strobes to flash.
d. Shut down all air-handling units as specified herein.
e. "SYSTEM ALARM" LED shall flash and panel sounder shall pulse.
f. Indicate on the 80-character alphanumeric panel display description of specific analog/addressable device in alarm. Display shall be of the liquid crystal type (LCD), clearly visible in the dark or in poor light conditions.

g. Close all magnetically held doors automatically.
h. Perform additional functions as specified herein or as indicated on the drawings.
i. Notify the Fire Department.

E. General System Operation:
1. When an alarm occurs, the control panel shall indicates alarm condition until manually reset.
2. Alarm may be acknowledged by pressing "ALARM ACKNOWLEDGE" switch.
3. This shall silence the panel sounder and change the "ALARM" LED from flashing to steadily lit.
4. All notification appliances may be silenced by operating the "SIGNAL SILENCE" switch.
5. This shall steadily light the "SYSTEM SILENCED" LED.
6. If a subsequent alarm is activated, notification appliances shall "resound" until again silenced.
7. Once silenced, all notification appliances may be restored by operating the "SIGNAL SILENCE" switch.

8. Waterflow zones shall be non-silenceable.

F. Alarm Verification:
1. Smoke detector alarm verification shall be a standard option on all zones, while allowing any dry contact device, such as manual stations and heat detectors, to create immediate alarm.
2. This feature shall allow smoke sensors that are installed in environments prone to nuisance or unwanted alarms to operate according to following sequence:
   a. System Ready: Prior to smoke sensor alarm.
   b. Smoke Sensor Alarm: At time = 0.
   c. Pre-alarm Window: 15 seconds. A distinctive pre-alarm indication shall be displayed.
   d. Zone Reset: 5 seconds. Occurs at end of pre-alarm window.
   e. Alarm Verification Window: 90 seconds. The system shall respond to a second alarm from same smoke sensor as a system alarm.
   f. System Ready: No alarm verification.
   g. The verification sequence is suspended once the system alarm is activated.

G. Alarm Signals:
1. All alarm signals shall automatically latch or "lock in" at the control panel until the operated device is returned to normal and the control panel is manually reset.
2. Alarm signals shall be programmable for “non-latching” operation when required by the Authority Having Jurisdiction. When used for waterflow, the "SIGNAL SILENCE" switch shall be bypassed.

H. Electrically Supervised:
1. Each signaling line circuit and notification appliance circuit shall be electrically supervised for opens, shorts, and ground faults.
2. Occurrence of a fault shall activate the system trouble circuitry, but shall not interfere with proper operation of the circuit that does not have a fault condition.
3. The yellow "SYSTEM TROUBLE" LED shall light and the system audible sounder shall steadily sound when trouble is detected in the system. Failure of power, opens, or short circuits on notification appliance or signaling line circuits, disarrangement in system wiring, failure of microprocessor or identification module, or system ground faults shall activate this trouble circuit.
4. Trouble signal may be acknowledged by operating the "ALARM ACKNOWLEDGE" switch. This shall silence the sounder. If subsequent trouble conditions occur, trouble circuitry shall resound.
5. During alarm, all trouble signals shall be suppressed with the exception of lighting the yellow "SYSTEM TROUBLE" LED.

I. Drift Compensation, Analog Smoke Sensors:
1. System software shall automatically adjust each analog smoke sensor approximately once each week for changes in sensitivity due to effects of component aging or environment (i.e.: dust).
2. Each sensor shall maintain its actual sensitivity under adverse conditions to respond to actual alarm conditions, while ignoring factors that generally contribute to nuisance alarms.
3. System trouble circuitry shall activate, display "DIRTY DETECTOR" and "VERY DIRTY DETECTOR" indications and identify the individual unit that has been compensated beyond its acceptable limits.

J. Analog Smoke Sensor Test:
1. System software shall automatically test each analog smoke sensor a minimum of 3 times daily.
2. Test shall be a recognized functional test of each ionization chamber (analog ionization sensors) and photocell (analog photoelectronic sensors) as required annually by NFPA 72.

3. Failure of a sensor shall activate the system trouble circuitry, display a "Test Failed" indication, and identify individual unit.

K. Dual-Mode Walk Test:
1. The control unit shall provide a Dual-Mode Zoned Walk Test Program that shall enable an individual to test the Alarm/Supervision status of each sensor or module connected to the system.
2. During walk test, the control unit shall automatically reset after an alarm condition enabling the technician to continue testing the system without requiring a return to control panel.
3. During an Audible walk test, placing a device in alarm shall cause 4 pulses on the notification appliance circuits. Operation of a supervisory switch shall cause 3 pulses, while removal or disconnection of an initiating device shall cause 2 pulses. All tests shall be recorded by printer for reference.
4. The Silent walk test shall record all tests by printer for reference, while not activating notification appliance circuit(s).

L. Printed Circuit Boards, Control Panel Components:
1. The control unit shall be contained in steel cabinet.
2. All groups of circuits or common equipment shall be clearly marked.
3. The control unit shall be red in color and shall include the following features:
   a. Auxiliary SPDT alarm and trouble dry contacts.
   b. A solid-state power transfer circuit that shall switch to standby power automatically and instantaneously if normal power fails or falls below 15 percent of normal ("brown out" conditions). This circuit shall allow batteries to be effectively "floated" on the operating system to avoid upsetting normal microprocessor operation and minimize resultant nuisance troubles and/or alarms. This circuit shall be physically isolated from the power supply to facilitate service.
   c. A Ground Fault detector to detect positive or negative grounds on signaling line circuits, notification appliance circuits, and power circuits. Ground fault indication shall occur on display and general trouble devices and shall operate as specified herein, but shall not cause alarm.
   d. Lightning protection shall be a standard feature of the fire alarm control panel and shall be incorporated in the power supply circuit, common control circuits, and notification appliance circuits. Systems that require an optional module to provide this protection shall not be considered equal.
   e. Individual overcurrent protection shall be provided for the following: smoke detector (resettable) power, main power supply, battery standby power, and auxiliary (non-resettable) output.
   f. A common reset and lamp test switch, labeled "SYSTEM RESET/LAMP TEST" shall be provided on panel.

M. City Connection:

fire alarm system shall be connected via Digital Alarm Communicator Transmitter (DACT) over telephone lines to a central station or remote station.

1.6 SUBMITTALS

A. Comply with Section Division 01 - Submittal Procedures.

B. Equipment Other Than That Specified:
   1. Submit to the Engineer appropriate documentation in writing 10 days before the Bid Date, if equipment other than that specified is to be supplied.
      a. Complete lists, descriptions, and drawings of materials.
      b. A complete list of current drain requirements during normal supervisory condition, trouble, and alarm conditions.
      c. Battery standby calculations showing total standby power needed to meet system requirements as specified.

C. Product Data:
   1. Submit manufacturers original catalog data and descriptive information for major components of equipment.
   2. Submit pertinent information regarding reliability and operation of equipment.
   3. Submit sufficient information so the exact function of each installed device is known.

D. Shop Drawings:
   1. The submittal of shop drawings shall contain at least 1 booklet of original manufacturer specification and installation instruction sheets. Subsequent booklets may be copies.
   2. All equipment and devices on the shop drawings shall be clearly marked in the specification sheets.

E. Scheduling:
   1. Submit delivery dates, installation dates, and final test/acceptance dates of equipment.

F. Supplier's Qualifications:
   1. Nicet level 4 on staff. Nicet level 3 designer. Nicet level 2 technician to program and test.
   2. Indicate years in business, service policies, warranty definitions, and list of similar installations.

G. Installer's Qualifications:
   1. Submit installer's qualifications.
   2. Indicate years in business and prior experience with installations that include type of equipment that is to be supplied.

H. Project Record Drawings:
   1. Complete set of reproducible project record drawings showing installed wiring, color coding, and wire tag notations for exact locations of all installed equipment, specific interconnections between all equipment, and internal wiring of equipment.
   2. Deliver to the Owner after completion of system.

I. Operating and Instruction Manuals:
   1. Submit before testing of system.
   2. Deliver 4 complete sets of operating and instruction manuals to the Owner after completion of testing.

J. Maintenance Instructions:
   1. Shall be complete, easy to read, and understandable.
   2. Provide instructions for replacing components of system, including internal parts.
   3. Provide instructions for periodic cleaning and adjustment of equipment with a schedule of these functions.
   4. Provide a complete list of all equipment and components with information as to address and telephone number of both manufacturer and local supplier of each item.

5. Provide user Operating Instructions: Prominently display these on a separate sheet located next to the control unit in accordance with UL 864.

K. Testing Instructions:
1. Complete, accurate, step-by-step testing instructions giving recommended and required testing frequency of all equipment, and methods for testing each individual piece of equipment.
2. Deliver to the Owner after completion of system.

1.7 QUALITY ASSURANCE

A. Catalog Numbers: Catalog numbers specified are those of Gamewell-FCI, and are indicative of the quality and type of equipment to be furnished.

B. Accessory Components: Accessory components as required shall be catalogued by the manufacturer and Listed to operate with the manufacturer's control panel.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to the site in manufacturer’s original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage: Store materials in a clean, dry area indoors in accordance with manufacturer’s instructions.

C. Handling: Protect materials from damage during handling and installation.

1.9 WARRANTY

A. The contractor shall warrant all equipment and wiring free from inherent mechanical and electrical defects for 1 year (365 days) from date of final acceptance.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Basis of Design:
- Gamewell-FCI, 12 Clintonville Road, Northford, Connecticut 06427 . Toll Free (800) 633-1311. Phone (203) 484-7161. Fax (203) 484-7118. Website www.gamewell-fci.com.

B. Alternate Manufacturer’s:
- GE – EST Edwards Fire Alarm Systems

C. Hybridized Systems: "Hybridized" systems (containing equipment from several different manufacturers) shall not be considered acceptable.

D. Labeling: Label equipment with manufacturer's name and logotype to assure integrity of complete system.

2.2 FIRE DETECTION AND ALARM SYSTEM

A. Fire Detection and Alarm System: Shall be an FCI S-3 Series, 24 VDC, analog/addressable, multiprocessor-based, fire alarm system.

2.3 WIRING

A. Wire and Cable: Shall be UL Listed for fire alarm use and be a minimum of 18 AWG or as required by local codes and the Authority Having Jurisdiction.

B. Wire Used on Fire Alarm System: Shall be UL Listed as fire alarm protection signaling circuit cable in accordance with the National Electrical Code, Article 760.

C. Raceways containing conductors identified as "Fire Alarm" conductors shall not contain other conductors.

D. No AC current carrying conductors shall be allowed in the same raceway with fire alarm conductors.

2.4 SYSTEM COMPONENTS

A. System Cabinet:
1. Surface mounted with texture finish.
2. Housess S-3 Micro microprocessor and related system circuitry.
3. Wiring Gutter Space: Minimum of 1-inch wiring gutter space shall be provided behind mounting plate.
4. Wiring: Terminated on removable terminal blocks to allow field servicing of all modules without disrupting system wiring.

B. LED Indicator and Outputs:
1. A green "AC ON" LED on lamp cluster shall indicate presence of primary power.
2. Power Supply Outputs: Maximum combined output for both shall be 1 ampere.
   a. 24 VDC non-resettable, 1 amp. maximum, power limited.
   b. 24 VDC resettable, 1 amp. maximum, power limited.

C. Battery Charger:
1. Power Supply: Contains battery charger with maximum average charging current of 1 ampere.
2. If the system loses AC power, a System Trouble shall occur.
3. Output: Supervised and overcurrent protected.
4. Charger: Shall be capable of maintaining sealed lead-acid batteries up to 31-ampere/hour capacity.

D. Batteries:

1. Shall be of sufficient capacity to provide power for the entire system upon loss of normal AC power for a period of 24 hours with 5 minutes of alarm signaling at end of this 24-hour period, as required by NFPA 72, Local Systems.

E. Connections and Circuits:
1. Connections to Light and Power Service: Shall be on a dedicated branch circuit in accordance with the NEC.
2. Circuit and Connections: Shall be mechanically protected.

3. Circuit Disconnecting Means: Shall be accessible only to authorized personnel and clearly marked "FIRE ALARM CIRCUIT CONTROL."

F. Basic System Module:
1. Enclosed within system cabinet, the basic system module shall contain a power supply, microprocessor, memory, system operating software stored on non-volatile EPROM, system configuration memory stored on non-volatile EEPROM, and circuits necessary to support a fire alarm system.
2. Volatile Memory: Not acceptable.
3. Module: Shall function as system control center, processing all messages from field devices supervisory, trouble, alarm.

G. Microprocessor:
1. Microprocessor: Shall execute all supervisory programming to detect and report failure or disconnection of any module or peripheral device.
2. Isolated "Watchdog" Circuit: Shall monitor the microprocessor and upon failure activate system trouble circuits on display.
3. Control-By-Event Functions: The microprocessor shall access the system program, for all control-by-event (CBE) functions.
4. System Program: Shall not be lost upon failure of both primary and secondary power.

H. Signaling Line Circuits:
1. Basic System Module: Shall provide communication with all analog/addressable devices (initiation/control) connected to the S-3 via 2 signaling line circuits.
2. Each Signaling Line Circuit: Shall be capable of being wired Class B, Style 4.
3. Class A, Style 6 Operation Shall be possible with installation of the optional Class A Operating Module (CAOM).
4. Circuits: Shall be capable of operating in NFPA Style 7 mode when equipped with the CAOM module and isolator modules or sensor bases.
5. Each Circuit: Shall communicate with a maximum of 159 analog sensors and 159 addressable monitor/control devices.

I. Real-Time Clock:
1. Basic System Module: Shall contain a real-time clock capable of monitoring all real-time programming and all time-control functions.

J. Notification Appliance Circuits:
1. Two Independent Notification Appliance Circuits: Provided on basic module, polarized and rated at 1.5 amperes DC per circuit, individually overcurrent protected and supervised for opens, grounds, and short circuits.
   a. Shall be capable of being wired Class B, Style Y.
   b. With installation of optional Class A Option Module (CAOM), Shall be capable of being wired Class A, Style Z.
2. Power Output: Shall be regulated so that UL Listed notification appliances with an operating voltage range of 17-26 VDC may be installed on the circuits.
   a. Voltage: 24 VDC regulated.
   b. Current: 1.5 amps, maximum alarm.

K. Trouble Dry Contacts:

1. Trouble Dry Contacts (Form C): Shall be rated 2 amps at 30 VDC (resistive) and transfer whenever system trouble occurs.

L. Alarm Dry Contacts:
1. Alarm Dry Contacts (Form C): Shall be rated 2 amps at 30 VDC (resistive) and transfer whenever system alarm occurs.

M. Gamewell-FCI Approved Sensors:
1. Use only Gamewell-FCI approved compatible sensors, UL Listed or FM Approved for use with S-3 system.
2. The following identifies by model number those approved, acceptable models.
   a. Analog Ionization Sensor: Model ASD-PL3I.
   b. Analog Photoelectronic Sensor: Model ASD-PL3.
   c. Analog Photoelectronic Sensor with 135-Degree F Thermal Unit: Model ASD-PTL3, ASD-PTL2F.
   d. Addressable Thermal Sensor, Fixed Temperature: Model ATD-L2, ATD-L2F.
   e. Addressable Thermal Sensor, Rate of Rise: Model ATD-RL2, ATD-RL2F.
   f. Standard Analog Plug-in Base: Model ADB-FL, ADB-FLF.
   g. Base/Sounder Assembly: Model B501BH,/BHT.
   h. Analog Duct Sensor, with Relay: Model ADP, ADPF, ADPR, ADPRF.
   i. Isolator Module: Model M500X.
   j. Isolator Base: Model B224BI.
   k. Multi-Criteria Sensor: Model MCS-Acclimate2, MCS-Acclimate2F
   l. Beam Detector: Model ABD-2F, ABD-RT2F.
   m. Laser Sensor: Model ASD-LS.

N. Display:
1. System Display: Furnishes audible and visual annunciation of all alarms and trouble signals.
2. Provide dedicated LEDs for the following functions:
   a. AC Power On: Green.
   b. Alarm: Red.
   c. Supervisory: Yellow.
   d. System Trouble: Yellow.
   e. Power Fault: Yellow.
   f. Ground Fault: Yellow.
   g. NAC 1 Silenced: Yellow.
   h. NAC 2 Silenced: Yellow.
   i. System Silenced: Yellow.
3. Eighty-Character Alphanumeric Display: Provides status of all analog/addressable sensors, monitor, and control points. Contains a 12-key keypad which shall permit selection of functions.
4. Type: Liquid crystal type (LCD), clearly visible in the dark and under all light conditions.
5. Panel: Contains 4 functional keys and 3 programming buttons:
   a. Functional Keys:
      1) Alarm Acknowledge.
      2) Trouble Acknowledge.
      3) Signal Silence.
      4) System Reset/Lamp Test.
   b. Programming Buttons:
      1) Menu/Back.
      2) Back Space/Edit.

3) OK.

2.5 PERIPHERAL DEVICES

A. Analog Photoelectronic Smoke Sensors, Model ASD-PL3

1. Analog Photoelectronic Sensors: Low profile and capable of being set at 4 sensitivity settings of "LOW, LOW MEDIUM, MEDIUM, MEDIUM HIGH, and HIGH" levels.
2. Automatic and Manual Functional Sensitivity and Performance Tests: Shall be possible without necessity of generating smoke. The test method shall test all sensor circuitry. "Failed Test" indication shall display for failed test.
3. LEDs: Two LEDs providing 360-degree visibility of operating status and alarm indication shall be provided on each sensor. LEDs shall pulse periodically indicating that the sensor is receiving power and communication is taking place. This feature shall be field programmable. Upon alarm, these LEDs shall light continuously. Alarm output shall be available for remote annunciation.
4. Sensitivity: The system shall check sensitivity of each sensor periodically. If a sensor alarm threshold sensitivity has changed due to aging and/or dust accumulation, the system shall automatically compensate for this change (drift compensation).
5. Sensitivity Levels: Each sensor shall allow for setting of 2 sensitivity levels. Levels may be programmed so when building is occupied, a sensor shall be less sensitive than when building is unoccupied. This feature permits sensors to be more reliable and at same time reduces/minimizes unwanted alarms. This feature shall also incorporate programmable weekend days, where the sensor shall remain at the unoccupied sensitivity level.
6. Sensor Screen and Cover Assembly: Shall be removable for field cleaning.
7. Interchangeable Sensors: Each sensor shall be interchangeable with Models ASD-IL2, ASD-IL2F; ATD-L2/RL2, ATD-L2F/RL2F sensors via adapter and twistlock mounting base, to ensure matching the proper sensor to potential hazards of the areas being protected. In all cases, the system shall recognize when improper sensor type has been installed in previously programmed sensor type location.
8. Thermal Sensor: Model ASD-PTL2, ASD-PTL2F sensor shall contain, in addition to above, a 135-degree FT thermal sensor.
7. Interchangeable Sensors: Each sensor shall be interchangeable with Models ASD-PL2/PTL2 , ASD-PL2F/PTL2F and ATD-L2, ATD-L2F Series sensors via adapters and twistlock mounting base, to ensure matching the proper sensor to potential hazards of the areas being protected. In all cases, system shall recognize when improper sensor type has been installed in previously programmed sensor type location.

C. Addressable Thermal Sensors, Model ATD-L3R,

1. Addressable Thermal Sensors: Shall be low profile and operate on combination "rate-of-rise" and "fixed temperature" principles with the fixed temperature set point at 135 degrees F, Model ATD-RL2, ATD-RL2F. The sensor shall contain dual thermistor sensing circuitry for fast response.
3. LEDs: Two LEDs providing 360-degree visibility of operating status and alarm indication shall be provided on each sensor. LEDs shall pulse periodically indicating that the sensor is receiving power and communication is being supplied. This feature shall be field programmable. Upon alarm, these LEDs shall light continuously. Alarm output shall be available for remote annunciation.
4. Interchangeable Sensors: Each sensor shall be interchangeable with Models ADS-PL2, ADS-PL3 and ASD-IL2, ASD-IL2F sensors via twistlock mounting base, to ensure matching proper sensor to potential hazards of areas being protected. In all cases, the system shall recognize when an improper sensor type has been installed in a previously programmed sensor type location.

D. Addressable Monitor Module, Model AMM-2, AMM-2F:
   1. An addressable monitor module with initiating circuit wired Class B, Style B shall be furnished to provide an address for individual, normally open (N.O.) contact devices.

E. Addressable Dual Monitor Module, Model AMM-2I, AMM-2IF:
   1. An addressable monitor module with 2 initiating circuits wired Class B, Style B shall be furnished to provide 2 addresses for individual, normally open (N.O.) contact devices.

F. Addressable Monitor Module, Model AMM-4, AMM-4F:
   1. An addressable monitor module with initiating circuit capable of being configured either Class A, Style D or Class B, Style B shall be furnished to provide an address for an individual, normally open (N.O.) contact device, or collective address for group of such devices.
   2. LED: The AMM-4, AMM-4F module shall contain a yellow status LED that shall flash when in quiescent mode and light continuously when in alarm. The LED shall be field programmable not to provide quiescent status indication, if so desired.

G. Addressable Sub-loop Monitor Module, Model AMM-4S, AMM-4SF:
   1. An addressable monitor module with initiating circuit capable of being configured Class B, Style B shall be furnished to provide a collective address for up to ten (10) Model 1151, 2151, 1451, or 1400, conventional 2-wire smoke detectors.
   2. LED: The Model AMM-4S, AMM-4SF module shall contain a yellow status LED that shall flash when in quiescent mode and light continuously when in alarm. The LED shall be field programmable not to provide quiescent status indication, if so desired.

H. Addressable Sub-loop Monitor Module, Model MMI-6S, MMI-6SF:
   1. An addressable monitor module with 6 initiating device circuits, each capable of being configured for six Class B, Style B, or three Class A, Style A circuits, shall be furnished to provide a collective address for up to ten (10) Model 1151, 2151, 1451, or 1400 conventional 2-wire smoke detectors installed in each circuit.
   2. LED: Each circuit shall contain a yellow status LED that shall flash when in quiescent mode and light continuously when in alarm. The LED shall be field programmable not to provide quiescent status indication, if so desired.

I. Addressable Monitor Module, Model MMI-10, MMI-10F:
   1. An addressable monitor module with 10 initiating device circuits, each capable of being configured Class B, Style B, or 5 circuits each capable of being configured Class A, Style D, shall be furnished to provide an address for an individual, normally open (N.O.) contact device, or collective address for group of such devices.
   2. LED: Each circuit shall contain a yellow status LED that shall flash when in quiescent mode and light continuously when in alarm. The LED shall be field programmable not to provide quiescent status indication, if so desired.

J. Addressable Output Module, Model AOM-2R, AOM-2RF:
   1. An addressable Output Module: Connected to the same signaling line circuit as analog/addressable monitor devices and Shall provide relay output (Form "C" 2 amp at 24 VDC, resistive only).

K. Addressable Output Module, Model AOM-2S, AOM-2SF:

1. An addressable Output Module: Connected to the same signaling line circuit as analog/addressable monitor devices and Shall be capable of switching an external power supply or audio amplifier (up to 80 VRMS) to notification appliances.
2. Notification Appliance Circuit: Shall be capable of being wired Class A (Style Z) or Class B (Style Y).
3. The module shall supervise wiring to connected loads and report their status as Normal, Open, or Short Circuit.

L. Addressable Output Module, Model MMO-6R, MMO-6RF:
1. An addressable Output Module: Connected to the same signaling line circuit as analog/addressable monitor devices and Shall Provide 6 relay outputs, each with Form "C" 2 amp at 24 VDC, (resistive only) contacts.

M. Addressable Output Module, Model MMO-6S, MMO-6SF:
1. An addressable Output Module: Connected to same signaling line circuit as analog/addressable monitor devices and Shall Provide 6 outputs, each capable of switching an external power supply or audio amplifier (up to 80 VRMS) to notification appliances.
2. Notification Appliance Circuit: Shall be capable of being wired Class A (Style Z) or Class B (Style Y).
3. The module shall supervise wiring to connected loads and report their status as Normal, Open, or Short Circuit.

N. Fault Isolator Module, Model M500X:
1. This module enables part of signaling line circuit to continue operating when a short circuit occurs on a section of it.
2. The LED flashes in normal condition and lights during a short circuit condition.
3. The module automatically restores the entire circuit to normal condition when the short circuit is removed.
4. The module may be used in multiple, in any combination with other modules, providing circuit operation similar to that of NFPA Style 7, and does not require an address on the signaling line circuit.

O. Addressable Manual Fire Alarm Station, Model MS-7A, MS-7AF:
1. Each Station: Shall be the non-coded double-action type, designed for installation in the signaling line circuit of the FCI analog addressable control panel.
2. Activation of Station: Shall cause its assigned address to register at the control panel.
3. LED: The door shall contain an LED which flashes red in normal condition and lights steadily when the station has been activated.
4. The station Shall contain screw terminals.
    b. The station shall be constructed of aluminum Type 6065/T5, equipped with break glass rod feature, and require a key to reset.
    c. Key: Shall be keyed alike with the control cabinet.
    d. Alarm Activation: An additional key-operated switch (keyed differently) Shall be mounted on the front of the lower door for "general alarm" signaling.
4. Institutional Manual Station, Model MS-2L:
    a. Each Station: Shall require a special key to release the outer door before it can be activated. After unlocking the actuator door and pulling it forward, the unit shall lock into a readily observable "alarm" position.
    b. The station shall be constructed of aluminum Type 6063/T5, equipped with a break glass rod feature, and require the same key to reset.

Q. Automatic Initiating Devices: Two-wire smoke detectors approved for use with AMM-4SF Addressable Sub-loop Monitor Module. Maximum of 20 detectors per module.s.

1. Photoelectric Area Smoke Detectors,
   a. Type: Photoelectric.
   b. Designed for 2-wire installations.
   c. Factory set to detect smoke at nominal 3.0 percent light obscuration per foot.
   d. Sensitivity Tester: Allows direct readout of actual detector sensitivity in percent obscuration per foot using standard digital voltmeter.
   e. To minimize nuisance alarms, detectors shall contain screen protecting the sensing chamber from dust and insects, and equipped with self-compensating circuitry to provide maximum stability against effects of aging, dust, and film accumulation.
   f. Detectors shall be equipped with pulsed LED power supervisory indicator and full functional test feature.
   g. Alarm Output: Available for remote annunciation.

2. Photoelectronic Area Smoke Detectors,
   a. Type: Photoelectronic.
   b. Nominal Sensitivity: 3.0 percent/ft.
   c. Signal-to-Noise Ratio: 2.0 nominal.
   d. Perform functional sensitivity and performance test on these detectors without need for generating smoke. Test method shall test all detector circuits.
   e. Alarm Indication: Provided by latching LED, which shall pulse periodically indicating power is being supplied to detector. Alarm output shall be available for remote annunciation.
   f. Detectors shall not alarm when exposed to wind gusts up to 2500 feet per minute.
   g. Detector Screen and Cover Assembly: Removable for field cleaning.
   h. Wire Connections: Made by clamping plate and screw.

3. Duct Smoke Detectors:
   a. Type: Photoelectric or ionization duct smoke detectors wired in 2 or 4-wire configuration.
   b. UL Listed under UL 268A for duct smoke detectors.
   c. Allows remote functional testing without generating smoke.

4. Four-Wire Duct Smoke Detectors,
   a. Type: Ionization or photoelectronic duct smoke detectors wired in 4-wire configuration.
   b. UL Listed under UL 268A for duct smoke detectors.
   c. Allow remote functional testing without generating smoke.
5. Rate of Rise Heat Detectors, :
   a. Function on both "rate of rise" and "fixed temperature" principles of operation.
   b. Low profile design, white in color.
   c. Locking base for mounting on standard electrical box.
6. Rate of Rise Heat Detectors,
   a. Function on both "rate of rise" and "fixed temperature" principles of operation.
   b. Also available in explosion-proof and combined weather/moisture-proof versions.
   c. Explosion-Proof Models: UL and FM approved/listed for Class I, Groups C and D, and Class II, Groups E, F, and G.
7. Fixed Temperature Heat Detectors,
   a. Function on the "fixed temperature" principle of operation.

b. Contact Arrangements: SPST or DPST.
c. Temperature Set Points: 135 degrees F or 200 degrees F.
d. Low profile design, white in color.
e. Locking base for mounting on standard electrical box.

8. Fixed Temperature Heat Detectors,
a. Function on the "fixed temperature" principle of operation.
b. Temperature Set Points: 136 degrees F or 190 degrees F.
c. Also available in explosion-proof and combined weather/moisture-proof versions.
d. Explosion-Proof Models: UL and FM approved/listed for Class I, Groups C and D, and Class II, Groups E, F, and G.

9. Fixed Temperature Heat Detectors,
a. Function on the "fixed temperature" principle of operation.
b. Temperature Set Points: 135 degrees F or 200 degrees F.
c. Replaceable plug-in detecting element.

R. Optional Remote Serial Annunciator, Model LCD-7100:
1. Display: 80-character display. Duplicates all information on basic system display, with exception of menus.
2. Function Keys: Alarm Acknowledge, Trouble Acknowledge, Signal Silence, System Reset/Lamp Test, and System Drill Test.
3. Keylock: A keylock which shall enable switches only when placed in the “ON” position, with exception of the Trouble Acknowledge key which is used to silence the local trouble audible sounder.
4. Contains the following LEDs: Alarm, Supervisory, System Trouble, Power Fault, System Silenced, NAC #1 Silenced, NAC #2 Silenced, NAC # 3 Silenced , NAC #4 Silenced .
5. Mounting: Mounts on standard 3-gang surface or flush electrical box.
6. S-3 Series Control Panel: Accommodates up to 5 remote Model LCD-slp annunciators, which can be located up to 4,000 feet from control panel.

2.6 AUXILIARY FUNCTIONS

A. HVAC Control:

1. Designated HVAC Units: Controlled through auxiliary contacts of heat detectors or 4-wire duct-type smoke detectors.
2. Designated HVAC Units: Controlled through auxiliary contacts of control panel after an alarm has been initiated from any zone.
3. Designated HVAC Units: Controlled through auxiliary zone contacts of control panel after alarm has been initiated from particular zone that is designated to control HVAC units. Disconnect switch shall be supervised.
4. Designated HVAC Units: Controlled by addressable output modules programmed to activate according to areas to be covered.

B. Electromagnetic Door Holders, Model FM-900 Series:
1. Hold fire and smoke barrier doors open until released by alarm.

2. Holding Power: Approximately 35 pounds (15.9-kg).
3. Offer fail-safe operation.
4. Capable of operation on 12 VDC, 24 VAC, 24 VDC, or 120 VAC interchangeably without need of configuration.
5. Holders: Release through contacts of control panel after alarm has been initiated from any zone.
6. Circuits: Separately fused.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install the fire alarm system in accordance with manufacturer's instructions.

B. Coordinate the installation of fire alarm equipment with the manufacturer or authorized distributor. OMNI SECURITY SYSTEMS INC. 208 745 1020

C. Install conductors and wiring according to the manufacturer's recommendations.

D. Coordinate with the supplier regarding correct wiring procedures before installing conduits or conductors.

E. Install system components in accordance with appropriate NFPA Standards, specified requirements, National Electrical Code, local and state regulations, requirements of fire department, and other applicable authorities having jurisdiction (AHJ).

3.2 FIELD QUALITY CONTROL

A. Final Test: Perform the following before the installation shall be considered completed and acceptable by awarding authority:
1. Operate by the Contractor's job foreman, in presence of a representative of the manufacturer, a representative of the Owner, and fire department, every installed device to verify proper operation and correct annunciation at control panel.
2. Perform at least one half of all tests on battery standby power.
3. Where application of heat would destroy any detector, it may be manually activated.
4. Open signaling line circuits and notification appliance circuits in at least 2 locations to verify the presence of supervision.
5. When testing has been completed to satisfaction of both Contractor's job foreman and representatives of the manufacturer and ~~the~~ Owner, a notarized letter co-signed by each attesting to the satisfactory completion of said testing shall be forwarded to the Owner and fire department.
6. Leave the fire alarm system in proper working order, and, without additional expense to the Owner, replace defective materials and equipment provided under this contract within 1 year (365 days) from date of final acceptance by awarding authority.
7. Notify the fire department before the final test in accordance with local requirements.

END OF SECTION

SECTION 26 6412 – INTELLIGENT VESDA AIR SAMPLING SYSTEM

PART 1 GENERAL

Scope

This document provides specification details of the Intelligent VESDA-E VEP Air-sampling Smoke Detection (ASD) products to assist in their installation and commissioning. Intelligent VESDA-E VEP range provides a single pipe and four pipe products. Intelligent VESDA VEP ASD is referred to as ASD throughout this document.

ASD System Information

A. A Very Early Warning Fire Detection System like the Intelligent VESDA-E VEP System shall be installed throughout the areas nominated on the drawings.

B. The ASD system shall consist of highly sensitive short wavelength LASER-based Smoke Detectors with aspirators connected to networks of sampling pipes.

C. When required, an optional Display unit may be provided to monitor each ASD detector.

Approvals and Standards

The ASD must be of a type submitted to, tested, approved, and/or listed to the Standards mentioned below by a Nationally Recognized Testing Laboratory (NRTL):

A. UL268 and UL268A: UL (Underwriters Laboratories Inc), USA

B. UL268: ULC (Underwriters Laboratories Canada), Canada

C. Category 7259: CSFM (California State Fire Marshal), USA

Codes, Standards or Regulations

The ASD shall be installed to comply with one or more of the following codes or standards:

A. NFPA Standards, US

B. NEC Standards, US

C. Fire Industry Association (FIA), Code of Practice for Design, Installation, Commissioning & Maintenance of Aspirating Smoke Detector (ASD) Systems

D. NZS 4512 : 2003

E. Local codes and standards

Quality Assurance

A. Manufacturer

1. The manufacturer shall have a minimum of 35 years production experience in the design and manufacture of high sensitivity air sampling smoke detection systems.
2. The manufacturer shall be certified as meeting ISO 9001:2008 for manufacturing.

B. Equipment Supplier

1. The equipment supplier shall be authorized trained by the manufacturer to calculate/design, install, test and maintain the ASD system.

2. The equipment supplier shall be able to produce a certificate of training from the manufacturer.

C. Installer

1. The equipment installer shall be authorized and trained by the manufacturer and shall have the ability to design a system based on code requirements.
2. The installer shall be capable of providing calculations, design, and testing documents upon request.

D. Warranty

1. The manufacturer shall guarantee the product by warranty for a period of two years.
2. Any damage to the ASD due to poor handling or operating outside its operation limits will void its warranty.
3. The installation and programming of the ASD shall be completed by a factory-trained installer.

E. Training

1. The manufacturer and their representatives shall make available adequate accreditation training to all personnel involved in the supply, installation, commissioning, operation and maintenance of the ASD system.

Documentation

The following documentation shall be supplied.

A. Product data and site drawings shall be submitted and shall include pipe layout, operational calculations and performance criteria. Tools such as ASPIRE may be used to generate this material.

B. A copy of the manufacturer's installation, operation and maintenance manuals shall be supplied upon completion of the installation.

C. System commissioning data shall be supplied (in a format recommended by the manufacturer and per the instructions provided by the manufacturer) within 30 days of completion of the installation.

PART 2 SYSTEM DESCRIPTION

ASD System Features

F. The ASD system shall:

1. Consist of a highly sensitive, short wavelength LASER-based, particle imaging and light scattering smoke detector, aspirator, and filter.
2. Be modular, with each detector having a display with indicator LEDs and a reset control button and/or optionally with a LCD Display showing detector status including fault categories and smoke level.
3. Consist of an air sampling pipe network to transport air to the detection system, supported by calculations from a computer-based design modelling tool.
4. Support optional equipment like dedicated graphics package such as VSM.
5. Be tested and approved to cover up to 1,000 sq. m. (10,760 sq. ft.) for the single pipe VEP, or up to 2,000 sq. m. (21,520 sq. ft.) for four pipe VEP.
1. Be approved to provide Very Early Warning Fire Detection (VEWFD) / Class A, Early Warning Fire Detection (EWFD) / Class B and Standard Fire Detection (SFD) / Class C.

2. Provide four output levels corresponding to Alert, Action, Fire 1 and Fire 2. These levels shall be programmable and able to be set at sensitivities ranging from 0.005-20% obs/m (0.0016–6.25% obs/ft) with a resolution of 0.0002% obs/m (0.00006%obs/ft).
3. Report any fault on the detector by direct communications on the SLC loop of a fire alarm control panel or a monitoring software tool running on a PC or hand-held device such as a tablet or smart phone.
4. Be self-monitoring for filter contamination.
5. Incorporate a flow sensor in each pipe inlet and provide staged airflow faults against flow fault thresholds that may be determined and set.

Detection Technology

A. Light Source

1. The Detection Chamber shall employ a highly sensitive, short wavelength LASER light source.

B. Detection Method

The detection sensing method shall use both a two-dimensional image sensing array and at least five (5) photodiodes spaced inside the chamber to detect various scattering angles.

The output data from the sensing method shall include particle size and mass scattering measures,

A particle counting method shall be employed for the purposes of:

1. Minimizing the effect of large dust particles on the true smoke obscuration.
2. Monitoring contamination of the filter (dust & dirt, etc.) to automatically notify the user when maintenance is required.

C. Absolute Calibration

The detection chamber shall be factory calibrated and shall not use adaptive algorithms or drift compensation techniques to adjust the sensitivity or detector output from that established during commissioning.

Intelligent Fire Alarm Control Panel Connectivity

A. The ASD shall be capable of connection to an E3 Series or S3 Series Fire Alarm Control Panel (FACP) via a Signaling Line Circuit (SLC) using the communications protocol native to the system, without the use of any additional hardware.
B. The FACP shall be capable of monitoring and annunciating up to four smoke event thresholds on the ASD and several trouble conditions.
C. Each event threshold shall be capable of being assigned a discrete type ID at the FACP, including Aspiration Alarm, Aspiration Pre-Alarm, Aspiration Supervisory, Aspiration Non-Fire, and Aspiration Air Reference, which will determine how the event will be annunciated at the FACP.
D. The FACP shall support flexible system programming for all event levels, and shall be capable of simultaneous activation of multiple event levels.
E. The following operations shall be able to be performed on the ASD via the FACP:
    1. Disable/enable
    2. Reset airflow baseline
F. Detector trouble conditions annunciated at the FACP shall include indications for:

1. Low air flow
2. High air flow
3. Configuration (programming) fault
4. Device in service mode
5. Communications loss
6. Time lost or not set
7. Aspiration fault
8. Filter fault
9. Detector fault
10. Detector initializing warning
11. Power fault.

Secondary Communications

A. Detectors shall provide inbuilt secondary communications for monitoring and configuration using the following physical media:
   1. USB
   2. 10/100 BaseT Ethernet
   3. WiFi (802.11b/g)

PART 3 PRODUCTS

Manufacturer

A. Air Sampling Smoke Detection System: Acceptable Manufacturer.
   1. Honeywell Gamewell FCI, 12 Clintonville Road, Northford CT 06118, USA

Manufactured Units(s)

The Intelligent VESDA-E VEP ASD system can be supplied in the following configurations:

Part Number	Description
VEP-A00-1P-GW	VESDA-E VEP with LEDs, 1 pipe, coverage area 1,000 sq. m. (10,760 sq. ft.)
VEP-A00-P-GW	VESDA-E VEP with LEDs, 4 pipes, coverage area 2,000 sq. m. (21,520 sq. ft.)
VEP-A10-P-GW	VESDA-E VEP with LEDs and 3.5” LCD, coverage area 2,000 sq. m. (21,520 sq. ft.)

Detector Features

A. The detector shall incorporate the following features.
   1. The Detector, Filter, Aspirator and Relay Outputs shall be housed in a plastic enclosure and shall be arranged in such a way that air is drawn from the fire risk area by an aspirator and a sample passed through a sample filter and detection chamber.
   2. The Detector shall employ a short wavelength LASER light source and incorporate particle imaging and light scattering using a two-dimensional image sensing array and scatter pattern measurement using photodiodes.

3. The detector shall have an obscuration sensitivity range of 0.005-20% obs/m (0.0016–6.25% obs/ft) with a resolution of 0.0002%obs/m (0.00006%obs/ft).
4. The Detector shall have four independent field programmable smoke alarm thresholds across its sensitivity range with adjustable time delays for each threshold between 0-60 seconds.
5. The detector shall employ modular construction allowing field replacement of the filter, chamber and aspirator.
6. The detector shall allow future hardware expansion via stackable modules placed either on top or below the detector.
7. The Detector shall also incorporate facilities to transmit the following fault categories:
    a) Detector
    b) Air flow
    c) Filter
    d) System
    e) Zone
    f) Network
    g) Power
    h) Chamber
    i) Module
8. The single and four pipe VEP shall include one and four sample pipe inlets respectively, and must contain a flow sensor for each pipe inlet. Both Minor and Urgent flow faults can be reported
9. The flow sensors in each pipe shall use ultrasonic flow sensing technology.
10. The filter shall be a disposable filter cartridge and shall be capable of filtering particles in excess of 20 microns from the air sample.
11. A second filter shall be ultrafine, removing more than 99% of contaminant particles of 0.3microns or larger, to provide a clean air barrier around the detector’s optics to prevent contamination and increased service life.
12. The aspirator shall be a purpose-designed impeller air pump. With applicable transport time as per the local codes:
    a) The single pipe VEP shall allow a linear pipe length of up to 100m (328ft) and branched pipe networks with a total length of up to 130m (427ft).
    b) The four pipe VEP shall allow a linear pipe length of up to 280m (919ft) and branched pipe networks with a total length of up to 560m (1,837ft).
13. The detector must contain seven relays for alarm and fault conditions. The relays shall be preconfigured to the required functions. The relays must be rated at 2 Amp at 30 VDC.
14. The detector shall have built-in event and smoke logging. It shall store smoke levels, alarm conditions, operator actions and faults. The date and time of each event shall be recorded. Each detector (zone) shall allow storage of up to 20,000 events and does not require the presence of a display in order to do so.
15. The detector shall incorporate a galvanically isolated General Purpose Input (GPI) which activates in the event of an applied voltage of 5 to 50VDC and assigned to Reset function.
16. The detector shall incorporate a monitored voltage-free input assigned to Reset function, to be

used with isolated relay contacts, which is supervised using a 10k Ohm terminating resistor.

Displays

A. Both single and four pipe VEP detectors shall provide an LED user interface with a button to silence the buzzer; four LEDs to indicate Alert, Action, Fire 1 and Fire2 alarm events; one trouble LED; one disable / standby LED; and power On / Off indication. All LEDs shall have appropriate symbols without any text. In addition to the LED user interface, the four pipe VEP detector shall optionally provide an LCD user interface with following characteristics:

1. Color LCD touch screen user interface with a bar graph display.
2. Alarm threshold indicators for Alert, Action and Fire 1.
3. Fault icons indicating these fault categories: detector, chamber, filter, flow, aspirator, network, power and external module where applicable.
4. A touch screen interface to allow scrolling through status screens on the LCD.

Monitoring

A. The system shall have available software to monitor all devices connected to a system. Such software shall be provided to run on:

1. PC-based, Android-based or iOS-based hardware
2. A dedicated monitoring device mounted remotely from any detector

Configuration and Programming

A. Configuration and programming may be performed using a Windows® application such as VSC running on a PC connected by direct connection to a detector or through Ethernet network. Configuration and programming tool shall support the following features at a minimum:

1. Programming of detector FACP SLC address.
2. Viewing of the status of any device in the system.
3. Adjustment of the alarm thresholds of a nominated detector.
4. Setting of Day/Night, weekend and holiday sensitivity threshold settings.
5. Initiation of AutoLearn™, to automatically configure the detector's smoke threshold settings to suit the environment.
6. Multi-level password control.
7. Programmable aspirator speed control for the four pipe VEP.
8. Programmable maintenance intervals.
9. Testing of relays assigned to a specific zone to aid commissioning.

Security

A. The following security measures shall be provided.

1. Connectivity via wireless access shall support WPA2 encryption with an encryption key.
2. Access to a detector via Ethernet or WiFi shall be protected using a detector password specific to the detector and in addition to the WiFi encryption key.
3. All software connecting to a detector or peripheral shall support an authentication protocol to verify that it has been supplied by the manufacturer of the system.

Upgrading

A. There shall be provision for field upgrading the firmware in the system using a USB memory key connected directly to the detector, avoiding the need for a separate PC for this function.

PART 4 APPLICATION

Detection Alarm Levels

A. The system shall have four (4) independently programmable alarm thresholds. The four alarm levels may be used as follows:

1 Alarm Level 1 (Alert) - Activate a visual and audible alarm in the fire risk area.

2 Alarm Level 2 (Action) - Activate the electrical/electronic equipment shutdown relay and activate visual and audible alarms in the Security Office or other appropriate location.

3 Alarm Level 3 (Fire 1) - Initiate an alarm condition in the Fire Alarm Control Panel to call the Fire Brigade and activate all warning systems.

4 Alarm Level 4 (Fire 2) - Activate a suppression system and/or other suitable countermeasures.

Initial Detection Alarm Settings

A. Initial settings for the alarm levels shall be determined by the requirements of the protected environment. However, the setting for Fire 1 (Alarm Level 3) shall always appear as 100% on the bar graph scale. Default settings of the unit shall be:

1. Alarm Level 1 (Alert) 0.08% obs/m (0.025% obs/ft)
2. Alarm Level 2 (Action) 0.14% obs/m (0.0448% obs/ft)
3. Alarm Level 3 (Fire 1) 0.20% obs/m (0.0625% obs/ft)
4. Alarm Level 4 (Fire 2) 2.0% obs/m (0.625% obs/ft)

B. Initial (factory default) settings for the alarm/fault delays

1. Alarm Level 1 (Alert) 10 seconds
2. Alarm Level 2 (Action) 10 seconds
3. Alarm Level 3 (Fire 1) 10 seconds
4. Alarm Level 4 (Fire 2) 10 seconds
5. Air Flow Fault 5 seconds

Power Supply and Batteries

A. The system shall be powered from a regulated supply of nominally 24V DC. The battery charger and battery shall comply with the relevant Codes, Standards or Regulations. Typically 24 hours standby battery backup is required followed by 30 minutes in an alarm condition. Local Power Supply Standards that may apply:

1. UL 1481 Listed - provided the power supply and standby batteries have been appropriately sized / rated to accommodate the system's power requirements.
2. US Telecommunication Central Office Power Supply - the system shall operate on negative 48 VDC (provided continuously from the telephone central office power source) converted

to 24VDC.

Sampling Pipe Design

Sampling Pipe. The sampling pipe shall comply with the following requirements.

1. The sampling pipe shall be smooth bore. Normally, pipe with an outside diameter (OD) of 25mm or 1.05" and internal diameter (ID) of 21mm or ¾" should be used.
2. The pipe material should be suitable for the environment in which it is installed, or should be the material as required by the specifying body (e.g. in the US, VESDA pipe material shall be UL 1887 Plenum rated CPVC).
3. All joints in the sampling pipe must be air tight and made by using solvent cement, except at entry to the detector.
4. The pipe shall be identified as Air Sampling/Aspirating Smoke Detector Pipe (or similar wording) along its entire length at regular intervals not exceeding the manufacturer's recommendation or that of local codes and standards.
5. All piping should be supported at centers of the lesser of 1.5m (5ft) apart or that specified by local codes or standards.
6. The end of each trunk or branch pipe shall be fitted with an end-cap and made air-tight by using solvent cement. Use of a hole in the end-cap will be dependent on the network design (see ASPIRE calculations).

Sampling Holes. The sampling holes shall comply with the following requirements.

1. Sampling holes shall not be separated by more than the maximum distance allowed for conventional point detectors as specified in the local codes and standards. Intervals may vary according to calculations. For FIA the maximum allowable distance is 10.6m. For NFPA the maximum allowable distance is 30ft.
2. Each sampling hole shall be identified in accordance with Codes or Standards.
3. Consideration shall be given to the manufacturer's recommendations and standards in relation to the number of sampling holes and the distance of the sampling holes from the ceiling or roof structure and forced ventilation systems.
4. Sampling hole size shall be as specified by ASPIRE calculations.

PART 5 EXECUTION

System Installation

The contractor shall install the entire detection system in accordance with the national and local codes and manufacturer's SLC Product Manual and System Design Manual.

ASD Detector Mounting

1 The detector shall be capable of vertical mounting with sample air inlet port(s) directed up toward the ceiling (normal mounting) or down towards the floor (inverted mounting).

2 The detector shall be capable of mounting directly to a wall using screw fasteners or by using a stainless steel mounting bracket such as the VSP-960.

3 Where a mounting bracket is used, it shall be marked or engraved with the correct locations of inlet port sample pipe(s) and cutting guide and electrical conduit locations.

The Capillary Sampling Network

The capillary sampling network shall comply with the following requirements:

1. Where false ceilings are installed, the sampling pipe shall be installed above the ceiling, and Capillary Sampling Points shall be installed on the ceiling and connected by means of a capillary tube.
2. The typical internal diameter of the capillary tube shall be 5mm or 3/8", the maximum length of the capillary tube shall be 8m (26 ft) unless otherwise specified in consultation with the manufacturer.
3. The Capillary tube shall terminate at a Ceiling Sampling Point specifically designed and approved by the manufacturer. The performance characteristics of the Sampling Points shall be taken into account during the system design.

Air Sampling Pipe Network Calculations

Air Sampling Pipe Network Calculations shall be provided by Air Sampling Pipe Network modelling program such as ASPIRE. Pipe network calculations shall be supplied with the proposed pipe layout design to indicate the following performance criteria:

Transport Time

Wherever possible the transport time (i.e. the time taken by smoke sampled to reach the detector) for the least favorable sampling point shall be less than 60 seconds for open hole sampling and less than 90 seconds for capillary tubes. Longer transport times may be tolerated where long pipe runs are required and local codes and standards permit.

Local codes and standards may also apply. For example:

1.	NFPA 72	The Americas	120 Seconds
2.	NFPA 76	The Americas	60 Second

When used within the EU the maximum transport times shall be in accordance with the limits approved under EN54-20.

Balance %

1. The balance is the ratio of lowest sampling hole flow rate to the highest, expressed as a percentage. The sampling hole balance for the pipe shall not be less than 70% as indicated by ASPIRE.
2. Tools such as ASPIRE calculate the balance for a protected area as part of the outputs for modelled pipe sampling network.

System Commissioning

Detector commissioning

The detector shall incorporate a push button to invoke self-learning modes to simplify commissioning including:

1. A learning mode that ensures the best selection of appropriate alarm thresholds during the commissioning process
2. A learning mode that determines the optimum flow fault thresholds based on environmentally induced flow changes during the commissioning process.

Additionally, there shall be a provision for a PC software tool to configure all user modifiable parameters of the all system devices.

Commissioning Tests

1 The contractor shall allow for the manufacturer's representative to attend commissioning of the entire installation in the presence of the owner and/or their representative.

2 All necessary instrumentation, equipment, materials and labor shall be provided by the Contractor.

3 The Contractor shall record all tests and system configuration and a copy of these results shall be retained on site in the System Log Book.

System Checks

Visually check all pipes to ensure that all joints, fittings, bends, sampling points, etc., comply with the Specification.

Check the system to ensure the following features are operational and programmed in accordance with the specification.

1. Alarm threshold levels (for both day and night settings),
2. Time delays,
3. Pipes in use for the four pipe VEP,
4. Detector SLC address,
5. Clock time and date synchronized with FACP,
6. Air flow fault thresholds,
7. Buzzer acknowledge button operable,
8. Touch screen operable where applicable,
9. Referencing set from the FACP
10. Units set to U.S./S.I. (for US only) or metric for other regions
11. Check to ensure that all ancillary warning devices operate as specified.
12. Check interconnection with Fire Alarm Control Panel to ensure correct operation and reporting on the correct SLC address.

Final Tests

The contractor shall:

1. Introduce smoke into the detector assembly to provide a basic Go / No-Go functional test.
2. Verify that the transport time from the farthest sampling hole does not exceed the local code requirements using a smoke signal rise displayed in VSC / VSM or the LCD display.
3. Activate the appropriate Fire Alarm zones and advise all concerned that the system is fully operational. Fill out the logbook and commissioning report accordingly.

Maintenance and Service

Sample Filter

1. The detector shall incorporate a replaceable cartridge-style filter such as the VSP-962 to remove large contaminants from the sampled air.
2. The filter shall be accessible by opening the cover for the field wiring terminal area.
3. Once accessible, the filter shall be removable and replaceable by hand without the need of a tool.

4. The filter shall incorporate an electronic circuit which identifies it uniquely and maintains status information such as the filter remaining life.

Spare Parts

1. The detector shall incorporate a replaceable Aspirator such as the VSP-963. The manufacturer's instructions for replacing the Aspirator shall be followed.
2. The detector shall incorporate a replaceable Chamber Assembly such as the VSP-964. The manufacturer's instructions for replacing the Chamber Assembly shall be followed.
3. The detector shall incorporate a replaceable Sampling Module such as the VSP-965. The manufacturer's instructions for replacing the Sampling Module shall be followed.
4. The detector shall incorporate replaceable Front Covers such as the VSP-968 (Front Cover with LEDs) and VSP-969 (Front Cover with LCD). The manufacturer's instructions for replacing the Front Cover shall be followed.