SPECIFICATIONS

FOR:

Twin Falls County Jail

PHASE 1B

Twin Falls, IDAHO

Laughlin Ricks Architecture

architecture/planning

134 3rd Avenue East * Twin Falls, Idaho 83301

(208) 736-8050

TABLE OF CONTENTS

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: 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 for Architect and Owner review.

1.4 APPLICATIONS FOR PAYMENT

A. Submit each application for Owner and Architect review.

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

C. Payment Period: Monthly. As approved by Owner.

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: As approved by Owner and 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 Architect and 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 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 a digital copy.

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

1.12 SHOP DRAWINGS

A. Shop Drawings for Review:

1. Submitted to Architect and 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, distribute in accordance with the SUBMITTAL PROCEDURES article above and for record documents.

B. Shop Drawings for Information:

1. Submitted for the Architect's and Owners benefit.

C. Submit a digital copy for Owner records

1.13 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 Architect and 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.

1.14 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.

1.15 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.

1.16 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.

1.17 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.

1.18 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.

1.19 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.

1.20 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.

1.21 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.

1.22 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.

1.23 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

1.24 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.

1.25 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.

1.26 TEMPORARY WATER SERVICE

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

1.27 TEMPORARY SANITARY FACILITIES

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

B. Contractor shall maintain in clean and sanitary condition.

1.28 WATER CONTROL

A. Contractor shall provide water to control dust.

1.29 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.

1.30 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.

1.31 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.

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.

1.32 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.

1.33 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.

1.34 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 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.

1.35 TRANSPORTATION, HANDLING, STORAGE AND PROTECTION

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

1.36 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.

1.37 SUBSTITUTIONS

A. Owner will consider requests for Substitutions.

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

C. In making request for Substitution, the 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.

1.38 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.

1.39 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.

1.40 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.

1.41 OPPERATIONS, TERMINATION AND REMOVAL:

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

C. 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.

D. 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.

1.42 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.

1.43 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.

1.44 ADJUSTING

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

1.45 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.

1.46 OPERATION AND MAINTENANCE DATA

A. Submit digital copy and 1 hard copy prior to final inspection.

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.

1.47 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.

1.48 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 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. Excavate as required 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 03 3000 CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Provide all labor, materials, equipment, fabrication, incidentals, transportation, placing and supervision necessary to complete all cast-in-place concrete work, its finishing, and all related work called for by the Contract Drawings and/or Specifications, or reasonably inferable from either or both, as needed for a complete and proper installation. Including, but not limited to, the following described items:

B. Concrete formwork.

C. Concrete for composite floor construction.

D. Concrete floors and slabs on grade.

E. Concrete footings, foundation walls

F. Concrete reinforcement.

G. Joint devices associated with concrete work.

H. Miscellaneous concrete elements, including equipment pads, light pole bases, flagpole bases, thrust blocks, and bollards.

I. Underslab Vapor Retarder

J. Waterproofing Admixture .

K. Water Stops

L. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Reinforcing, refer to contract documents.

B. Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

C. Divisions 21, 22, 23: Mechanical items for casting into concrete.

D. Division 26: Electrical items for casting into concrete.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1. Inform/invite Architect & Engineer

2. In areas receiving Special Concrete Floor Finishes coordinate with Finish Manufacturer and Installer for special requirements.
3. Topics for discussion may include: design mixture, placement schedule, placement methods, tolerances, curing method, jointing, and slab protection.
4. Minutes of the meeting shall be recorded, typed, and distributed by the General Contractor to all concerned parties, including but not limited to the Owner's Representative, Architect, and all attendees within 5 days of the meeting.

1.04 SUBMITTALS

A. See Section 010010 - Submittals.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives and special concrete finishes.

C. Mix Design: Submit proposed concrete mix design.
1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.

D. Shop Drawings: Submit plans showing locations of construction and control joints for Engineer/Owner review.

E. Samples: Submit samples of underslab vapor retarder to be used.

F. Samples: Submit two, 12 inch long samples of construction joint devices.

G. Test Reports: Submit report for each test or series of tests specified.

H. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

I. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.06 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.
1. Maintain one copy of each document on site.

B. Follow recommendations of ACI PRC-305 when concreting during hot weather.

C. Follow recommendations of ACI PRC-306 when concreting during cold weather.

D. Vapor Barrier Installation: Conduct pre-installation conference and installation review prior to concrete placement, either in-person or digitally.

1.07 WARRANTY

A. See Section 010010 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 FORMWORK

A. Formwork Design and Construction: Comply with guidelines of ACI PRC-347 to provide formwork that will produce concrete complying with tolerances of ACI SPEC-117.

B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.

C. Form Facing for Exposed Finish Concrete: Contractor 's choice of materials that will provide smooth, stain-free final appearance.

1. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
2. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

2.02 REINFORCEMENT MATERIALS

A. Comply with requirements of Structural Contract Documents.

2.03 CONCRETE MATERIALS

A. Cement: Portland Cement ASTM C 585 Typle 1L.
1. Acquire cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C33/C33M.
1. Acquire aggregates for entire project from same source.

C. Fly Ash: ASTM C618, Class F.

D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 ADMIXTURES

A. Chemical Admixture:
1. Manufacturers:
a. Sika Corporation: www.sikaconstruction.com
b. GCP Applied Technologies; www.gcpat.com
c. BASF Chemical Company: www.basf-admixtures.com
d. Euclid Chemical Company: www.euclidchemical.com
e. Substitutions: See Section 010010 - Product Requirements.

B. Do not use chemicals that will result in soluble chloride ions in excess of 0.05 percent by weight of cement.

C. Verify that admixtures are compatible.

D. Air Entrainment Admixture: ASTM C260/C260M.
1. Certification attesting to compliance with ASTM C260/C260M shall be furnished.
2. All exterior concrete flatwork, curbs and gutters, and catch basins shall have an airentraining agent added which will yield entrainment.

E. Water Reducing (set controlling) Admixtures:
1. Concrete shall be adjusted to produce the required rate of hardening for varied climatic and job site conditions.
2. Admixture shall not reduce the amount of cement required. Amounts as accepted by Architect/Engineer. Do not use calcium chloride or admixtures that contain calcium chloride.
3. Field Service, when requested, a qualified concrete technician, employed by the manufacturer, shall be available to assist in proportioning concrete materials for optimum use, to advise on proper use of the admixture and adjustment of concrete mix proportions to meet the jobsite and climatic conditions.
4. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
   a. Approval in writing required from Engineer.
5. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.
   a. Under 40 degrees F ambient temperature - Accelerate (Approval in writing required from Engineer).
6. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
   a. Over 80 degrees F ambient temperature - Retard.
7. Water Reducing Admixture: ASTM C494/C494M Type A.
   a. Between 40 degrees F and 80 degrees F ambient temperature - Normal rate of hardening.
8. Shrinkage Reducing Admixture:
   a. ASTM C494/C494M, Type S.
   b. Products:
      1) GCP Applied Technologies; Eclipse 4500: www.gcpat.com/#sle.
      2) Substitutions: See Section 010010 - Product Requirements.
9. Waterproofing Admixture: Admixture formulated to reduce permeability to liquid water, with no adverse effect on concrete properties.
   a. Admixture Composition: Crystalline, functioning by growth of crystals in capillary pores.
   b. Permeability of Cured Concrete: No measurable leakage when tested in accordance with COE CRD-C 48 at 200 psi; provide test reports.
   c. Products:
      1) Master Builders Solutions, Masterlife 300C
      2) Xypex Chemical Corporation; XYPEX Admix C-500: www.xypex.com/#sle.

2.05 ACCESSORY MATERIALS

A. If during construction ground water is discovered within 1.3 m of footing or slab depth, an Underslab waterproofing system will be required in lieu of Underslab vapor barrier. Consult Architect by RFI.

B. Underslab Vapor Barrier: 15 mil high performance multi-layered virgin polyolefin, complying with ASTM E1745, Class A ; stated by manufacturer as suitable for installation in contact with

soil or granular fill under concrete slabs.Maintain water vapor permeance less than 0.01 perms before and after mandatory conditioning testing per ASTM E1745 Section 7.1.

1. Single ply polyethylene is prohibited.
2. To be installed under all Slabs on Grade
3. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations in vapor barrier.
4. Products:
    a. GCP: Flouroprufe
    b. Stego Industries, LLC: www.stegoindustries.com.
    c. Fortifiber; Product - :Moistop Ultra 15": www.fortifiber.com.
    d. Raven Industries; VaporBlock 15 mil: www.ravenind.com.
    e. Substitutions: Not permitted.

C. Self-Leveling Cementitious Concrete Floor Topping: as specified on contract drawings

2.06 BONDING AND JOINTING PRODUCTS

A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.

B. Epoxy Bonding System:
1. Complying with ASTM C881/C881M and of Type required for specific application and moisture insensitive.

C. Waterstops: Rubber, complying with COE CRD-C 513.
1. Configuration: As indicated on drawings.
2. Size: As indicated on drawings.

D. Waterstops: PVC, complying with COE CRD-C 572.
1. Configuration: As indicated on drawings.
2. Size: As indicated on drawings.

E. Waterstops: Hydrophilic rubber waterstop, complying with the following:
1. Physical Properties:
    a. Hydrostatic Head Resistance: 231 feet (70 m).
    b. Wet-Dry Cycling (25 cycles @ 231 feet (70 m)): No Effect.
    c. Adhesion to Concrete using Manufacturers Adhesive: Excellent.
2. Adhesive: As recommended by Manufacturer.
3. Products:
    a. ADCOR 500S manufactured by GCP Applied Technologies; www.gcpat.com
    b. Swellsill 2010 TPR manufactured by GCP...
    c. Substitutions: See Section 010010 - Product Requirements.

F. Slab Isolation Joint Filler: 1/2-inch thick, height equal to slab thickness, with removable top section forming 1/2-inch deep sealant pocket after removal.
1. Material: ASTM D1751, cellulose fiber.

2.07 CONCRETE MIX DESIGN

A. General Concrete Mix Requirements:

1. Design of concrete mixes, including recommended amounts of admixture and water to be used in the mixes, shall be obtained by the Contractor from a qualified independent testing laboratory or agency, or from a mill or ready-mix plant, properly equipped to design concrete mixes. The design shall be performed and certified by a professional engineer currently registered as a civil or structural engineer Idaho. The laboratory, agency, mill, or ready-mix plant shall meet applicable requirements of ASTM E329. Costs of obtaining the mix designs shall be paid by the Contractor.
2. Selection of mix proportions shall conform to the applicable requirements of ACI 211.1 and ACI 211.2. Concrete shall comply with ACI 301 and ACI 318, as applicable. Ensure that mix designs will produce concrete suited for proper placement and finishing.
3. Mix designs shall indicate brands, types, and quantities of admixtures included. If fly ash is proposed, it shall be identified as such (for example, “fly ash”), and the mix design shall identify the percentage of cement replacement.
4. If concrete is to be placed by pumping, concrete mixes shall be designed in accordance with the applicable requirements of ACI 304R and ACI 304.2R, and shall include strengths and slumps.
5. Mix designs shall indicate location of each mix within the structure.
6. Mix designs with replacement of portland cement by weight with fly ash shall not exceed 25 percent.
7. Mix design for architectural concrete and formed concrete which will be exposed to the public in the finished work shall include 10 percent minimum replacement of the cement with fly ash along with a plasticizing admixture, conforming with ASTM C1017, to provide a dense and plastic concrete mix which completely fills out the forms and form detail without air holes and rock pockets.
8. Mix design for mass concrete shall have a percentage of fly ash replacement of cement by weight to reduce the amount of heat generated during heat of hydration.
9. Mix designs of exterior concrete shall include air entrainment by total volume of concrete: 4 1/2 percent (plus or minus 1 percent).
10. Aggregates shall conform to Standard Specifications for Concrete Aggregates ASTM C33.
11. Calcium chloride or other materials containing chlorides are corrosive to reinforcing steel and shall not be used as an admixture in post-tensioned concrete.
12. Concrete Strength: Establish required average strength for concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
13. Drying Shrinkage of Concrete: Establish required “Drying Shrinkage” for concrete on thebasis of field experience or trial mixtures, as specified in ASTM C157and ASTM C490.

B. Mix designs

1. As indicated on structural drawings.

2.08 MIXING

A. Concrete shall be ready-mixed batched, mixed, and transported in accordance with ASTM C94/C94M, "Specifications For Ready-Mixed Concrete," unless a higher standard is called for.

1. Plant equipment and facilities shall conform to the "Checklist For Certification of Ready Mixed Concrete Production Facilities" of the National Ready-Mixed Concrete Association.

B. A delivery ticket is required for each load of concrete and shall show the following information:
   1. Number of cubic yards.
   2. The exact amount of cement and fly ash (if allowed); this can be indicated either by weight or quantity.
   3. The amount of mixing water including free moisture in aggregates; this can be indicated either by weight or quantity.
   4. Amount of slump in inches.
   5. Type of cement.
   6. Amount of air entrainment when delivered at job site.
   7. Do aggregates meet ASTM specified - yes or no. Indicate maximum size aggregate.
   8. Amount and brand (or ASTM) of admixture other than air entraining agent (if any) previously accepted in writing by Engineer.

C. These tickets shall be given to the Job Superintendent or Foreman and they shall see that they are delivered to the Architect and Testing Contractor once a week. Note exact location of concrete on job.

D. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

A. Verify that forms are clean and free of rust before applying release agent.

B. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

C. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning with steel brush and applying bonding agent in accordance with manufacturer's written instructions.
   1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
   2. Use latex bonding agent only for non-load-bearing applications.

D. Interior Slabs on Grade:
   1. Level and compact base material
   2. Install vapor barrier under all interior slabs on grade in accordance with ASTM E1643.
   3. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer’s recommended products and follow manufacturer’s written instructions.
   4. Extend vapor barrier to the perimeter of the slab. If practical, terminate at the top of slab, otherwise (a) at point acceptable to the structural engineer or (b) where

obstructed by impediments, such as rebar, dowels, waterstops, or any other site condition requiring early termination of the vapor barrier.

5. At point of termination, seal vapor barrier to foundation wall, grade beam, or slab itself. If sealing to foundation wall use double-sided perimeter sealing tape as recommended by manufacturer. When sealing to placed slab, use textured tape engineered to bond to newly placed concrete slabs per manufacturer's instructions.
6. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.
   a. Or Waterproofing as required (see 2.05 above).
7. Repair damaged vapor barrier before covering. Avoid use of non-permanent stakes driven through vapor barrier.

E. Subgrade Preparation: Provide final check of finish grading before reinforcing is placed, and make any required adjustments. Provide ground surfaces at optimum moisture content (as determined by Soils Engineer).

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Fabricate and handle epoxy-coated reinforcing in accordance with ASTM D3963/D3963M.

B. Comply with requirements of ACI SPEC-301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

C. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

D. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI PRC-304.

B. Place concrete for floor slabs in accordance with ACI PRC-302.1.

C. At locations shown on architectural and/or mechanical drawings, provide 6 inch (150 mm) high concrete housekeeping pads where indicated for equipment.

D. Where floors are indicated to be recessed for topping slab or floor tile which also slope to drains - the concrete subfloor shall be sloped to provide for consistent thickness of setting bed, no exceptions.
   1. Any recessed floor which does meet the required slope will be replaced at no cost to the owner.

E. Contractor shall be aware that an Underslab Vapor Retarder will be installed and shall protect it during all concrete floor forming and installation. No screed stakes or other penetrations shall be allowed. Contractor shall also take all required precautions to prevent excess

moisture from entering the base under the vapor retarder prior to, during, and after installing the concrete slab on grade.

1. Repair underslab vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches (150 mm) and seal watertight.

F. Notify Architect not less than 24 hours prior to commencement of placement operations.

G. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

H. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

I. Place concrete continuously between pre-determined expansion, control, and construction joints.

J. Place floor slabs in checkerboard or saw cut pattern indicated.

K. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 SLAB JOINTING

A. Locate joints as indicated on the drawings.

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

C. Anchor joint fillers and devices to prevent movement during concrete placement.

D. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment, foundations, footings, stairs, manholes, sumps, and drains.

E. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 16 hours of batch time; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

F. Apply sealants in joint devices.

3.06 SEPARATE FLOOR TOPPINGS

A. Prior to placing floor topping remove deleterious material. Broom and vacuum clean.

B. Place concrete floor toppings to required lines and levels.

C. Screed toppings level, maintaining surface flatness of maximum 1:1000.

3.07 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. An independent testing agency will inspect finished slabs for compliance with specified tolerances.

B. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
   1. Exposed to View and Foot Traffic: F(F) of 20; F(L) of 15.
   2. Under Thick-Bed Tile: F(F) of 20; F(L) of 15.
   3. Under Carpeting: F(F) of 25; F(L) of 20.
   4. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25.

C. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155 (ASTM E1155M), within 48 hours after slab installation; report both composite overall values and local values for each measured section.

D. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.

E. Finish and measure surface so gap at any point between concrete surface and an unleveled freestanding 10-foot (3.05 m) long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed the following:

1. 1/8 inch (3.2 mm).

F. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.08 CONCRETE FINISHING

A. Repair surface defects immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
   1. Smooth Rubbed Finish:
      a. Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
      b. Smooth Rubbed finish is required at all exposed concrete.
      c. If due to imperfections concrete cannot be finished to architect's standard by Smooth Rubbed finish, General Contractor may opt to try Grout Cleaned Finish (below) in those areas, or reject the concrete and re-pour. Architect will review for approval of finished work.
   2. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.

D. Concrete Slabs: Finish to requirements of ACI PRC-302.1 and as follows:

1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI PRC-302.1; thick floor coverings include quarry tile, ceramic tile, and Portland cement terrazzo with full bed setting system.
2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI PRC-302.1; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
3. Exposed Surfaces: Trowel as described in ACI 302.1R; use steel-reinforced plastic trowel blades instead of steel blades to avoid black-burnish marks; exposed surfaces include all other exposed slab surfaces.

E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as shown on contract drawings.

3.09 CURING AND PROTECTION

A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
1. At ceramic/paver tile locations, DO NOT USE liquid curing compounds except removable curing compounds so as to promote enhanced tile installation.
2. In areas receiving Special Concrete Floor Finishes coordinate with Finish Manufacturer and Installer for special requirements.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
1. Normal concrete: Not less than seven days.

C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

D. Surfaces Not in Contact with Forms:
1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
3. Final Curing: Begin after initial curing but before surface is dry.
a. Curing Compound: Apply in two coats at right angles.
1) Apply curing compound at the application rate at which it meets ASTM C309.
2) If sprayed on, backroll with short nap roller.

3.10 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

D. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.

E. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.

F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.11 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances, visual appearance or specified requirements as determined by the Architect.

C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.12 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION 03 3000

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

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

E. 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.
2. 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.
3. 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.

1.5 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. 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.

D. 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.

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

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

G. 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.

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.

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. 40 gallon recovery.
b. Vacuum Motors: Two, 24V DC 3-stage, 140 CFM.

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.

4. Concrete Weighted Ultra High Speed Burnisher:

a. Weighted pad driver.
b. CARB/EPA certified.
c. Width: 27 inch.
d. Ergonomically designed to minimize vibration, noise, and user fatigue.

H. 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.

I. 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.

J. 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.

1.6 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.

1.7 CLOSEOUT SUBMITTALS

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

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

C. 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.

1.9 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.

1.10 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. Floor Flatness and Levelness Tolerances:

1. Exposed to View and Foot Traffic: F(F) of 20; F(L) of 15.
2. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25.

1.11 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.

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 034100 - PRECAST STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Precast structural concrete.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for concrete topping and placing connection anchors in concrete.
2. Section 051200 "Structural Steel Framing" for furnishing and installing connections attached to structural-steel framing.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each precast concrete mixture.

C. Shop Drawings:

1. Include member locations, plans, elevations, dimensions, shapes and sections, openings, support conditions, and types of reinforcement, including special reinforcement.
2. Detail fabrication and installation of precast structural concrete units, including connections at member ends and to adjoining construction.
3. Indicate joints, reveals, drips, chamfers, and extent and location of each surface finish.
4. Indicate separate face and backup mixture locations and thicknesses.
5. Indicate type, size, and length of welded connections by AWS standard symbols.
6. Detail loose and cast-in hardware, lifting and erection inserts, connections, and joints.
7. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
8. Include and locate openings larger than 12 inches. Where additional structural support is required, include header design.
9. Indicate location of each precast structural concrete unit by same identification mark placed on panel.
10. Indicate relationship of precast structural concrete units to adjacent materials.
11. Indicate estimated camber for precast floor slabs with concrete toppings.

12. Indicate shim sizes and grouting sequence.
13. If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.

D. Delegated Design Submittals: For precast structural concrete indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Show precast structural concrete unit types, connections, types of reinforcement, including special reinforcement, and concrete cover on reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frame from precast structural concrete.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Material Certificates: For the following:

1. Cementitious materials.
2. Reinforcing materials and prestressing tendons.
3. Admixtures.
4. Bearing pads.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm that assumes responsibility for engineering precast structural concrete units to comply with performance requirements. Responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

1. Designated as a PCI-certified plant as follows:

a. Group C, Category C3 - Prestressed Deflected Strand Structural Members

B. Required Certified Installer Qualifications: If a third-party precast concrete erector is used (and erector other than the pre-casting company), they shall be qualified and designated by PCI's Certificate of Compliance, to erect Category S2 – Complex Structural Systems.

C. Installer Qualifications: An experienced precast concrete erector who has retained a "PCI-Certified Field Auditor" to conduct a field audit of a project installed by erector in Category S2 - Complex Structural Systems and who can produce an Erectors' Post Audit Declaration, according to PCI MNL 127, "PCI Erector's Manual - Standards and Guidelines for the Erection of Precast Concrete Products."

D. Testing Agency Qualifications: Qualified according to ASTM C1077 and ASTM E329 for testing

indicated.

E. Quality-Control Standard: For manufacturing procedures, testing requirements, and quality-control recommendations for types of units required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Structural Precast Concrete Products."

F. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."

1.6 COORDINATION

A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction before starting that Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Support units during shipment on nonstaining shock-absorbing material in same position as during storage.

B. Store units with adequate bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.

1. Store units with dunnage across full width of each bearing point unless otherwise indicated.
2. Place adequate dunnage of even thickness between each unit.
3. Place stored units so identification marks are clearly visible, and units can be inspected.

C. Handle and transport units in a manner that avoids excessive stresses that cause cracking or damage.

D. Lift and support units only at designated points indicated on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design precast structural concrete units.

B. Design Standards: Comply with ACI 318 and with design recommendations in PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of precast structural concrete units indicated.

C. Fire-Resistance Calculations: Where indicated, provide precast structural concrete units whose fire resistance meets the fire resistance ratings of the contract documents and meets the prescriptive requirements of the governing code or has been calculated according to PCI MNL 124, "Design for Fire Resistance of Precast Prestressed Concrete," and is acceptable to authorities having jurisdiction.

D. Structural Performance:

1. Precast structural concrete units and connections to withstand design loads indicated within limits and under conditions indicated.
2. Provide precast structural concrete units and connections capable of withstanding the design loads shown on the contract documents.

a. Design precast structural concrete framing system and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live-load deflection, shrinkage and creep of primary building structure, and other building movements. Maintain precast structural concrete deflections within limits of ACI 318.

1) Thermal Movements: Allow for in-plane thermal movements resulting from annual ambient temperature changes of minus 40 to plus 110 deg F.

b. Fire-Resistance Rating: Select material and minimum thicknesses to provide indicated fire rating.

2.2 MOLD MATERIALS

A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that provides continuous precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.

1. Mold-Release Agent: Commercially produced form-release agent that does not bond with, stain, or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.

2.3 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A706/A706M, deformed.

C. Steel Bar Mats: ASTM A184/A184M, fabricated from ASTM A615/A615M, Grade 60 ASTM A706/A706M, deformed bars, assembled with clips.

D. Plain-Steel Welded Wire Reinforcement: ASTM A185/A185M, fabricated from as-drawn steel wire into flat sheets.

E. Deformed-Steel Welded Wire Reinforcement: ASTM A497/A497M or ASTM A1064/A1064M,

flat sheet.

F. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 116.

2.4 PRESTRESSING TENDONS

A. Pretensioning Strand: [ASTM A416/A416M, Grade 250 or Grade 270, uncoated, seven-wire or ASTM A886/A886M, Grade 270, indented, seven-wire, low-relaxation strand.

2.5 CONCRETE MATERIALS

A. Portland Cement: ASTM C150/C150M, Type 1 P, gray, unless otherwise indicated.

1. For surfaces exposed to view in finished structure, use gray or white cement, of same type, brand, and mill source.

B. Supplementary Cementitious Materials:

1. Pozzolans: ASTM C618, Class C, F, or N with maximum loss on ignition of 3 percent.
2. Metakaolin: ASTM C618, Class N.
3. Silica Fume: ASTM C1240, with optional chemical and physical requirement.
4. Ground Granulated Blast-Furnace Slag: ASTM C989, Grade 100 or 120.

C. Normal-Weight Aggregates: Except as modified by PCI MNL 116, ASTM C33/C33M, with coarse aggregates complying with Class 4S, Class 4M. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.

D. Lightweight Aggregates: Except as modified by PCI MNL 116, ASTM C330/C330M, with absorption less than 11 percent.

E. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.

F. Air-Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures.

G. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

1. Water-Reducing Admixtures: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.

4. Water-Reducing and Accelerating Admixture: ASTM C494/C494M, Type E.
5. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
6. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
7. Plasticizing Admixture: ASTM C494/C494M, Type S.
8. Plasticizing and Retarding Admixture: ASTM C494/C494M, Type S.
9. Corrosion-Inhibiting Admixture: ASTM C1582/C1582M.

2.6 STEEL CONNECTION MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A36/A36M.

B. Carbon-Steel-Headed Studs: ASTM A108, Grade 1010 through 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 116.

C. Carbon-Steel Plate: ASTM A283/A283M, Grade C.

D. Malleable-Iron Castings: ASTM A47/A47M, Grade 32510 or Grade 35028.

E. Carbon-Steel Castings: ASTM A27/A27M, Grade 60-30.

F. High-Strength, Low-Alloy Structural Steel: ASTM A572/A572M.

G. Carbon-Steel Structural Tubing: ASTM A500/A500M, Grade B or Grade C.

H. Wrought Carbon-Steel Bars: ASTM A675/A675M, Grade 65.

I. Deformed-Steel Wire or Bar Anchors: ASTM A496/A496M or ASTM A706/A706M.

J. Carbon-Steel Bolts and Studs: ASTM A307, Grade A; carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A563/A563M; and flat, unhardened steel washers, ASTM F844.

K. High-Strength Bolts, Nuts, and Washers:

1. ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563/A563M heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

    a. Finish: Plain

2. ASTM F3125/F3125M, Grade A490, Type 1, heavy-hex steel structural bolts; ASTM A563/A563M heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.

L. Shop-Primed Finish: Prepare surfaces of nongalvanized-steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3, and shop apply [lead- and chromate-free, rust-inhibitive primer, complying with performance requirements in MPI 79 SSPC-Paint 25 according to SSPC-PA 1.

M. Welding Electrodes: Comply with AWS standards.

N. Precast Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install precast structural concrete units.

2.7 BEARING PADS

A. Provide one of the following bearing pads for precast structural concrete units as recommended by precast fabricator for application:

1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore, Type A durometer hardness, ASTM D2240; minimum tensile strength 2250 psi, ASTM D412.
2. Random-Oriented-Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. 70 to 90 Shore, Type A durometer hardness, ASTM D2240; capable of supporting a compressive stress of 3000 psi with no cracking, splitting, or delaminating in the internal portions of pad. Test one specimen for every 200 pads used in Project.
3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer; 80 to 100 Shore, Type A durometer hardness, ASTM D2240; complying with AASHTO's "AASHTO LRFD Bridge Design Specifications," Division II, Section 18.10.2; or with MIL-C-882E.
4. Frictionless Pads: PTFE, glass-fiber reinforced, bonded to stainless or mild-steel plate, or random-oriented-fiber-reinforced elastomeric pads; of type required for in-service stress.
5. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

2.8 ACCESSORIES

A. Precast Accessories: Provide clips, hangers, high-density plastic or steel shims, and other accessories required to install structural precast concrete units.

2.9 GROUT MATERIALS

A. Sand-Cement Grout: Portland cement, ASTM C150/C150M, Type I, and clean, natural sand, ASTM C144 or ASTM C404. Mix at ratio of 1 part cement to 2-1/2 to 3 parts sand, by volume, with minimum water required for placement and hydration. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C1218/C1218M.

B. Nonmetallic, Nonshrink Grout: Packaged, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107/C1107M, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C1218/C1218M.

C. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C881/C881M, of type, grade, and class to suit requirements.

2.10 CONCRETE MIXTURES

A. Prepare design mixtures for each type of precast concrete required.

1. Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
2. Limit use of fly ash to 35 percent replacement of portland cement by weight and ground granulated blast-furnace slag to 50 percent of portland cement by weight; metakaolin and silica fume to 10 percent of portland cement by weight.

B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast structural concrete fabricator's option.

C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 116 when tested according to ASTM C1218/C1218M.

D. Normal-Weight Concrete Mixtures: Proportion [face mixtures] [face and backup mixtures] [full-depth mixture] [face and backup mixtures or full-depth mixtures, at fabricator's option] by either laboratory trial batch or field test data methods according to ACI PRC-211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi minimum.
2. Release strength: as required by design
3. Maximum Water-Cementitious Materials Ratio: 0.45.

E. Lightweight Concrete Backup Mixtures: Proportion mixtures by either laboratory trial batch or field test data methods according to ACI PRC-211.2, with materials to be used on Project, to provide lightweight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi.
2. Release strength: as required by design
3. Unit Weight: Calculated equilibrium unit weight of 115 lb/cu. ft., plus or minus 3 lb/cu. ft., according to ASTM C567/C567M.

F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 116.

G. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

H. Concrete Mix Adjustments: Concrete mix design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.11 MOLD FABRICATION

A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

B. Maintain molds to provide completed precast structural concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

1. Edge and Corner Treatment: Uniformly chamfered or radiused.

2.12 FABRICATION

A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.

1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."

B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing precast structural concrete units to supporting and adjacent construction.

C. Cast-in reglets, slots, holes, conduit sleeves, and other accessories in precast structural concrete units as indicated on the Contract Drawings.

D. Cast-in openings larger than 12 inches in any dimension. Do not drill or cut openings or prestressing strand without Architect's approval.

E. Reinforcement: Comply with recommendations in PCI MNL 116 for fabricating, placing, and supporting reinforcement.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcement exceeds limits specified in ASTM A775/A775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
3. Place reinforcing steel and prestressing strand to maintain at least 3/4-inch minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 inches when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while

placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.

4. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.

F. Reinforce precast structural concrete units to resist handling, transportation, and erection stresses and specified in-place loads.

G. Prestress tendons for precast structural concrete units by either pretensioning or post-tensioning methods. Comply with PCI MNL 116.

1. Delay detensioning or post-tensioning of precast, prestressed structural concrete units until concrete has reached its indicated minimum design release compressive strength as established by test cylinders cured under same conditions as concrete unit.
2. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
3. If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
4. Protect strand ends and anchorages with bituminous, zinc-rich, or epoxy paint to avoid corrosion and possible rust spots.
5. Protect strand ends and anchorages with a minimum of 1-inch- thick, nonmetallic, nonshrink, grout mortar and sack rub surface. Coat or spray the inside surfaces of pocket with bonding agent before installing grout.

H. Comply with requirements in PCI MNL 116 and in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

I. Place face mixture to a minimum thickness after consolidation of the greater of 1 inch or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover specified.

J. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete units.

1. Place backup concrete mixture to ensure bond with face-mixture concrete.

K. Thoroughly consolidate placed concrete by vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 116.

1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants." Ensure adequate bond between face and backup concrete, if used.

L. Comply with PCI MNL 116 procedures for hot- and cold-weather concrete placement.

M. Identify pickup points of precast structural concrete units and orientation in structure with

permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast structural concrete unit on a surface that does not show in finished structure.

N. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

O. Discard and replace precast structural concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 116 and meet Architect's approval.

2.13 FABRICATION TOLERANCES

A. Fabricate precast structural concrete units to shapes, lines, and dimensions indicated so each finished unit complies with PCI MNL 116 product dimension tolerances as well as position tolerances for cast-in items.

2.14 COMMERCIAL FINISHES

A. Commercial Grade: Remove fins and protrusions larger than 1/8 inch and fill holes larger than 1/2 inch. Rub or grind ragged edges. Faces must have true, well-defined surfaces. Air holes, water marks, and color variations are permitted. Limit form joint offsets to 3/16 inch.

B. Standard Grade: Normal plant-run finish produced in molds that impart a smooth finish to concrete. Surface holes smaller than 1/2 inch caused by air bubbles, normal color variations, form joint marks, and minor chips and spalls are permitted. Fill air holes greater than 1/4 inch in width that occur more than once per 2 sq. in.. Major or unsightly imperfections, honeycombs, or structural defects are not permitted. Limit joint offsets to 1/8 inch.

C. Grade B Finish: Fill air pockets and holes larger than 1/4 inch in diameter with sand-cement paste matching color of adjacent surfaces. Fill air holes greater than 1/8 inch in width that occur more than once per 2 sq. in.. Grind smooth form offsets or fins larger than 1/8 inch. Repair surface blemishes due to holes or dents in molds. Discoloration at form joints is permitted.

D. Screed or float finish unformed surfaces. Strike off and consolidate concrete with vibrating screeds to a uniform finish. Hand screed at projections. Normal color variations, minor indentations, minor chips, and spalls are permitted. Major imperfections, honeycombing, or defects are not permitted.

E. Smooth, steel trowel finish unformed surfaces. Consolidate concrete, bring to proper level with straightedge, float, and trowel to a smooth, uniform finish.

F. Apply roughened surface finish according to ACI 318 to precast concrete units that receive concrete topping after installation.

2.15 SOURCE QUALITY CONTROL

A. Testing: Test and inspect precast structural concrete according to PCI MNL 116 requirements and ASTM C1610/C1610M, ASTM C1611/C1611M, ASTM C1621/C1621M, and ASTM C1712.

1. Test and inspect self-consolidating concrete according to PCI TR-6.

B. Strength of precast structural concrete units is considered deficient if units fail to comply with ACI 318 requirements for concrete strength.

C. If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 requirements, employ a qualified testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C42/C42M.

1. A minimum of three representative cores to be taken from units of suspect strength, from locations directed by Architect.
2. Test cores in an air-dry condition or, if units are wet under service conditions, test cores after immersion in water in a wet condition.
3. Strength of concrete for each series of three cores is considered satisfactory if average compressive strength is equal to at least 85 percent of 28-day design compressive strength and no single core is less than 75 percent of 28-day design compressive strength.
4. Report test results in writing on same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports include the following:

a. Project identification name and number.
b. Date when tests were performed.
c. Name of precast concrete fabricator.
d. Name of concrete testing agency.
e. Identification letter, name, and type of precast concrete unit(s) represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

D. Patching: If core test results are satisfactory and precast structural concrete units comply with requirements, clean and dampen core holes and solidly fill with same precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.

E. Defective Units: Discard and replace precast structural concrete units that do not comply with requirements, including strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Architect's approval. Architect reserves the right to reject precast units that do not match approved samples, sample panels, and mockups. Replace unacceptable units with precast concrete units that comply with requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, bearing surface tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Do not install precast concrete units until supporting, cast-in-place concrete has attained minimum allowable design compressive strength and until supporting steel or other structure is structurally ready to receive loads from precast concrete units.

3.2 INSTALLATION

A. Install clips, hangers, bearing pads, and other accessories required for connecting precast structural concrete units to supporting members and backup materials.

B. Erect precast structural concrete level, plumb, and square within specified allowable tolerances. Provide temporary structural framing, shoring, and bracing as required to maintain position, stability, and alignment of units until permanent connections are complete.

1. Install temporary steel or plastic spacing shims or bearing pads as precast structural concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
3. Remove projecting lifting devices and use plastic patch caps or sand-cement grout to fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
4. For hollow-core slab voids used as electrical raceways or mechanical ducts, align voids between units and tape butt joint at end of slabs.

C. Connect precast structural concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.

1. Do not permit connections to disrupt continuity of roof flashing.

D. Field cutting of precast units is not permitted without approval of Architect.

E. Fasteners: Do not use drilled or powder-actuated fasteners for attaching accessory items to precast, prestressed concrete units.

F. Welding: Comply with applicable requirements in AWS D1.1/D1.1M and AWS D1.4/D1.4M for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.

1. Protect precast structural concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.
2. Clean weld-affected steel surfaces with chipping hammer followed by brushing or power tool cleaning and then reprime damaged painted surfaces in accordance with manufacturer's recommendations.
3. Clean weld-affected steel surfaces with chipping hammer followed by brushing and reprime damaged painted surfaces.
4. Visually inspect welds and remove, reweld, or repair incomplete and defective welds.

G. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.

1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot.
2. For slip-critical connections, use one of the following methods to assure proper bolt pretension:

    a. Turn-of-Nut: According to RCSC's "Specification for Structural Joints Using ASTM A325 or A 490 Bolts."
    b. Calibrated Wrench: According to RCSC's "Specification for Structural Joints Using ASTM A325 or A 490 Bolts."
    c. Twist-off Tension Control Bolt: ASTM F3125/F3125M, Grade 1852.
    d. Direct-Tension Control Bolt: ASTM F3125/F3125M, Grade 1852.

3. For slip-critical connections, use method and inspection procedure approved by Architect and coordinated with inspection agency.

H. Grouting or Dry-Packing Connections and Joints: Grout connections and joints and open spaces at keyways, connections, and joints where required or indicated on Shop Drawings. Retain flowable grout in place until hard enough to support itself. Alternatively, pack spaces with stiff dry-pack grout material, tamping until voids are completely filled.

1. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces.
2. Fill joints completely without seepage to other surfaces.
3. Trowel top of grout joints on roofs smooth and uniform. Finish transitions between different surface levels not steeper than 1 to 12.
4. Place grout end cap or dam in voids at ends of hollow-core slabs.
5. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.
6. Keep grouted joints damp for not less than 24 hours after initial set.

3.3 ERECTION TOLERANCES

A. Erect precast structural concrete units level, plumb, square, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 135.

B. Minimize variations between adjacent slab members by jacking, loading, or other method recommended by fabricator and approved by Architect.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. As shown in table on sheet S1.0.

B. Visually inspect field welds and test according to ASTM E165 or to ASTM E709 and ASTM E1444. High-strength bolted connections are subject to inspections.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, to be performed to determine compliance of replaced or additional work with specified requirements.

F. Prepare test and inspection reports.

3.5 REPAIRS

A. Repair precast structural concrete units if permitted by Architect.

1. Repairs may be permitted if structural adequacy, serviceability, durability, and appearance of units have not been impaired.

B. Remove and replace damaged precast structural concrete units that cannot be repaired or when repairs do not comply with requirements as determined by Architect.

3.6 CLEANING

A. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

B. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.
2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 03 41 00

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. Mock-ups can be constructed as part of the work.

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: “Natural.”

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. Install 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. Testing shall be as required per special inspection for masonry Level 3 (TMS602)

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) REFER TO PAINTS AND COATINGS (099120)

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 per manufacturers recommendations.

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 099120 “Paints and coatings” and 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

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 4000 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. Concrete Treads:
1. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in- Place Concrete" for normal-weight, air-entrained, ready-mix concrete with minimum 28-day compressive strength of 4000 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 064100 - CASEWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Countertops.

C. Cabinet hardware.

D. Preparation for installing utilities.

1.2 SUBMITTALS

A. Shop Drawings: Indicate materials, component profiles, fastening methods, joining details, and accessories. Provide the information required by AWI/AWMAC/WI Architectural Woodwork Standards.

B. Product Data: Provide data for hardware accessories.

1.3 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of experience.

PART 2 PRODUCTS

2.1 CABINETS

A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI/AWMAC/WI Architectural Woodwork Standards for Custom Grade.

B. Plastic Laminate Faced Cabinets: Premium grade.

C. Cabinets:

1. Finish – Exposed Exterior Surfaces: Decorative laminate.

2. Door and Drawer Front Edge Profiles: Self-Edge banding with material of same finish and pattern.

3. Casework Construction Type: Type A – Frameless.

4. Interface Style for Cabinet and Door: Style 1 – Overlay; Flush overlay.

5. Adjustable Shelf Loading: 50 lbs. per sq. ft.

2.2 LAMINATE MATERIALS

A. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

B. Provide specific types as indicated.

1. Horizontal Surfaces: HGL, 0.050 inch nominal thickness, colors as scheduled, finish as scheduled.

2. Vertical Surfaces: VGS, 0.028 inch nominal thickness, colors as scheduled, finish as scheduled.

3. Cabinet Liner: CLS 0.020 inch nominal thickness, colors as scheduled, finish as scheduled.

4. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

C. Low Pressure Thermofused Polyester and Melamine Laminates: ALA (American Laminators Association).

D. PVC edgebanding (polyvinyl chloride) on seamless rolls to be applied with automatic edge banding machines using hot-melt adhesives. Product to be chip proof, flame and moisture resistant.

D. Colors of laminates shall be as follows:
1. Cabinets door and drawer faces: As selected from full line of colors
2. Countertops: As selected from full line of colors

E. Colors of semi-exposed and concealed melamine shall be as selected from Almond, Folkstone Grey, Black and White. Color as selected by Architect.

2.3 COUNTERTOPS

A. Plastic Laminate Countertops; Medium density fiberboard substrate covered with HPDL, 3-mm PVC edgebanding and other specified requirements.

B. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on drawings, finished to match.

C. Solid Surface Counters: Provide solid surface shelves as manufactured by the following:
1. Corian by Dupont:
2. Samsung Chemical USA:
3. Wilsonart Contract:
4. Solid Surface Material:

a. Non-porous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment: not coated, laminated or of composite construction; meeting following criteria:

b. flammability: Class 1 and A when tested to UL 723.

c. Finish: Matte, with a 60 gloss rating of 5-20

d. ¾" thick.

D. Stainless Steel Countertop:
1. Stainless Steel: Except as otherwise indicated, provide AISI 18-8, Type 304, hardest workable temper, with No. 4 directional polish applied either prior to or after forming.
2. Counter Tops: 14 Gauge.
3. Where joints in stainless steel work are necessary due to limitations of sheet sizes or installation requirements, make tight without open seams by welding.
4. Close ends of all fixtures, splash aprons, shelves, and bases by sealing or welding end plates.
5. Indicate exact sizes and locations of blocking required on shop drawings.
6. Provide inserts, and anchors built into other work for support of this work. Ensure these items are installed in their proper location. Include fastening devices required to attach the work. Use proper anchoring devices for the materials encountered and the usage expected.
7. Install items in accordance with the manufacturers' instructions using workers skilled and familiar with items and installation requirements.

2.4 ACCESSORIES

A. Adhesive: Type recommended by AWI/AWMAC to suit application to meet requirements of ASTM-D3110.

B. Solvent Based Contact Cement: MMM-A-J130B.

C. Fasteners: Size and type to suit application.

D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel chrome-plated finish in exposed locations.

E. Concealed Joint Fasteners: Threaded steel.

F. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface. Provide a wiring grommet at each electrical or data outlet and additional grommets as indicated in the contract documents.

G. Provide National Lock No. C8173-26D for cabinets as indicated in the contract documents.

H. Workmanship Complies with Industry Standards: AWI (Architectural Woodwork Institute).

2.5 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Drawer and Door Pulls: If not specified in drawings then provide 5/16" "U" shaped wire pull, aluminum with satin finish, 4 inch centers.

C. Drawer Slides:

1. Box Drawer: Single extension, almond epoxy finish with 75 lb. load rating and positive in and out stops, stay close detent, one side captive and four nylon rollers. Hettich #FR602L, Accuride No. 3832, or Blum No. 230M.
2. File Drawers: Full extension, zinc finish with 150 lb. load rating and positive in and out stops, stay close detent and steel ball bearing. Accuride #4034.

D. Adjustable Shelf Support System:

1. Standard adjustable shelf support system shall be provided by inserting nickel plated steel "L" shaped clips into predrilled 5-mm diameter holes 32-mm (1-1/4") on centers. Liberty #A1131 HNP. Shelves shall be fixed using a retaining screw.

E. Clothes Rod and Hangers: (not used)

1. 1" diameter extruded rigid PVC tube, internally reinforced with steel tube when over 18" long. Supported by injection molded ABS plastic brackets at each end. All parts shall be selected from Almond, Folkstone Grey, and White.

F. Mirrors: (not used)

1. 1/4" thick polished plate glass mirror, 10" x 18" with retainer clips, clear plastic screw mount. K & V #6092.

G. Wall Standards and Brackets: (not used)

1. All adjustable shelves indicated on the Interior Elevations to have heavy duty metal standards and brackets, to be provided with zinc plated steel, adjustable 2” center. Knape & vogt No. 85 and 185 double-slot standards and brackets.

H. Countertop Support Brackets:

1. Countertop support brackets shall be constructed of 16 gauge 1-1/2" tube steel, with welded construction, designed to support countertops off finished wall at desired heights. Brackets are powered coated. Color as selected by Architect.

2. 18" x 21" legs for up to 26" deep countertop.

3. 21" x 27" legs for up to 32" deep countertop.

I. Hinges: European style concealed self-closing type, steel with satin finish. Maximum door size of 24" x 36" and 24" x 48" shall be provided with 2 knuckles. Maximum door size of 24" x 84" shall be provided with 3 knuckles. Maximum door size of 24" x 90" shall be provided with 4 knuckles.

2.6 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to sit in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: 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.

1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.

E. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Seal cut edges.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

A. Set and secure custom cabinets I place, assuring that they are rigid, plumb, and level.

B. Use fixture attachments in concealed locations for wall mounted components.

C. Use concealed joint fasteners to align and secure adjoining cabinet units.

D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

E. Secure cabinets to floor using appropriate angles and anchorages.

F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

G. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

H. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.

I. Seal joint between back/end splashes and vertical surfaces. Back and end splashes with plastic laminate self edge at tops and exposed ends; construction similar to counter tops.

J. Framed Walls: Wall sheathing, weather barrier, cementitious backer board, and direct application; TCNA W244E.

END OF SECTION 06 4100

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: 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: Per finish schedule, height dimension required to provide full height vertical joints with no intermediate horizontal joints.

   a. FRP will be 8'-0" height x 4'-0” width lengths.

4. Color: White

5. Division Bars, Corner Trim: Panel manufacturer's standard single length aluminum pieces; longest length possible - to eliminate end joints.
6. Sani-cove stainless steel base by Crane Composites or approved equal

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 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
4. Metal roof edging and copings
5. Flashings
6. Walkway pads
7. Other roofing-related items specified or indicated on the drawings or otherwise necessary to provide a complete weatherproof roofing system

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.

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: Demonstrate performance history of producing specified roof membrane 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: 25 years, No dollar limitation (NDL) 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. Elevate roofing, lining, and wall systems, 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: 80 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, 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.

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, 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 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.

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 07 7200 - ROOF HATCH

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Roof Hatches.
   a. Security Series use thicker materials and optional additional locks.
2. Accessory Products for Roof Hatches
   a. Safety Railings for all roof hatches
   b. Safety posts for vertical ladder access roof hatches

1.2 RELATED REQUIREMENTS:

A. Division 05 for ladders and stairs.

B. Division 07 for roofing and sealants.

1.3 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a watertight installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.4 ACTION SUBMITTALS

A. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected Work.

1. Hatch Units: Show types, elevations, thickness of metals, and full-size profiles.
2. Hardware: Show materials, finishes, locations of fasteners, types of fasteners, locations and types of operating hardware, and details of installation.
3. General: Show connections of units and hardware to other Work. Include schedules showing location of each type and size of unit

B. Product Data: Manufacturer’s technical data for each type of hatch assembly, including setting drawings, templates, finish requirements, and details of anchorage devices.

1. Include complete schedule, types, locations, construction details, finishes, latching or locking provisions, and other pertinent data.

1.5 INFORMATIONAL SUBMITTALS

A. Provide manufacturer's standard warranty.

1.6 CLOSEOUT SUBMITTALS

A. Manufacturer's Installation Instructions and Operation & Maintenance: Indicate installation, operation and maintenance requirements and rough-in dimensions.

1.7 QUALITY ASSURANCE

A. Regulatory Requirements:

1. OSHA 29 CFR 1910.23 Guarding floor and wall openings and holes
2. OSHA 29 CDR 1919.29 Fall protection systems and falling object protection-criteria and practices.
3. OSHA 29 CFR 1926.502 Fall protection systems criteria
4. International Building Code (IBC) Section 1013.6 Roof Access
5. International Building Code (IBC) Section 1009.11 Means of Egress, Stairways, Stairway to Roof
6. International Building Code for venting requirements

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site ready use.

B. Exercise proper care in handling of Work so as not to disrupt finished surfaces.

C. Store materials under cover in a dry and clean location off the ground.

1.9 WARRANTY

A. Provide manufacturer's standard 5 year warranty. Roof hatches and smoke vents shall be free from manufacturing defects in materials and fabrication for a period of 5 years from the date of shipment. Should a product fail to function in normal use within this period, manufacturer shall furnish a replacement or new part.

PART 2 - PRODUCT

2.1 MANUFACTURER

A. Babcock-Davis
9300 73rd Ave N
Brooklyn Park, MN 55428
PH: 888.412.3726
www.BabcockDavis.com

B. Or approved equal

2.2 ROOF HATCH

A. Roof Hatches:

1. Type and Size: Security, BRHS, single-leaf metal lid, **36 by 36 inches.**

a. Loads

1) Minimum 40-lbf/sq. ft. (1.9-kPa) external live load with a maximum deflection of 1/150 of the span and 20-lbf/sq. ft. (0.95-kPa) internal uplift load.

b. Hatch Material

1) Cover: **3/16 inch hot rolled pickled and oiled (HRPO)**

a) Cover Insulation: **2 inches Polyisocyanurate**

2) Curb**: 3/16 galvanneal steel,** 12 inch high single wall curb, with integral counterflashing. Mounting flange continuous around base of frame.
   a) Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
   b) Sloping Roofs: Where slope or roof deck exceeds 3:12, fabricate curb with perimeter curb height that is tapered to accommodate roof slope so that top surfaces of perimeter curb are level.
3) Curb Insulation: 2 inch polyisocyanurate

c. Finish: **TGIC Polyester powder coat paint**

d. Hardware: Type 316 stainless steel.
   1) Hinge/Spring Assembly: Zinc plated steel Tamper-proof hinge contained within hinge/spring assembly with compression springs contained within telescope tubes.
   2) Hold Open Device: Automatic zinc plated steel hold open arm with red vinyl grip handle.
   3) Latch: Zinc plated steel spring-type slam latch with inside and outside operating turn handles and padlock hasp provisions.
   4) Gasket: Extruded EPDM adhesive back seal, continuous around cover.

e. Security Locking Options
   1) Lock: Brinks 7016, Key lock access from both interior and exterior
   2) Door Position Sensor to tie into the building alarm system. Honeywell roller lever VL series miniature type limit switch.

B. Safety Railing System: Model BSRC Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.

1. Height: 42 inches above finished roof deck.

2. Rails:
   a. Aluminum, 1-1/4 inch, 1.66 inch outside diameter, schedule 40 pipe, 6061-T6 alloy
   b. Finish: TGIC Polyester powder coat paint.
   c. Color: As selected by Architect from manufacturer's full range.
   d. Fittings: 5052-H32 Cast aluminum alloy with set screw hold.
   e. Mounting Brackets: 3/16 inch steel, zinc plated with nut backing plate.
   f. Exit: Self-closing gate, 1-1/4 inch aluminum, self-closing with coil spring.

C. Ladder-Assist Post: Model BSP Roof-hatch manufacturer's standard device for attachment to roof-access ladder.

1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.

2. Height: 42 inches above finished roof deck.

3. Material**:** Steel tube.

4. Post: 1-1/2 inch by 1-1/2 inch by 1/8 inch diameter high strength square.

5. Finish: Manufacturer's standard powder coat.

6. Color: As selected by Architect from manufacturer's full range.

D. Safety Grab Bar: Model BSGB provide safe access through roof hatches while providing added functionality and weight bearing support

1. Operation: mounts through a corner section through the curb counterflashing.
2. Material: Aluminum pipe 1-1/4 inch inside diameter Schedule 40 ATSM A53 Seamed Steel
3. Fittings: Cast aluminum alloy with set screw hold
4. Hardware: Hex head bolts 3/8 inch by 3/4 inch
5. Finish: Manufacturer's standard powder coat.
6. Color: As selected by Architect from manufacturer's full range

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion.
B. Verify that deck, curbs, roof membrane, base flashing, and other items affecting Work of this Section are in place and positioned correctly.
C. Verify tolerances and correct improper condition
D. Identify conditions detrimental to providing proper quality and timely completions of work.
E. Do not proceed with installation until detrimental conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's recommendations.
B. Coordinate installation of components of this Section with installation of roof deck, roof structure, roofing membrane, and base flashing.
C. Coordinate installation of sealant and roofing cement with Work of this Section to ensure water tightness.
D. Securely anchor roof accessories in compliance with manufacturer's instructions.
E. Set units plumb, level, and true to line without warp or rack. Separate metal from incompatible metal or corrosive substrates, including wood, by coating concealed surfaces, at locations of contact, with bituminous coating or providing other permanent separation.
F. Flange Seals: Unless otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a seal

3.3 ADJUSTING

A. Adjust movable parts for smooth operation

B. Operational Units: Test-operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

3.4 CLEANING

A. Clean exposed surfaces per manufacturer's written instructions. Touch up damaged metal coatings.

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 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. 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 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.

PART 2 PRODUCTS

1.3 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.

4. Approved: Tremco

B. Interior Glazing Sealant: one-part mildew resistant silicone sealant; DOW

1. Standard colors matching finished surfaces.
2. Approved: Tremco

C. interior Building Sealants (Painted surfaces)

1. One-part Acrylic Latex with Silicone (paintable) sealant:

a. Dap – 35-year warranty.
b. Approved: Tremco

D. Security caulk at precast concrete interior joints and slab on grade control joints.
1. Sikaflex CR 195 or Sikadur-31 hi mod gel.
2. Substitutions as approved.

E. Exterior caulk at precast concrete joints.
1. Sikaflex NP-2
2. Substitutions as approved.

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.

PART 3 EXECUTION

1.4 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.

1.5 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 12 gauge minimum thickness, cold-rolled steel.
2. Security Grade 3: Provide doors with face sheets of 14 gauge minimum thickness, cold-rolled, steel.
3. Security Grade 4: Provide doors with face sheets of 16 gauge 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 12 gauge minimum thickness, cold-rolled steel.
2. Security Grade 3: Provide frames fabricated from 14 gauge minimum thickness, cold-rolled steel.
3. Security Grade 4: Provide doors with face sheets of 16 gauge 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. 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.

E. 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.

F. Security Sealant: Apply epoxy security sealant at all exposed gaps between detention frames and adjacent substrates.

G. 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).

H. 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.

I. Fire-Rated Detention Doors: Install with clearances as specified in NFPA 80.

J. Smoke-Control Detention Doors: Install according to NFPA 105.

K. Installation Tolerances: Comply with installation tolerances indicated in NAAMM-HMMA 863.

L. 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: APPROVED EQUAL.

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 or approved equal. 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. Interior Steel: 20 gauge, galvanized.
e. End Stiles: 16 gauge with thermal break.
f. 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.

g. Insulation: CFC-free and HCFC-free polyurethane, fully encapsulated.
h. Thermal Values: Tested installed assembly U-factor of 0.10 Btu/hr/SF degrees F; calculated section R-value of 17.40.
i. Air Infiltration: 0.08 cfm at 15 mph; 0.08 cfm at 25 mph.
j. Sound Transmission: Class 26.
k. 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. Electric Lock operated from the control booth.

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 44 18 FIRE-RATED STEEL CURTAIN WALLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Fire-rated curtain wall systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of curtain wall framing.

1.2 REFERENCES

A. American Architectural Manufacturers Association (AAMA)
1. AAMA 501.1-2005: Standard Test Method for Water Penetration of Windows, Curtain Walls, and Doors Using Dynamic Pressure
2. AAMA 501.2-2003: Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems
3. AAMA 501.4-2000 (Revised 2001): Recommended Static Test Method for Evaluating Curtain Wall and Storefront Systems Subjected to Seismic and Wind Induced Interstory Drifts
4. AAMA 501.5-2005: Test Method for Thermal Cycling of Exterior Walls
5. AAMA 506-2000 (Revised 2003): Voluntary Specifications for Hurricane Impact and Cycle Testing of Fenestration Products
6. AAMA 1503-1998: Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections
7. AAMA 2603-2002 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
8. AAMA 2604-2005 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
9. AAMA 2605-2005 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

B. American Society for Testing and Materials (ASTM):
1. Fire safety related:
   a. ASTM E119: Methods for Fire Tests of Building Construction and Materials.
2. Material related
   a. ASTM A 1008/A 1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2007.
   b. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2006b.

3. Exterior related
   a. ASTM E 283-04: Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen
   b. ASTM E 330-02: Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference Procedure A
   c. ASTM E 331-04: Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
   d. ASTM E 783-02: Test Method for Field Measurement of Air Leakage through Installed Exterior Windows and Doors
   e. ASTM E 1105-00: Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference
4. Hurricane related
   a. ASTM E 1886-05: Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
   b. ASTM E 1996-05: Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes
5. Sound related:
   a. ASTM E 90-04: Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
   b. ASTM E 413-04: Standard Classification for Rating Sound Insulation

C. American Welding Society (AWS)
   1. AWS D1.3 - Structural Welding Code - Sheet Steel; 2007

D. Builders Hardware Manufacturers Association, Inc
   1. BHMA A156 - American National Standards for door hardware; 2006 (ANSI/BHMA A156).

E. National Fire Protection Association (NFPA):
   1. NFPA 80: Fire Doors and Windows.
   2. NFPA 251: Fire Tests of Building Construction & Materials
   3. NFPA 252: Fire Tests of Door Assemblies
   4. NFPA 257: Fire Test of Window Assemblies

F. Underwriters Laboratories, Inc. (UL):
   1. UL 9: Fire Tests of Window Assemblies
   2. UL 10 B: Fire Tests of Door Assemblies
   3. UL 10 C: Positive Pressure Fire Tests of Window & Door Assemblies
   4. UL 263: Fire tests of Building Construction and Materials
   5. UL-752: Ratings of Bullet-Resistant Materials

G. American National Standards Institute (ANSI):

1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings

H. Consumer Product Safety Commission (CPSC):
1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials

I. American Society of Civil Engineers (ASCE)
1. ASCE 7 – Minimum Design Loads for Buildings and Other Structures; 2005

1.3 DEFINITIONS

A. Manufacturer: A firm that produces primary glass, fabricated glass or framing as defined in referenced glazing publications.

1.4 SUBMITTALS

A. Submit in accordance with Section 010010 Basic Requirements.

B. Product Data:
1. Technical Information: Submit latest edition of manufacturer's product data providing product descriptions, technical data, Underwriters Laboratories, Inc. listings and installation instructions.

C. Shop Drawings:
1. Include plans, elevations and details of product showing component dimensions; framed opening requirements, dimensions, tolerances, and attachment to structure

D. Samples. For following products:
1. Glass sample-as provided by manufacturer
2. Sample of frame
3. Verification of sample of selected finish

E. Glazing Schedule: Use same designations indicated on drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

F. Warranties: Submit manufacturer's warranty.

G. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements.
1. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualifications according to
   1. International Accreditation Service for a Type A Third-Party Inspection Body (Field Services ICC-ES Third-Party Inspections Standard Operating Procedures, 00-BL-S0400 and S0401)
   2. International Accreditation Service for Testing Body-Building Materials and Systems
      a. Fire Testing
         1) ASTM Standard E119
         2) CPSC Standard 16 CFR 1201
         3) NFPA Standards 251, 252, 257
         4) UL Standards 9, 10B, 10C, 1784, UL Subject 63
         5) BS 476; Part 22: 1987
         6) EN 1634-1
         7) CAN/ULC Standards S101, S104, S106

B. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.

C. Source Limitations for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

D. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are classified and labeled by UL, for fire ratings indicated, based on testing according to NFPA 257 and UL 9.

E. Fire-Rated Wall Assemblies: Assemblies complying with ASTM E119 that are classified and labeled by UL, for fire ratings indicated, based on testing in accordance with UL 263, ASTM E119.

F. Listing and Labels – Fire-Rated Assemblies: Under current follow-up service by Underwriters Laboratories® maintaining a current listing or certification. Label assemblies accordance with limits of manufacturer's listing.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle under provisions specified by manufacturer.

1.7 PROJECT CONDITIONS

A. Obtain field measurements prior to fabrication of frame units. If field measurements will not be available in a timely manner, coordinate planned measurements with the work of other sections.
   1. Note whether field or planned dimensions were used in the creation of the shop drawings

B. Coordinate the work of this sections with others effected including but not limited to: other interior and /or exterior envelope components and door hardware beyond that provided by this section.

1.8 WARRANTY

A. Provide the Pilkington Pyrostop® and the Fireframes® Curtainwall Series standard five-year manufacturer warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS (ACCEPTABLE MANUFACTURERS/PRODUCTS)

A. Manufacturer Glazing Material: "Pilkington Pyrostop®" fire-rated glazing as manufactured by the Pilkington Group and distributed by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 phone (800.426.0279) e-mail tgp.sales@allegion.com, web site http://www.fireglass.com.
   1. Or Equal

B. Frame System: Fireframes® Curtainwall Series fire-rated steel frame system as supplied by Technical Glass Products 8107 Bracken Place SE, Snoqualmie, WA 98065 phone (800.426.0279) e-mail tgp.sales@allegion.com, web site http://www.fireglass.com.
   1. Or Equal

2.2 PERFORMANCE REQUIREMENTS

A. System Description:
   1. Steel fire-rated glazed curtain wall system, outside glazed pressure plate, cover cap format.
   2. Face Widths Available:
      a. 1 3/4-inch.
   3. Water Drainage:
   4. System is vertically weeped. No joint plugs or weep holes at horizontal mullions. Horizontal gaskets are notched and received by vertical gaskets.

B. Structural Performance
   1. Member deflection: Limit deflection of the edge of the glass normal to the plane of the glass to [flexure limit of glass][1/175 of the glass edge length or ¾ inch, whichever is less][of any framing member
   2. Accommodate movement between storefront and adjoining systems

C. Air Infiltration: ASTM E 283; Air infiltration rate shall not exceed 0.06 cfm/ft^2 at a static air pressure differential of 6.24 psf.

D. Water Resistance, (static): ASTM E 331; No leakage at a static air pressure differential of 15 psf as defined in AAMA 501.

E. Water Resistance, (dynamic): AAMA 501.1; No leakage at an air pressure differential of 15 psf as defined in AAMA 501.

F. Thermal Movements: Provide steel fire-rated glazed curtain-wall systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.MATERIALS - GLASS

G. Properties Interior Glazing

Property				
Fire Rating	45 minute	60 minute		120 minute
Manufacturer's designation	45-200	60-101	60-201	120-104
Glazing type	single	single	single	IGU
Nominal Thickness	3/4" (19mm)	7/8" (23mm)	1-1/16" (27mm)	2-1/8 (54mm) [with 8 mm spacer, or 2-3/8" (60 mm) with 14 mm spacer]
Weight in lbs/sf	9.2	10.85	12.5	21.7
Daylight Transmission	86%	87%	86%	75%
Sound Transmission Coefficient	40dB	41dB	44dB	46dB

H. Logo: Each piece of fire-rated glazing shall be labeled with a permanent logo including name of product, manufacturer, testing laboratory (UL), fire rating period, safety glazing standards, and date of manufacture.

I. Glazing Accessories: Manufacturer's standard compression gaskets, spacers, setting blocks and other accessories necessary for a complete installation.

2.3 MATERIALS –STEEL FRAMING

A. Steel Curtainwall Framing System [45 min.] [60 min.] [120 min]
   1. Frame: [Steel]: profiled steel tubing permanently joined with steel bolts.
   2. Insulation: Insulate framing system against effects of fire, smoke, and heat transfer from either side. Firmly pack perimeter of framing system to rough opening with mineral wool fire stop insulation or appropriately rated intumescent sealant
   3. Fasteners: Type recommended by manufacturer

4. Glazing Gaskets, Compounds and tapes: Glaze Pilkington Pyrostop glass with approved EPDM glazing gaskets and [closed cell PVC tape], or [pure silicone sealant].
5. Steel Pressure Plates: Formed stainless steel pressure plate with dimensions recommended by manufacturer to securely hold glazing material in place.
6. Cover Caps: Formed [steel] [stainless steel] [extruded aluminum].

B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M Standard Specification for Carbon Structural Steel
2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable
3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

C. Brackets and Reinforcements: Manufacturer's standard high-strength materials with nonstaining, nonferrous shims for aligning system components.

D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
4. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
5. Reinforce members as required to receive fastener threads.

E. Anchors: Three-way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

F. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

2.4 ACCESSORIES

A. Exposed Fasteners: Use fasteners fabricated from Type 304 or Type 316 stainless steel.

B. Glazing Gaskets:
1. Glazing gaskets for interior or exterior applications: ASTM C 864 (extruded EPDM rubber that provides for silicone adhesion) or ASTM C1115 Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories (extruded silicone).

C. Intumescent Tape: As supplied by frame manufacturer.

D. Setting Blocks: ¼" Calcium silicate.

E. Perimeter Anchors: Steel or 316 Stainless steel when exposed.

F. Flashings: As recommended by manufacturer; same material and finish as cover caps.

G. Silicone Sealant: One-Part Low Modulus, neutral cure High Movement-Capable Sealant: Type S; Grade NS; Class 25 with additional movement capability of 100 percent in extension and 50 percent in compression (total 150 percent); Use (Exposure) NT; Uses (Substrates) M, G, A, and O as applicable. (Use-O joint substrates include: Metal factory-coated with a high-performance coating; galvanized steel; ceramic tile.)
   1. Available Products:
      a. Dow Corning 790, 795 - Dow Corning Corp.
      b. Momentive
      c. Tremco

H. Intumescent Caulk: Single component, latex-based, intumescent caulk designed to stop passage of fire, smoke, and fumes through fire-rated separations; permanently flexible after cure; will not support mold growth; flame spread/smoke developed 10/10.
   1. Available Products:
      a. 3M CP 25WB+.

2.5 SLAG-WOOL-FIBER/ROCK-WOOL-FIBER INSULATION

A. Available Manufacturers:
   1. Fibrex Insulations Inc.
   2. Owens Corning
   3. Thermafiber
   4. Rockwool

B. Unfaced, Slag-Wool-Fiber/Rock-Wool-Fiber Board Insulation: ASTM C 612, maximum flame-spread and smoke-developed indexes of 15 and 0, respectively; passing ASTM E 136 for combustion characteristics; and of the following nominal density and thermal resistivity:
   1. Nominal density of 4 lb/cu. ft. (64 kg/cu. m), Types IA and IB, thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).
   2. Fiber Color: Regular color, unless otherwise indicated.

2.6 FABRICATION

A. General:
   1. Fabricate components per manufacturer's installation instructions and with minimum clearances and shim spacing around perimeter of assembly yet enabling installation and dynamic movement of perimeter seal.

2. Accurately fit and secure joints and corners. Make joints flush and weatherproof.
3. Prepare components to receive anchor devices.
4. Provide physical and thermal isolation of glazing from framing members.
5. Provide internal guttering to drain water from joints and condensation occurring within glazing pocket.
6. Fabricate anchors.
7. Arrange fasteners and attachments to be concealed from view.

B. Guttered System Components:
1. Fabricate components to resist water penetration as follows:
   a. Internal guttering system or other means to drain water passing joints, occurring within framing members, and moisture migrating within glazed steel curtain walls.
   b. Pressure-equalized system, double barrier, or two lines of air and water resistance design with primary air and water barrier at interior side of glazing pocket.

2.7 POWDER COAT FINISHES

A. Finish after fabrication.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

C. Interior and Exterior Steel Finishes
1. Powder-Coat Finish: Polyester Super Durable powder coating which meets AAMA 2604 for chalking and fading. Apply manufacturer's standard powder coating finish system applied to factory-assembled frames before shipping, complying with manufacturer's recommended instructions for surface preparation including pretreatment, application, and minimum dry film thickness.
2. Color and Gloss: As selected by Architect from manufacturer's full range.
3. Acceptable Manufacturers:
   a. Tiger Drylac
   b. Additional manufacturers as approved by TGP

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer’s instructions. Verify openings are sized to receive curtain wall system and sill plate is level in accordance with manufacturer’s acceptable tolerances.

B. Notify Architect of any conditions which jeopardize the integrity of the proposed fire wall / door system.

C. Do not proceed until such conditions are corrected.

3.2 INSTALLATION

A. See Fireframes Curtainwall Series Installation Manual

3.3 PROTECTION AND CLEANING

A. Protect glass from damage immediately after installation by attaching crossed streamers to framing held away from the glass. Do not apply markers to the glass surface. Remove nonpermanent labels, and clean surfaces.
   1. Do not clean with astringent cleaners. Use a clean “grit free” cloth and a small amount of mild soap and water or mild detergent.
   2. Do not use any of the following:
      a. Steam jets
      b. Abrasives
      c. Strong acidic or alkaline detergents, or surface-reactive agents
      d. Detergents not recommended in writing by the manufacturer
      e. Do not use any detergent above 77 degrees F
      f. Organic solvents including but not limited to those containing ester, ketones, alcohols, aromatic compounds, glycol ether, or halogenated hydrocarbons.
      g. Metal or hard parts of cleaning equipment must not touch the glass surface

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Wash glass 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 glass as recommended by glass manufacturer.

END OF SECTION 084418

SECTION 086200 – UNIT SKYLIGHTS

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. Self-flashing unit skylights with integral curbs.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of unit skylight.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for unit skylights.

B. Shop Drawings: For unit skylight work.

1. Include plans, elevations, sections, details, and connections to supporting structure and other adjoining work.

C. Aluminum Finish Samples: For each type of exposed finish required, in a representative section of each unit skylight in manufacturer's standard size.

D. Glazing Samples: For each color and finish of glazing indicated, 12 inches (300 mm) square and of same thickness indicated for the final Work.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For unit skylights and unit skylight operating system to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating unit skylights that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

B. Installer Qualifications: An installer acceptable to unit skylight manufacturer for installation of units required for this Project.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of unit skylights that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Uncontrolled water leakage.

b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
c. Yellowing of acrylic glazing.
d. Breakage of polycarbonate glazing.
e. Deterioration of insulating-glass hermetic seal.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Product: Subject to compliance with requirements, provide Bristolite Skylights Model AL-ESD-CM-2 or comparable product by one of the following.

1. Acralight International
2. American Skylights; a division of the Andi Group
3. Auburn Skylights
4. CPI Daylighting Inc
5. Dur-Red Products
6. Exarc Skylights, Inc
7. Fiore Skylights Inc; a division of Pepco Manufacturing
8. Fox Lite, Inc; Skymaster Skylights
9. Glazed Structures Inc
10. Kalwall Corporation
11. Lane Aire Manufacturing Corporation
12. Naturalite Skylight Systems; Oldcastle class Engineered Products
13. PECOT Skylights; Plastic Engineering Company of Tulsa
14. Plasterco Inc
15. SABIC Polymershapes
16. Skyline Sky-Lites
17. Solar Industries Inc
18. Sunglo Skylight Products
19. VELUX America Inc
20. Wasco Products Inc.
21. Aladdin Industries Skylights

2.2 PERFORMANCE REQUIREMENTS

A. Thermal Transmittance: NFRC 100 maximum U-factor of 0.55 Btu/sq. ft. x h x deg F (3.12 W/sq. m x K).

2.3 UNIT SKYLIGHTS

A. General: Provide factory-assembled unit skylights that include glazing, extruded-aluminum glazing retainers, gaskets, and inner frames and that are capable of withstanding performance requirements indicated.
B. Unit Shape and Size: Square, 36-by-36-inch inside curb.
C. Acrylic Glazing: ASTM D4802, thermoformable, monolithic sheet, category as standard with manufacturer, Finish 1 (smooth or polished), Type UVF (formulated with UV absorber).

1. Triple Glazing Profile: Dome, 25 percent rise.
    a. Thicknesses: Not less than thicknesses required to exceed performance requirements.
    b. Outer Glazing Color: Colorless, transparent.
    c. Inner Glazing Color: Colorless, transparent.
2. Self-Ignition Temperature: 650 deg F (343 deg C) or more for plastic sheets in thickness indicated when tested according to ASTM D1929.
3. Smoke-Production Characteristics: Smoke-developed index of 450 or less when tested according to ASTM E84, and smoke density of 75 or less when tested according to ASTM D2843
4. Burning Characteristics: Tested according to ASTM D635. Class CC2, burning rate of 2-1/2 inches (64 mm) per minute or less for nominal thickness of 0.060 inch (1.5 mm) or thickness indicated for use.

D. Glazing Gaskets: Manufacturer's standard.

E. Integral Curb: Extruded-aluminum, self-flashing type.
1. Extruded-Aluminum Shapes: ASTM B221 (ASTM B221M), alloy and temper to suit structural and finish requirements but with not less than the strength and durability of Alloy 6063-T52.
2. Height: 12 inches (300 mm).
3. Construction: Double wall.
4. Insulation: Manufacturer's standard rigid or semirigid type.
    a. Exposed Insulation: Cover face of insulation exposed to interior of building with aluminum liner.

F. Condensation Control: Fabricate unit skylights with integral internal gutters and nonclogging weeps to collect and drain condensation to the exterior.

G. Thermal Break: Fabricate unit skylights with thermal barrier separating exterior and interior metal framing.

2.4 ACCESSORY MATERIALS

A. Fasteners: Same metal as metal being fastened, nonmagnetic stainless steel, or other noncorrosive metal as recommended by manufacturer. Finish exposed fasteners to match material being fastened.
1. Where removal of exterior exposed fasteners might allow access to building, provide nonremovable fastener heads.

B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat.

2.5 ALUMINUM FINISHES

A. Mill Finish: Manufacturer's standard.

B. Clear Anodic Finish: AAMA 611, or thicker.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Coordinate installation of unit skylight with installation of substrates, vapor retarders, roof insulation, roofing membrane, and flashing as required to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight.
B. Comply with recommendations in AAMA 1607 and with manufacturer's written instructions for installing unit skylights.
C. Install unit skylights level, plumb, and true to line, without distortion.
D. Anchor unit skylights securely to supporting substrates.
E. Where aluminum surfaces of unit skylights will contact another metal or corrosive substrates, such as preservative-treated wood, apply bituminous coating on concealed metal surfaces or provide other approved permanent separation recommended in writing by unit skylight manufacturer.

3.3 CLEANING

A. Clean exposed unit skylight surfaces according to manufacturer's written instructions. Touch up damaged metal coatings and finishes.
B. Remove excess sealants, glazing materials, dirt, and other substances.
C. Remove and replace glazing that has been broken, chipped, cracked, abraded, or damaged during construction period.
D. Protect unit skylight surfaces from contact with contaminating substances resulting from construction operations.
E. Unit Skylight Operating System: Clean and lubricate joints and hardware. Adjust for proper operation.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain unit skylight operating system.

END OF SECTION

SECTION 087163 - DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware
2. Electronic access control system components

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 "General Requirements" sections for Allowances, Alternates, Owner Furnished Contractor Installed, Project Management and Coordination.
2. Division 06 Section "Rough Carpentry"
3. Division 06 Section "Finish Carpentry"
4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:
   a. "Detention Doors and Frames"
   b. "Sectional Overhead Doors"
   c. "Security Windows"
   d. "Security Glazing"
6. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
7. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

1.02 REFERENCES

A. UL LLC

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature

4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code
2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
   a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
   b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
   a. Wiring Diagrams: For power, signal, and control wiring and including:
      1) Details of interface of electrified door hardware and building safety and security systems.
      2) Schematic diagram of systems that interface with electrified door hardware.
      3) Point-to-point wiring.
      4) Risers.

3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
   a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule:

a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
c. Indicate complete designations of each item required for each opening, include:
    1) Door Index: door number, heading number, and Architect's hardware set number.
    2) Quantity, type, style, function, size, and finish of each hardware item.
    3) Name and manufacturer of each item.
    4) Fastenings and other pertinent information.
    5) Location of each hardware set cross-referenced to indications on Drawings.
    6) Explanation of all abbreviations, symbols, and codes contained in schedule.
    7) Mounting locations for hardware.
    8) Door and frame sizes and materials.
    9) Degree of door swing and handing.
    10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.

5. Key Schedule:
    a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
    b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
    c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
    d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
    e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
    f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:
    a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
    b. Include warranties for specified door hardware.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
    a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
    b. Catalog pages for each product.
    c. Final approved hardware schedule edited to reflect conditions as installed.
    d. Final keying schedule

e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:

1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
   a. Fire door assemblies, in compliance with NFPA 80.
   b. Required egress door assemblies, in compliance with NFPA 101.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
   a. For door hardware: DHI certified AHC or DHC.
   b. Can provide installation and technical data to Architect and other related subcontractors.
   c. Can inspect and verify components are in working order upon completion of installation.
   d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.

4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:
   a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
   b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

2. Smoke and Draft Control Door Assemblies:
   a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105

b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

3. Electrified Door Hardware
   a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

4. Accessibility Requirements:
   a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings

1. Keying Conference
   a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
      1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
      2) Preliminary key system schematic diagram.
      3) Requirements for key control system.
      4) Requirements for access control.
      5) Address for delivery of keys.

2. Pre-installation Conference
   a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   b. Inspect and discuss preparatory work performed by other trades.
   c. Inspect and discuss electrical roughing-in for electrified door hardware.
   d. Review sequence of operation for each type of electrified door hardware.
   e. Review required testing, inspecting, and certifying procedures.
   f. Review questions or concerns related to proper installation and adjustment of door hardware.

3. Electrified Hardware Coordination Conference:
   a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.

C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.06 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

1.07 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
    a. Mechanical Warranty
        1) Locks
            a) Schlage ND Series: 10 years
        2) Exit Devices
            a) Von Duprin: 10 years
        3) Closers
            a) LCN 4000 Series: 30 years
        4) Cylinders
            a) 3 years

1.08 MAINTENANCE

A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

B. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.

B. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

C. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fabrication

1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer's recognized installation standards for application intended.
2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with "Metal Doors and Frames", "Flush Wood Doors", "Stile and Rail Wood Doors" to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

C. Cable and Connectors:

1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. Ives 5BB series
b. Stanley

2. Acceptable Manufacturers and Products:
a. Hager BB1191/1279 series
b. McKinney TB series
c. Best FBB series

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
b. Interior: Heavy weight, steel, 5 inches (127 mm) high

5. 2 inches or thicker doors:
a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
b. Interior: Heavy weight, steel, 5 inches (127 mm) high

6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
7. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
8. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
a. Steel Hinges: Steel pins
b. Non-Ferrous Hinges: Stainless steel pins
c. Out-Swinging Exterior Doors: Non-removable pins
d. Out-Swinging Interior Lockable Doors: Non-removable pins
e. Interior Non-lockable Doors: Non-rising pins

9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

2.04 CONTINUOUS HINGES

A. Manufacturers:

1. Scheduled Manufacturer:
a. Ives

2. Acceptable Manufacturers:
a. Select
b. Best
c. Roton
d. ABH
e. Hager

B. Requirements:

1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
7. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.05 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Schlage ND series

2. Acceptable Manufacturers and Products:
   a. Best

B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
2. Indicators: Where specified, provide escutcheon with lock status indicator window on top of lockset rose:
   a. Escutcheon height (including rose) 6.05 inches high by 3.68 inches wide.
   b. Indicator window measuring a minimum 3.52-inch by .60 inch with 1.92 square-inches of front facing viewing area and 180-degree visibility with a total of .236 square-inches of total viewable area.
   c. Provide snap-in serviceable window to prevent tampering. Lock must function if indicator is compromised.
   d. Provide messages color-coded with full text and symbol, as scheduled, for easy visibility.
   e. Unlocked and Unoccupied message will display on white background, and Locked and Occupied message will display on red background.
3. Cylinders: Refer to "KEYING" article, herein.
4. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
5. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
6. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
7. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
8. Provide electrified options as scheduled in the hardware sets.
9. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
   a. Lever Design: RHODES

2.06 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Von Duprin 98/35A series

2. Acceptable Manufacturers and Products:
   a. Precision APEX 2000 series

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide smooth touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with manufacturer's approved strikes.
9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.07 ELECTRIC STRIKES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Von Duprin 6000 Series

2. Acceptable Manufacturers and Products:
   a. Folger Adam 300 Series
   b. HES 1006 Series

B. Requirements:

1. Provide electric strikes designed for use with type of locks shown at each opening.
2. Provide electric strikes UL Listed as burglary resistant that are tested to a minimum endurance test of 1,000,000 cycles.
3. Where required, provide electric strikes UL Listed for fire doors and frames.
4. Provide transformers and rectifiers for each strike as required. Verify voltage with electrical contractor.

2.08 CYLINDERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Best Patented

2. Acceptable Manufacturers and Products:
   a. No Substitute-Owner standard

B. Requirements:

1. Provide cylinders/cores compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset; manufacturer's series as indicated. Refer to "KEYING" article, herein.
2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
   a. Patented Restricted Small Format: cylinder with small format interchangeable cores (SFIC) with restricted, patented keyway.

3. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent protected.
4. Nickel silver bottom pins.

2.09 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. LCN 4040XP series

2. Acceptable Manufacturers and Products:
   a. Sargent 281 series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch (38 mm) diameter piston with 5/8-inch (16 mm) diameter double heat-treated pinion journal. QR code with a direct link to maintenance instructions.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.

5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards. Provide snap-on cover clip, with plastic covers, that secures cover to spring tube.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck. Provide graphically labelled instructions on the closer body adjacent to each adjustment valve. Provide positive stop on reg valve that prevents reg screw from being backed out.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.
11. Closers shall be capable of being upgraded by adding modular mechanical or electronic components in the field.

2.10 CONCEALED DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. LCN 2030 series

2. Acceptable Manufacturers and Products:

B. Requirements:

1. Provide concealed door closers at doors conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory.
2. Provide heavy duty, single-acting closers with single lever arm and roller assembly.
3. Provide closers capable of being mounted in a minimum 1-3/4-inch header.
4. Provide concealed door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
5. Cylinder Body: 1-1/8-inch (29 mm) piston diameter, with 5/8-inch (16 mm) diameter heat-treated pinion journal.
6. Provide all-weather hydraulic fluid, fireproof, passing requirements of UL10C.
7. Pressure Relief Valve (PRV) Technology: Not permitted.
8. Provide special template, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.11 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Elmes

b. Burns
c. Trimco
d. Rockwood

B. Requirements:

1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

2.12 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Burns
   b. Trimco
   c. Rockwood

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.13 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers:
   a. Glynn-Johnson

2. Acceptable Manufacturers:
   a. Rixson
   b. Sargent
   c. ABH

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.

2.14 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:

a. Zero International
b. PEMKO

2. Acceptable Manufacturers:
a. National Guard
b. Reese
c. DHSI
d. Legacy
e. Pemko

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.15 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:
a. Ives

2. Acceptable Manufacturers:
a. Burns
b. Rockwood
c. Trimco

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.16 MAGNETIC HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:
a. LCN

2. Acceptable Manufacturers:
a. Rixson
b. Sargent

B. Requirements:

1. Provide wall or floor mounted electromagnetic door release as specified with minimum of 25 pounds of holding force. Coordinate projection of holder and armature with other hardware and wall conditions to ensure that door sits parallel to wall when fully open. Connect magnetic holders on fire-rated doors into the fire control panel for fail-safe operation.

2.17 FINISHES

A. FINISH: BHMA 626/652 (US26D); EXCEPT:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Latch Protectors: BHMA 630 (US32D)
9. Weatherstripping: Clear Anodized Aluminum
10. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
4. Installation Guide for Doors and Hardware: DHI TDH-007-20

B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.

C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

I. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:

1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Connections to panel interface modules, controllers, and gateways.
6. Testing and labeling wires with Architect's opening number.

J. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

K. Continuous Hinges: Re-locate the door and frame fire rating labels where they will remain visible so that the hinge does not cover the label once installed.

L. Door Closers & Auto Operators: Mount closers/operators on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

M. Overhead Stops/Holders: Mount overhead stops/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

N. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.

O. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

P. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

Q. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

R. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

S. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.03 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.04 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items per manufacturer's instructions to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

D. Hardware Sets:

Abbreviation	Name
BES	Best Locking Systems
GLY	Glynn-Johnson Corp
IVE	H.B. Ives
LCN	LCN Commercial Division
SCH	Schlage Lock Company
TRI	Trimco/Bbw/Quality
VON	Von Duprin
ZER	Zero International Inc
ASSA	ASSA ALBOY
AI	AIRTEQ
OFCI	Owner Furnished, contractor installed
SS	SOUTHERN STEEL
PEM	PEMKO

NOTE: ALL HARDWARE SHALL BE SATIN CHROME 652 OR 626

HW GROUP: 1 CELL DOORS – 20 MIN RATED

For use on Door #(s):

132	133	134	135	136	137
138	139	140	141	142	143
144	145	146	206	207	208
209	210	211	212	213	214
215	216	217	218	219	220

Each to have:

3	EA	HINGE	604FMCS 4 ½ X 41/2 32D OR EQUAL	AI
1	EA	DETENTION LOCK	AIRTEQ 9500	AI
1	EA	MORTISE CYLINDER	ASSA 6551-10 1 1/8	ASSA
1	EA	DOOR POSITION SWITCH	Airteq 6200 DPS	AI
1	EA	FLUSH PULL W/ TAMPER RESISTANT SCREWS	Airteq 614	AI
1	EA	OFFSET STRIKE/PULL W/ DPS PREP	AIRTEQ 3”	AI
1	EA	CYLINDER STOPS		
1	EA	GASKETING	ANTI-LIG 5050B HEAD & JAMBS	AI
1	EA	FOOD PASS	DROP DOWN BY DOOR MFG	
2	EA	FOOD PASS HINGE	BY DOOR MFG	
1	EA	FOOD PASS LOCK	1017AM	SS

HW GROUP: 2 MAIN POD ENTRANCE – 45 MIN RATED

For use on Door #(s):

131 152 154

Each to have:

3	EA	HINGE	604FMCS 4 ½ X 41/2 32D OR EQUAL	AI
1	EA	DETENTION LOCK	AIRTEQ 9500	AI
1	EA	MORTISE CYLINDER	ASSA 6551-10 1 1/8	ASSA
1	EA	DOOR POSITION SWITCH	Airteq 6200 DPS	AI
1	EA	FLUSH PULL W/ TAMPER RESISTANT SCREWS	Airteq 614	AI
1	EA	OFFSET STRIKE/PULL W/ DPS PREP	AIRTEQ 3”	AI
1	EA	CYLINDER STOPS		
1	EA	GASKETING	ANTI-LIG 5050B HEAD & JAMBS	AI

HW GROUP:3 EXTERIOR DOORS – NOT RATED –

For use on Door #(s):

101 107 112 120 130 148
150 153 155 156

Each to have:

3	EA	HINGE	604FMCS 4 ½ X 41/2 32D OR EQUAL	AI
1	EA	DETENTION LOCK	AIRTEQ 9500	AI
1	EA	MORTISE CYLINDER	ASSA 6551-10 1 1/8	ASSA
1	EA	DOOR POSITION SWITCH	Airteq 6200 DPS	AI
1	EA	FLUSH PULL W/ TAMPER RESISTANT SCREWS	Airteq 614	AI
1	EA	OFFSET STRIKE/PULL W/ DPS PREP	AIRTEQ 3”	AI
1	EA	CYLINDER STOPS		
1	EA	GASKETING	ANTI-LIG 5050B HEAD & JAMBS	AI
1	EA	RAIN DRIP	142AA	PEM
1	EA	DOOR SWEEP	39A	PEM
1	EA	THRESHOLD	655A-233	PEM

HW GROUP:3A EXTERIOR DOORS – ¾ HOUR RATED

For use on Door #(s):
159

Each to have:

3	EA	HINGE	604FMCS 4 ½ X 41/2 32D OR EQUAL	AI
1	EA	DETENTION LOCK	AIRTEQ 9500	AI
1	EA	MORTISE CYLINDER	ASSA 6551-10 1 1/8	ASSA
1	EA	DOOR POSITION SWITCH	Airteq 6200 DPS	AI
1	EA	FLUSH PULL W/ TAMPER RESISTANT SCREWS	Airteq 614	AI
1	EA	OFFSET STRIKE/PULL W/ DPS PREP	AIRTEQ 3”	AI
1	EA	CYLINDER STOPS		
1	EA	GASKETING	ANTI-LIG 5050B HEAD & JAMBS	AI
1	EA	RAIN DRIP	142AA	PEM
1	EA	DOOR SWEEP	39A	PEM
1	EA	THRESHOLD	655A-233	PEM

HW GROUP:3B EXTERIOR DOORS – OUTDOOR REC

For use on Door #(s):
157 158

Each to have:

3	EA	HINGE	604FMCS 4 ½ X 41/2 32D OR EQUAL	AI
1	EA	DETENTION LOCK	AIRTEQ 9500	AI
1	EA	MORTISE CYLINDER	ASSA 6551-10 1 1/8	ASSA
1	EA	DOOR POSITION SWITCH	Airteq 6200 DPS	AI
1	EA	FLUSH PULL W/ TAMPER RESISTANT SCREWS	Airteq 614	AI
1	EA	OFFSET STRIKE/PULL W/ DPS PREP	AIRTEQ 3”	AI
1	EA	CYLINDER STOPS		
1	EA	RAIN DRIP	142AA	PEM
1	EA	THRESHOLD	655A-233	PEM

HW GROUP: 4 Corridor, break, janitor –RATED

For use on Door #(s):

100	102	103	109	110	117
118	119	121	122	123	124
125	126	127	200	201	202
203	204				

Each to have:

3	EA	HINGE	604FMCS 4 ½ X 41/2 32D OR EQUAL	AI
1	EA	DETENTION LOCK	AIRTEQ 9500	AI
1	EA	MORTISE CYLINDER	ASSA 6551-10 1 1/8	ASSA
1	EA	DOOR POSITION SWITCH	Airteq 6200 DPS	AI
1	EA	FLUSH PULL W/ TAMPER RESISTANT SCREWS	Airteq 614	AI
1	EA	OFFSET STRIKE/PULL W/ DPS PREP	AIRTEQ 3”	AI
1	EA	CYLINDER STOPS		
1	EA	GASKETING	ANTI-LIG 5050B HEAD & JAMBS	AI
1	EA	CONCEALED CLOSER	2030 BUMP TORX	LCN

HW GROUP: 4A KITCHEN/ CORRIDOR –RATED

For use on Door #(s):

104	105

Each to have:

3	EA	HINGE	604FMCS 4 ½ X 41/2 32D OR EQUAL	AI
1	EA	DETENTION LOCK	AIRTEQ 9500	AI
1	EA	MORTISE CYLINDER	ASSA 6551-10 1 1/8	ASSA
1	EA	DOOR POSITION SWITCH	Airteq 6200 DPS	AI
1	EA	FLUSH PULL W/ TAMPER RESISTANT SCREWS	Airteq 614	AI
1	EA	OFFSET STRIKE/PULL W/ DPS PREP	AIRTEQ 3”	AI
1	EA	CYLINDER STOPS		
1	EA	GASKETING	ANTI-LIG 5050B HEAD & JAMBS	AI
1	EA	SURFACE CLOSER WITH HOLD OPEN	4050A HW/PA	LCN

HW GROUP: 5 EMPLOYEE RESTROOMS

For use on Door #(s):
114 115 116 118A

Each to have:

3	EA	HINGE	5BB1 4.5 X 4.5 NRP		IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	ND40S RHO OS-OCC		SCH
1	EA	SFIC CORE	1E-74 PATD 626		BES
1	EA	WALL OR FLOOR STOP			
1	EA	GASKETING	488SBK PSA ZAG	BK	PEM
1	EA	SURFACE CLOSER	4040XP RW/PA MC		LCN

HW SET: 05A KITCHEN RESTROOM

For use on Door #(s):
104A

Each to have:

3	EA	HINGE	5BB1 4.5 X 4.5 NRP		IVE
1	EA	ENTRANCE OFFICE	ND50 RHO OS-LOC		SCH
1	EA	SFIC CORE	1E-74 PATD 626		BES
1	EA	WALL OR FLOOR STOP			
1	EA	GASKETING	488SBK PSA ZAG	BK	PEM

HW GROUP: 6 KITCHEN DOUBLE-DOOR

For use on Door #(s):
106

Each to have:

6	EA	HINGE	5BB1 4.5 X 4.5 NRP	IVE
1	SET	AUTO FLUSH BOLT	FB31P	IVE
1	EA	STOREROOM LOCK	ND80BD RHO	SCH
1	EA	COORDINATOR	COR X FL	IVE
2	EA	MOUNTING BRACKET	MB	IVE
2	EA	SURFACE CLOSER WITH HOLD OPEN	4050A HW/PA	LCN
2	EA	WALL OR FLOOR STOP		
1	EA	GASKETING	8303AA	PEM
1	EA	DOOR SWEEP	39A	PEM
1	EA	THRESHOLD	655A-233	PEM

HW GROUP: 6A CONTROL DOUBLE-DOOR

For use on Door #(s):
118C

Each to have:

6	EA	HINGE	5BB1 4.5 X 4.5 NRP	IVE
1	SET	AUTO FLUSH BOLT	FB31P	IVE
1	EA	PASSAGE	ND10 RHO	SCH
1	EA	COORDINATOR	COR X FL	IVE
2	EA	MOUNTING BRACKET	MB	IVE
2	EA	SURFACE CLOSER WITH HOLD OPEN	4050A HW/PA	LCN
2	EA	WALL OR FLOOR STOP		

HW SET: 7 STOREROOM LOCK W CLOSER

For use on Door #(s):
104B 104C 113 118B

Each to have:

3	EA	HINGE	5BB1 4.5 X 4.5 NRP		IVE
1	EA	STOREROOM LOCK	ND80BD RHO		SCH
1	EA	SFIC CORE	1E-74 PATD 626		BES
1	EA	WALL OR FLOOR STOP			
3	EA	SILENCER	SR64	GRY	IVE
1	EA	SURFACE CLOSER	4040XP RW/PA MC		LCN

HW GROUP: 8 CONTROL & SOME HALLWAYS –-RATED

For use on Door #(s):
118 147 149 221 222

Each to have:

3	EA	HINGE	604FMCS 4 ½ X 41/2 32D OR EQUAL	AI
1	EA	DETENTION LOCK	AIRTEQ 9500	AI
1	EA	MORTISE CYLINDER	ASSA 6551-10 1 1/8	ASSA
1	EA	DOOR POSITION SWITCH	Airteq 6200 DPS	AI
1	EA	FLUSH PULL W/ TAMPER RESISTANT SCREWS	Airteq 614	AI
1	EA	OFFSET STRIKE/PULL W/ DPS PREP	AIRTEQ 3”	AI
1	EA	CYLINDER STOPS		
1	EA	GASKETING	ANTI-LIG 5050B HEAD & JAMBS	AI

HW GROUP: 9 EXTERIOR ELECTRIC RM -STOREROOM CLOSER

For use on Door #(s):
101

Each to have:

3	EA	HINGE	5BB1 4.5 X 4.5 NRP		IVE
1	EA	STOREROOM LOCK	ND80BD RHO		SCH
1	EA	SFIC CORE	1E-74 PATD 626		BES
1	EA	WALL STOP	WS406/407CCV		GLY
1	EA	SURFACE CLOSER	4040XP RW/PA MC		LCN
1	EA	RAIN DRIP	142AA		PEM
1	EA	GASKETING	8303AA		PEM
1	EA	DOOR SWEEP	39A		PEM
1	EA	THRESHOLD	655A-233		PEM

HW GROUP: 10 PASSAGE W CLOSER

For use on Door #(s):
111

Each to have:

3	EA	HINGE	5BB1 4.5 X 4.5 NRP		IVE
1	EA	PASSAGE	ND10 RHO		SCH
1	EA	SURFACE CLOSER	4040XP RW/PA MC		LCN
1	EA	WALL OR DOOR STOP			
1	EA	GASKETING	488SBK PSA ZAG	BK	PEM

HW GROUP: R1 GARAGE DOORS

For use on Door #(s):
108 151

Each to have:

	EA	NOTE	ALL HARDWARE BY ROLL UP DOOR MANUFACTURER

NOTE: THIS DOOR MUST HAVE A DPS AND BE CONTROLLED BY CONTROL

HW SET: C1 PLUMBING CHASES MAIN FLOOR FIRE

For use on Door #(s):
C1 C2
NOTE: THERE ARE 14 OF THESE DOORS

Each to have:

1	EA	CHASE DEADBOLT	661BD	SCH
1	EA	GASKETING	ANTI-LIG 5050B HEAD & JAMBS	AI
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	IVE

HW SET: C1 PLUMBING CHASES MAIN FLOOR FIRE

For use on Door #(s):
C3 C4 C5

Each to have:

1	EA	CHASE DEADBOLT	661BD	SCH
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	IVE

END OF SECTION

Door Numbers	HwSet#
100	4
101	3
102	4
103	4
104	4A
104A	5A
104B	7
104C	7
105	4A
106	6
107	3
108	R1
109	4
110	4
111	10
112	3
113	7
114	5
115	5
116	5
117	4
118	4
118A	5
118B	7
118C	6A
119	4
120	3
121	4
122	4
123	4
124	4
125	4
126	4
127	4
130	3
131	2
132	1
133	1
134	1
135	1
136	1
137	1
138	1
139	1
140	1
141	1
142	1
143	1

Door Numbers	HwSet#
144	1
145	1
146	1
147	8
148	3
149	8
150	3
151	R1
152	2
153	3
154	2
155	3
156	3
157	3B
158	3B
159	3A
200	4
201	4
202	4
203	4
204	4
205	4
206	1
207	1
208	1
209	1
210	1
211	1
212	1
213	1
214	1
215	1
216	1
217	1
218	1
219	1
220	1
221	8
222	8
C1	C1 (7 DOORS)
C2	C1 (7 DOORS)
C3	C2
C4	C2
C5	C2

SECTION 08 88 13 FIRE-RATED GLASS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Fire-rated glazing materials installed as vision lights in fire-rated doors.
2. Fire-rated glazing materials installed as [sidelites] [transoms] [borrowed lites] in fire-rated frames and [wall applications].

B. Related Sections include the following:
1. Section 08 11 00 “Metal Doors and Frames” for vision panels in interior doors and interior vision panel (borrowed lites) frames.
2. Section 08 14 16 “Flush Wood Doors” for vision panels in interior doors.
3. [Section 09 21 00 “Gypsum Board Assemblies” for gypsum board and metal stud framed area separation partition walls.]

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
1. ASTM E 119: Fire Tests of Building Construction and Materials.

B. American National Standards Institute (ANSI):
1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings

C. Consumer Product Safety Commission (CPSC):
1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials

D. Glass Association of North America (GANA):
1. GANA – Glazing Manual.
2. FGMA – Sealant Manual.

E. National Fire Protection Association (NFPA):
1. NFPA 80: Fire Doors and Windows.

F. Underwriters Laboratories, Inc. (UL):
1. UL 263: Fire tests of Building Construction and Materials

G. Standard Council of Canada:
1. CAN/ULC-S101 Standard Test of Fire Endurance Tests of Building Construction and Materials
2. CAN/ULC-S104 Standard Method of Fire Tests of Door Assemblies
3. CAN/ULC-S106 Standard Method of Fire Tests of Window and Glass Block Assemblies

H. IBC 2018

1.3 PERFORMANCE REQUIREMENTS

A. Fire-rated, clear and wireless glazing material for use in locations such as doors, sidelites, transoms, borrowed lites, and wall applications with fire rating requirements ranging from 45 minutes to 2 hours with required hose stream test; for use in interior and exterior applications.

B. Provides protection by reducing the radiant and conductive heat transfer

1.4 SUBMITTALS

A. Comply with requirements of Section 01 00 10.

B. Product data: Submit manufacturer's technical data for each glazing material required, including installation and maintenance instructions.

C. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction.

D. Product Test Listings: From UL indicating fire-rated glass complies with requirements, based on comprehensive testing of current product.

E. Samples: Submit, for verification purposes, approx. 8-inch by 10-inch sample for each type of glass indicated.

1.5 QUALITY ASSURANCE

A. Glazing Standards: FGMA Glazing Manual and Sealant Manual.

B. Fire Resistance Rated Glass: Each lite shall bear permanent, nonremovable label of UL certifying it for use in tested and rated fire resistive assemblies.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials under provisions of Section 01 00 10.

B. Deliver materials to specified destination in manufacturer or distributor's packaging, undamaged, complete with installation instructions.

C. Pilkington Pyrostop® must not be exposed outside the range -40 degrees F to 120 degrees F (-40 degree C to +50 degrees C) during storage and transportation.

D. Store off ground, under cover, protected from weather and construction activities.

E. Do not expose the non-PVB side of glass to UV light.

F. Store sheets of glass vertically. DO NOT lean.

1.7 WARRANTY

A. Provide manufacturer's limited warranty.

PART 2 - PRODUCTS

2.1 FIRE-RATED GLAZING MATERIALS

A. Manufacturer: Pilkington Pyrostop® as manufactured by the Pilkington Group and distributed by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065, voice (800.426.0279), e-mail tgp.sales@allegion.com, Web site www.fireglass.com.
1. Or Equal

B. Composition: Composed of multiple sheets of “Optiwhite” high visible light transmission glass laminated with an intumescent interlayer.

C. Properties:
1. Thickness: For Interior Use: [3/4”, #45-200], [7/8”, #60-101], [1-1/16” #60-201], [1-7/16, #90-102], [2-1/8”, #120-104] [2-1/4”, #120-106] [2-13/16”, #120-401].
1. Weight: Varies with thickness (approximate range 9 to 22 lbs./sq. ft.).
2. Approximate Visible Transmission: Varies with thickness (approximate range 88 to 75 percent).
3. Fire-rating: Up to 2 hours.
4. Impact Safety Resistance: ANSI Z97.1 and CPSC 16CFR1201 (Cat. I and II).
5. STC Rating: Up to 46 dB.

D. Permanently label each piece of Pilkington Pyrostop® with the appropriate marking.

E. Fire Rating – 60 Minutes and Greater: Fire rating classified and labeled by UL for fire rating scheduled at opening locations on drawings, when tested in accordance with ASTM E 119 and UL 263.

F. Substitutions: Or Equal as approved by Architect

2.2 GLAZING COMPOUND FOR FIRE-RATED GLAZING MATERIALS

A. Glazing Tape: Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to effect an air and vapor seal.

B. Silicone Sealant: One-part neutral curing silicone, medium modulus sealant, Type S; Grade NS; Class 25 with additional movement capability of 50 percent in both extension and compression (total 100 percent); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable. Available Products:
1. Dow Corning 795 - Dow Corning Corp.
2. Silglaze-II 2800 - General Electric Co.
3. Spectrem 2 - Tremco Inc.

C. Setting Blocks: Hardwood or calcium silicate; glass width by 4 inches by 3/16 inch thick.

D. Spacers: Neoprene or other resilient blocks of 40 to 50 Shore A durometer hardness, adhesive-backed on one face only, tested for compatibility with specified glazing compound.

E. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

2.3 FABRICATION

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine glass framing, with glazier present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
   2. Minimum required face or edge clearances.
   3. Observable edge damage or face imperfections.

B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

C. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.2 INSTALLATION (GLAZING)

A. Comply with referenced GANA standards and instructions of manufacturers of glass, glazing sealants, and glazing compounds.

B. Protect glass from edge damage during handling and installation. Inspect glass during installation and discard pieces with edge damage that could affect glass performance.

C. Cut glazing tape to length and set against permanent stops, flush with sight lines to fit openings exactly, with stretch allowance during installation.

D. Place setting blocks located at quarter points of glass with edge block no more than 6-inches from corners.

E. Glaze vertically into labeled fire-rated metal frames or partition walls with the same fire rating as glass and push against tape for full contact at perimeter of pane or unit.

F. Place glazing tape on free perimeter of glazing in same manner described above.

G. Do not remove protective edge tape.

H. Install removable stop and secure without displacement of tape.

I. Do not pressure glaze.

J. Glaze exterior openings with PVB layer toward the exterior of the building.

K. Knife trim protruding tape.

L. Apply cap bead of silicone sealant along void between the stop and the glazing, to uniform line, with bevel to form watershed away from glass. Tool or wipe sealant surface smooth.

M. Provide minimum 3/16 inch edge clearance.

N. Install in vision panels in fire-rated doors to requirements of NFPA 80.

O. Install so that appropriate UL and Pilkington Pyrostop® markings remain permanently visible.

3.3 PROTECTION AND CLEANING

A. Protect glass from contact with contaminating substances resulting from construction operations. Remove any such substances by method approved by glass manufacturer.

B. Wash glass on both faces not more than four days prior to date scheduled for inspections intended to establish date of substantial completion. Wash glass by method recommended by glass manufacturer.

3.4 GLAZING SCHEDULE

A. Interior Use:

Fire Rating	**Manufacturer Designation**	**Supply Form**	**Thickness**	**Weight Approx.**	**U-Value**	**Daylight Trans. Approx. (%)**	**STC Rating Approx. (dB)**	**Assembly**	**Max. Exposed Area (Sq. In.)**	**Mx. Width Of Exposed Glazing (In.)**	**or**	**Max. Height Of Exposed Glazing (In.)**
45 min.	45-200	Single Glazing	3/4" (19 mm)	9.22 lb / ft2 (45.00 kg / m2)	.86	86	40	Other than doors Door	4,500 3,724	95-1/4 41-5/8		95-1/4 89-3/4
60 min.	60-101	Single Glazing	7/8" (23 mm)	10.86 lb / ft2 (53.00 kg / m2)	.83	87	41	Other than doors Door	5,616 3,724	96 41-5/8		96 89-3/4
60 min.	60-201	Single Glazing	1-1/16" (27 mm)	12.90 lb / ft2 (63.00 kg / m2)	.83	86	44	Other than doors Door	7,442 3,724	96 41-5/8		118-1/4 89-3/4
90 min.	90-102	Single Glazing	1-7/16" (37 mm)	17.61 lb / ft2 (86.00 kg / m2)	.74	84	45	Other than doors Door	3,724 3,724	96 41-5/8		96 89-3/4
2 hr.	120-104	I.G. Units	2-1/8" (54 mm) [with 8 mm spacer, or 2-3/8" (60 mm) with 14 mm	21.71 lb / ft2 (106.00 kg / m2)	.44	75	46	Other than doors	3,730	111		111

			spacer]								
2 hr.	120-106	I.G. Units	2-1/4" (57 mm)	22.94 lb / ft2 (112.00 kg / m2)	.42	75	46	Other than doors	3,730	111	111
2 hr.	120-401	I.G. Units	2-13/16" (72 mm)	30.72 lb / ft2 (150.00 kg / m2)	.46	73	45	Fireframes ClearFloor ® System	2,372	47-1/4	50-3/8

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 REFLECTIVE FILM

A. Provide 3M Privacy series one-way mirror film or equal.

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 092800- BULLET RESISTANT FIBERGLASS PANEL

PART 1 – GENERAL

1.1 SECTION INCLUDES
- A. Bullet Resistant Fiberglass Panel

1.2 SUBMITTALS
- A. Product Data for each type of product indicated.

1.3 QUALITY ASSURANCE
- A. Underwriters Laboratories UL 752
- B. National Institute of Justice (NIJ) (I, II-A, II, III-A, III)
- C. MIL-P-46593A (ORD) V-50 test
- D. ASTM E119-ooA (1 hour fire test)
- E. ASTME-84-91a (Surface Burning Characteristics)
- F. Nominal weights and thicknesses

1.4 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. Insulgard Security Products. www.insulgard.com, (800) 624-6315.
  1. FG 100
  2. Or approved Equal

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.

2.3 AUXILIARY MATERIALS:
- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
  1. Reinforcement using a 4" wide strip of the same material as a batten.
  2. Fasteners per manufacturers recommendation.

PART 3 – EXECUTION

3.1 At butt joints install 4" wide strip of same material as a batten.

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,FRP, and any restroom walls and walls with plumbing 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 096501 - RESILIENT BASE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes resilient base.
B. Section includes Stainless Steel Cove Base.

1.2 SYSTEM DESCRIPTION

A. Resilient Flooring: Conform to applicable code for flame/smoke rating in accordance with ASTM E 648.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer’s product data.

B. Samples:
   1. Submit manufacturer's complete set of color samples for initial selection.

1.4 CLOSE-OUT SUBMITTALS

A. Operation and Maintenance Data: Submit maintenance instruction and data.

1.5 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Resilient Base (RB): ASTM F-1861 vinyl; top set coved
   1. Height: 4 inch.
   2. Thickness: 0.125 inch thick.
   3. Length: Roll.
   4. Color: as selected.

B. Stainless Steel Cove Base:
   1. Sani-Cove Base by Crane Composites or equal

2.2 ACCESSORIES

A. Primers and Adhesives: Waterproof, types recommended by material manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that walls are acceptable to line, grade and surface.

3.2 PREPARATION

A. Clean substrate.

B. Fill minor low spots and other defects.

C. Apply primer as required to prevent "bleed-thru" or interference with adhesion by substances that cannot be removed. Apply primer to surfaces.

3.3 INSTALLATION

A. Adhere base tight to wall and floor surfaces.

B. Fit joints tightly and make vertical. Miter internal corners.

3.4 CLEANING

A. Remove excess adhesive from surfaces without damage.

END OF SECTION

SECTION 096723 – RESINOUS FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes:

1. High-performance resinous flooring systems.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Installer Certificates for Qualification: Signed by manufacturer stating that installers comply with specified requirements.

C. Material Certificates: For each resinous flooring component, from manufacturer.

D. Maintenance Data: For maintenance manuals.

E. Samples: Submit two 6” X 6” samples of each resinous flooring system applied to a rigid backing. Provide sample which is a true representation of proposed field applied finish. Provide sample color and texture for approval from Owner in writing or approved by General Contractor prior to installation.

F. Product Schedule: For resinous flooring.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of flooring systems required for this Project.

1. Engage an installer who is approved in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.

2. Installer Letter of Qualification: Installer to provide letter stating that they have been in business for at least 5 years

B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

C. Pre-installation Conference: Conduct conference at Project site before work and mockups begin.

D. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution. Do not cover up mockup area.

1. Apply mockup on 04 square foot cement board as a sample.

2. Finish surfaces for verification of products, color, texture, and sheen.

3. Mockup shall demonstrate desired slip resistance for review and approval by Owner's representative in writing.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

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. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. The Sherwin Williams Company, Cleveland, OH. swflooring@sherwin.com.

2. Basis of Design Product: Fastop Topfloor SL13.

3. Substitutions must be approved in writing 10 days prior to bid date.

a. 1st Coat: Primer Resuflor Aqua 3477 applied at 250 sq. ft./gal

b. 2nd Coat: Slurry - **1/16”** FasTop 4080 with 5035 applied at 60-65 sq. ft. / unit. To achieve **1/8”**, broadcast 20-40 mesh silica sand 5310-8 at 0.4 lbs per sq. ft. to excess into wet slurry.

c. 3rd Coat: Seal Coat FasTop 4090TC applied at 80-100 sq. ft. / unit.

B. Crown Polymer Advanced Floor Coatings

1. 1/8” Urethane Cement System

a. 8341 CrownPro Pigmented Polyaspartic

b. Sand Broadcast

c. 818 CrownCrete-U

d. Moisture Mitigation Primer: 8303 CrownShield Clear

e. Waterproof & Crack Suppression Membrane: 8502 CrownFlex Clear

f. Cove Binder: CrownCrete – U Cove

2.2 MATERIALS

A. VOC Content of Resinous Flooring: Provide resinous flooring systems, for use inside the weatherproofing system, that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24)].

1. Resinous Flooring: 100 g/L.

2.3 HIGH-PERFORMANCE RESINOUS FLOORING

A. Resinous Flooring: Abrasion-, impact- and chemical-resistant, high-performance, resin-based, monolithic floor surfacing designed to produce a seamless floor.

B. System Characteristics:

1. Color and Pattern: As indicated from manufacturers listed above.
2. Slip Resistance: Provide slip resistant finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Inspection: Prior to commencing Work, thoroughly examine all underlying and adjoining work, surfaces and conditions upon which Work is in any way dependent for perfect results. Report all

conditions which affect Work. No "waiver of responsibility" for incomplete, inadequate or defective underlaying and adjoining work, surfaces and conditions will be considered, unless notice of such unsatisfactory conditions has been filed and agreed to in writing before Work begins. Commencement of Work constitutes acceptance of surfaces.

B. Surface Preparation: Remove all surface contamination, loose or weakly adherent particles, laitance, grease, oil, curing compounds, paint, dust and debris by blast track method or approved mechanical means (acid etch not allowed). If surface is questionable try a test patch. Create a minimum surface profile for the system specified in accordance with the methods described in ICRI No. 03732 to achieve profile CSP 3-4 as follows:

1.	Thin film, to 10 mils	CSP-1 to CSP-3
2.	Thin and medium films, 10 to 40 mils	CSP-3 to CSP-5
3.	Self-leveling mortars, to 3/16”	CSP-4 to CSP-6
4.	Mortars and laminates, to 1/4” or more	CSP-5 to CSP-10

C. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.

1. Moisture Testing: Perform tests indicated below.

a. Calcium Chloride Test: Perform anhydrous calcium chloride test per ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours. Perform tests so that each test area does not exceed 1000 sq. ft. and perform 3 tests for the first 1000 sq. ft. and one additional test for every additional 1000 sq ft.

b. In-Situ Probe Test: Perform relative-humidity test using in-situ probes per ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative-humidity-level measurement.

3.2 ENVIRONMENTAL CONDITIONS

A. All applicators and all other personnel in the area of the RF installation shall take all required and necessary safety precautions. All manufacturers’ installation instructions shall be implicitly instructions shall be implicitly followed.

B. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.

C. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

D. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

E. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

F. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

3.3 APPLICATIONS

A. Install resinous floor over properly prepared concrete surface in strict accordance with the manufacturer's directions.

1. Install the primer and/or base coats over thoroughly cleaned and prepared concrete.

2. Install topcoat over flooring after excess aggregate has been removed.

3. Maintain a slab temperature of 60°F to 80°F for 24 hours minimum before applying floor topping, or as instructed by manufacturer.

B. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.

2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.

3. At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.

C. Sealant: Saw cut resinous floor topping at expansion joints in concrete slab. Fill sawcuts with sealant prior to final seal coat application. Follow manufacturer’s written recommendations.

D. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

E. Slip Resistant Finish: Provide grit for slip resistance.

F. Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.

3.4 COMPLETED WORK

A. Cleaning: Upon completion of the Work, clean up and remove from the premises surplus materials, tools, appliances, empty cans, cartons and rubbish resulting from the Work. Clean off all spattering and drippings, and all resulting stains.

B. Protection: Protect Work in accordance with manufacturer's directions from damage and wear during the remainder of the construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

C. Contractor shall insure that coating is protected from any traffic until it is fully cured to the satisfaction of the coating manufacturer.

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.

.

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 101400 - SIGNS

PART 1 GENERAL

1.1 SUMMARY

A. Interior Signage

1. Provide surface mounted panel signs.

B. Exterior Signage

1. Provide fire signage.

2. Provide metal address numerals.

1.2 REFERENCES

A. Standards of the following referenced:

1. American National Standards Institute (ANSI).

B. Industry Standards:

1. Department of Justice, Office of the Attorney General, “Americans with Disabilities Act”, Public Law 1010-336, (ADA).

2. ANSI A117.1: Providing Accessibility and Usability for Physically Handicap People, 1986 edition.

3. Federal Register part III, Department of Justice, Office of the Attorney General 28 CFR Part 36: Nondiscrimination of the Basis of Disability by Public Accommodations and in Commercial Facilities, Final Rule, July 26, 1992.

4. Federal Register part II, Architectural and Transportation Barrier Compliance Board, 36 CFR Part 1191: Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Amendment to Final Guidelines, September 6, 1991.

1.3 DEFINITIONS

A. Terms:

1. Braille: Grade 2 Braille including 189 part-word or whole word contractions in addition to grade 1 Braille 63 characters. Tactile is required whenever braille is required; see “System Description” Section, below.
2. Non-tactile: Letters and numbers on signs with width-to- height ratio between 3:5 and 1:1 and stroke width ration between 1:5 and 1:10 using upper case “X” to calculate ratios.

Use type styles with medium weight; upper and lower-case lettering is permitted; serif type styles are permitted See "System Description" below.

3. Symbols: Symbol itself is not required to be tactile but equivalent verbal description is required both in tactile letters and braille.

4. Tactile: 1/32" raised capital letters without serifs at least 5/8" height and not more than 2" height based on upper case "X". Braille is required whenever tactile is required; see "System Description" Section below.

1.4 SYSTEM DESCRIPTION

A. Signage under this Section is intended to include items for identification, direction, control, and information of building where installed as complete integrated system from a single manufacturer, for each sign type.

B. Tactile Signage requiring tactile graphics per ADA:

1. Surface mounted panel signs (those designating permanent rooms and spaces such as room numbers and restroom, office, and fire exit identifications). Individually applied characters are prohibited.

a. Refer to the signage types and details indicated on the drawings. Signs include restroom, conference, Fire Riser, parking and address numbers.

1.5 SUBMITTALS

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

B. Product Data: Include manufacturer's construction details relative to materials, dimension of individual components, profiles, and finishes for each type of sign required.

1. After review and approval, submit to Architect.

C. Shop Drawings: Provide shop drawings for fabrication location and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, reinforcement, accessories, layout, and installation details.

1. Provide message list for each sign required, including large-scale details of wording and layout of lettering.

2. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of work in other Sections.

3. After review and approval, submit to Architect.

D. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.

1. Samples for verification of color, pattern, and texture selected, and compliance with requirements indicated:

a. Panel Signs: Provide a sample panel about 8- 1/2" by 11" for each material indicated. Include a panel for each color, texture and pattern required. On each panel include a representative sample of the graphic and image process required, showing graphic style, and colors and finishes of letters, numbers, and other graphic devices.

b. Aluminum: Samples of each finish type and color, on 6" long sections of extrusions and not less than 4" squares of sheet or plate. Where finishes involve normal color and texture variations include sample sets showing the full range of variations expected.

2. After review and approval, submit to Architect.

1.6 QUALITY ASSURANCE

A. Single-Source Responsibility: For each separate type of sign required, obtain signs from one source from a single manufacturer, regularly engaged in work of this magnitude and scope for minimum of five (5) years.

B. Design Concept: The Drawings indicate sizes, profiles, and dimensional requirements of signs and are based on the specific types and models indicated. Sign units by other manufacturers may be considered provided deviations in dimensions and profiles do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

PART 2 PRODUCTS

2.1 MANUFACTURERS/PRODUCTS

A. Surface mounted panel signs:

1. Manufacturer: to meet requirements of sign specifications as listed.

2. Product: ADA tactile, 1/8" thick photopolymer phenolic signs.

3. Braille portion mechanically embossed into face material.

4. Name slot: Tamper resistant, Lexan covered.

5. Colors: As selected by Architect. Several colors shall be selected.

6. Font: Style as selected by Architect.

2.2 MATERIALS AND FABRICATION

A. Surface Mounted Panel Signs: ADA tactile signs, 1/8" thick photopolymer phenolic signs for interior use. Braille portion raised minimum 1/32", mechanically embossed into face material.

1. Several colors shall be selected by Architect from full range of signage manufacturer's colors (24 colors minimum).

2. Name slot shall be tamper resistant, Lexan covered.

3. Font: As selected.

B. Fire Signs: Provide aluminum sheet of alloy and temper recommended by the aluminum producer or finisher for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B209 for 5005-H15.

1. Provide permanent sign.

2. Sign board shall be corrosion resistant metal.

C. Metal Letters: Provide (4) 12" metal letters to comply with the requirements indicated for the manufacturing process, materials, finish, style, size, and message content.

1. Cast Letters and Numerals (Address): Form letters by casting. Produce letters with smooth, flat faces, sharp corners, precisely-formed lines and profiles, free from pits, scale, sand holes, or other defects. Cast lugs into the back of the characters and tap to receive threaded mounting studs.

a. Metal: Aluminum.
b. Font: Palatino.
c. Address numbers: 2515
d. Installal as required by the Fire Marshal

2.3 FINISHES

A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related

to appearance, provide color as selected by the Architect from the manufacturer's standards, except where custom colors are indicated.

1. Provide surface mounted panel signs from full line of colors, as selected by Architect.

2. Provide metal letters and numerals in custom color as selected by Architect.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install sign units level, plumb and at the height as indicated with signs free from distortion or other defects in appearance.

1. Locate sign units and accessories where indicated or scheduled, using mounting methods of the type described and in compliance with the manufacturer's directions.

B. Install signs with adhesive and tamper resistant fasteners.

C. Panel Signs:

1. Screw attach panel signs to wall surfaces using countersunk mounting holes located as indicated. Mount units with backs in full contact with wall surfaces.

2. At panel signs mounted to glazing, provide blank panel on opposite side of glazing; same size and finish as panel sign.

3.2 CLEANING AND PROTECTION

A. At completion of the installation, clean soiled sign surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

B. Replace damaged signage prior to installation. Replace installed signs that are damaged prior to Substantial Completion.

END OF SECTION 101400

SECTION 102812 - COMMERCIAL TOILET ACCESSORIES

PART 1 – GENERAL

1.1 SUMMARY

A. Products Furnished and Installed Under This Section:

1. Selected accessories for Rest Rooms.

2. Utility Room accessories.

1.2 SUBMITTALS

A. Action Submittals:

1. Shop Drawings: Schedule showing items used, location where installed, and proper attaching devices for substrate.

B. Closeout Submittals:

1. Operations and Maintenance Data: Include manufacturer's literature or cut sheets in Operations and Maintenance Manual.

2. Warranty Documentation: Include final, executed warranty in Operations and Maintenance Manual.

1.3 WARRANTY

A. Manufacturer's standard warranty against rusting.

PART 2 – PRODUCTS

2.1 MANUFACTURED UNITS

A. Manufacturers:

1. Manufacturer List:

a) American Specialties Inc (ASI), Yonkers, NY

b) Bobrick Washroom Equipment Inc, North Hollywood, CA

c) Bradley Corp, Menomonee Falls, WI

B. Materials:

1. Approved Products.

a) Rest Rooms:

1) Grab Bars:
   a. Concealed mount, 18 ga, type 304 stainless steel, 1-1/2-inch diameter, and nonslip finish in configuration shown on Drawings.
2) Sanitary Napkin Disposal Container: A&J AAI ASI Bobrick. Bradley GAMCO U590 NM-10 0852 B-270 4781-15 ND-1
3) Single Robe Hook with Exposed Fasteners: A&J AAI ASI Bobrick Bradley GAMCO UX110**B OR-B5153 7340B B-671 9114 5153B**
4) Mirrors: Glass with stainless steel channel frame with No. 4 Satin Finish. A&J AAI ASI Bobrick Bradley GAMCO U711 CA Series 0620 B-165 700 Series C series. 18x36
5) Soap Dispenser: Colgate Palmolive Co. CPM 01951 OFCI
6) Paper Towel Dispenser – B-262 OFCI
7) Toilet Paper Dispenser – B69997 OFCI
8) Toilet Seat Cover Dispenser – B-221

b) Janitor/Utility Rooms:
1) Mop Holder: Series B-224 x 36

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install using mounting devices proper for base structure.

B. Where possible, mount like items in adjoining compartments back-to-back on same partition.

END OF SECTION

SECTION 102813 - 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: All products shall be anti-ligature and shall be constructed so that they cannot be disassembled, broken or modified in anyway to create a weapon.
   1. Safety hooks.
   2. Miscellaneous toilet accessories.
   3. Stainless-steel mirrors.
   4. Grab bars.
   5. Shower seats. ADA Shower locations.

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.
d. All Grab bars shall be anti-ligature

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 104416 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Provide fire extinguisher cabinets (FEC), fire extinguishers, mounting brackets (FE) and accessories for a complete installation.

B. All equipment and accessories supplied shall be UL rated.

C. Conform to NFPA 10 requirements for portable fire extinguishers.

1.2 SUBMITTALS

A. Product Data for each type of product specified.

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain fire extinguishers and cabinets from one source from a single manufacturer.

B. Conform to NFPA 10 requirements for portable fire extinguishers.

C. UL-Listed Products: Provide new fire extinguishers which are UL- listed and bear UL “Listing Mark” for type, rating, and classification of extinguisher.

PART 2 PRODUCTS

2.1 MANUFACTURERS/PRODUCTS

A. Fire extinguishers:

1. Manufacturer: J.L. Industries, Inc.

2. Product: “Cosmic 10E” multi-purpose dry chemical type with UL rated multi-purpose dry chemical type 4-A: 80-B: C, 10 lb. nominal capacity. Provide fire extinguishers where indicated on contract documents.

3. At Kitchen: Provide (1) one J.L. Industries “Saturn 15” fire extinguisher with wall mounting bracket. Fire Extinguisher is U.L. rated class “K” 6 liter, 15 lbs.

4. Approved: Larsen’s Manufacturing Co.

5. Other manufacturers must request approval.

B. Brackets:

1. Provide type designed to prevent accidentally dislodging extinguisher, of sizes required for type and capacity of extinguisher, in painted finish.

C. Fire extinguisher cabinets (FEC):

1. Manufacturer: J.L. Industries, Inc. (Design Standard)

2. Product: “Ambassador”, with tempered glass, 2-1/2” rolled edge, semi-recessed units with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and will return at outer edge (backbend)

3. Finish: Baked enameled steel.

4. Door style: “Contemporary V.” Provide continuous hinge and friction latch with keyed lock (one key, minimum, with each cabinet, keyed alike) and “red vertical lettering for “FIRE EXTINGUISHER.”

5. Approved: Larsen’s Manufacturing Co.

6. Other manufacturers must request approval.

D. Provide proper fire-related (UL label) cabinets in fire-rated walls.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install fire extinguisher and brackets in strict conformance with manufacturer’s directions

END OF SECTION 104416

SECTION 105050 METAL LOCKERS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract.

1.02 SUMMARY
A. This Section includes the following:
1. Welded Hallway Lockers
2. Provide fasteners and anchorage devices to install lockers provided under this section.
3. Provide metal filler panels to fill between banks of lockers and adjacent construction.
4. Provide metal angled top from locker to wall framing.

1.03 SUBMITTALS
A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of locker and bench.
B. Shop Drawings: Show lockers in detail, method of installation, fillers, trim, base, and accessories. Include locker numbering sequence information.
C. Samples for verification: Submit one full-size locker sample for evaluation. Adherence to the specification is required. Locker submitted must meet specification regardless of manufacturer's standard product. Submit manufacturer's technical data and installation instructions for metal locker units.
D. Maintenance Data: For adjusting, repairing and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.04 QUALITY ASSURANCE
A. Uniformity and Single Manufacturer Requirements: Provide each type of metal locker as produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.
B. All of the sheet metal parts and all major hardware components used to manufacture this product to be produced in the United States of America. No exceptions will be allowed.
C. Installers Qualifications: Lockers to be installed by an experienced agent of the manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING
A. Packing and Shipping: Do not deliver metal lockers until building is enclosed and ready for locker installation.
B. Storage and Protection: Protect materials from damage during delivery, handling, storage and installation.

1.06 WARRANTY

A. Locker manufacturer shall warrant the lockers for the lifetime use of the original purchaser from date of shipment. Warranty shall include all defects in material and workmanship, excluding finish, vandalism and improper installation.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows:

1. DeBourgh Manufacturing Company

2. List Industries, Inc.

3. Republic Storage Systems Company, Inc.

2.02 FABRICATION

A. Locker Construction

1. Lockers to be welded unibody construction with exposed welds sanded smooth.

2. No bolts, screws or rivets used in assembly of locker units.

3. Ship lockers set-up, ready to be anchored in place in accordance with manufacturer's instructions.

B. Body of Lockers:

1. Tops, Bottoms, and Sides: Exterior sides constructed of 16 gauge domestic cold rolled sheet steel for maximum durability with 18 gauge intermediate partitions.

2. Backs and Intermediate Partitions: Solid sheet of 18 gauge cold rolled sheet steel welded to frames of sides and intermediate partitions.

3. Shelves: Constructed of 18 gauge cold rolled sheet steel welded to sides and intermediate partition construction. Shelves provided in lockers 60-inches and taller, located to provide a minimum of 12-inches clearance.

4. Tier Dividers: Full depth 16 gauge CRS securely welded on all four sides, to combine with tops, bottoms, sides, and intermediate partitions to create four-sided continuous door strike.

C. Continuous Door Strike:

1. Tier dividers, tops and bottoms constructed to provide four-sided, continuous door strike for a secure, sanitary and intrusion-free locker while door is in closed position.

D. Doors:

1. Doors are 16 gauge CRS formed outer panel with double bends on both sides and a single bend on top and bottom with 18 gauge steel formed stiffener panel.

2. Door stiffener runs top to bottom on hinge side of door and is securely welded to outer door to form a reinforced channel for additional torque-free strength and

sound reduction when closing door. (Inner panel not available on 9-inch wide or box lockers 12-inches high or less).

E. Door Ventilation:
- **1.** Louvered Ventilation.

F. Latching:
- **1.** Sentry III Single-Point Latch:
  - **a.** 11 gauge stationary latch welded securely to locker frame.
  - **b.** Latch extends no more than 1-1/4-inch into locker opening, penetrating through cup.
  - **c.** Flush-mounted, recessed stainless steel cup in a formed door with 18 gauge vertical back panel stiffener.

G. Hinges:
- **1.** 16 gauge continuous piano hinge on the right side of the opening.
- **2.** Hinges welded to door and riveted to locker frame.

H. Slope Tops:
- **1.** Provide 18 gauge all welded slope top with 25 degree pitch, attached at factory with concealed fasteners. Slope top to be in addition to standard 16 gauge flat top.

I. Closed Base:
- **1.** Provide 4-inch high, 14 gauge welded steel base enclosed on all four sides securely welded to locker bottom.

J. Reinforced Bottom:
- **1.** Provide 16 gauge spacer channel welded to locker bottom from front to back for a more secure installation Spacer channel to have full height 1/2-inch ID tube welded over anchor holes to eliminate deflection upon locker installation. Spacer channel meets all California installation seismic requirements. (When closed bases are not used).

K. Filler Panels: Manufacturer's standard fabricated from 18 gauge solid steel finished to match lockers.

L. Finish:
- **1.** Complete locker unit to be thoroughly cleaned, phosphatized and sealed.
- **2.** Finish to be baked powder coat with a minimum 2-3 mil thickness.
- **3.** Color of lockers shall be chosen from manufacturer's 27 standard colors.

2.03 LOCKER ACCESSORIES

A. Hooks:
- **1.** Hooks to be heavy duty forged steel with ball ends and zinc plated.

2. Provide two single wall hooks and one double ceiling hook in each locker opening 20-inches or taller.

B. Numbering:
1. Furnish each locker with black anodized laser-etched aluminum number plate.
2. Locate number plate near center of each door.
3. Owner to furnish numbering sequence.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Wall Installation:
1. Securely anchor every locker to wall and or/floor before use.
2. Anchoring to be determined by conditions at time of installation.
3. Tie adjacent locker units together by bolting at four points, two at top and two at bottom, using ¼-inch cadmium plated bolts.

3.02 ADJUSTING

A. General Requirements: Upon completion of installation, inspect lockers and adjust for proper door and locking mechanism operation.

3.03 CLEANING

A. General Requirements:
1. Clean interior and exposed exterior surfaces, removing debris, dust, dirt, and foreign substances on exposed surfaces.
2. Touch up scratches and abrasions to match original finish.
3. Polish stainless steel and non-ferrous metal surfaces.
4. Replace locker units that cannot be restored to factory-finished appearance.
5. Use only materials and procedures recommended or furnished by locker manufacturer.

Specifications

01/23/2025

Project
Twin Falls County Jail

From
BS & R Equipment Co.
Doug Burch
198 Locust Street South
Twin Falls, ID 83301
208-733-4221

ITEM 1 - COMBI OVEN, ELECTRIC (1 REQ'D)

RATIONAL Model ICP 6-FULL ON 10-FULL E 208/240V 3 PH or approved equal

One (1) (CC1ERRA.0000218) iCombi Pro® 6-Full Size Combi Oven on one (1) (CE1ERRA.0000221) iCombi Pro® 10-Full Size Combi Oven, double stack, electric, (16) 18" x 26" sheet pan or (32) 12" x 20" steam pan or (16) 2/1 GN pan capacity, (8) stainless steel grids included, intelligent cooking system with (4) assistants; iDensityControl, iCookingSuite, iProductionManager, & iCareSystem, (6) operating modes, (5) cooking methods, (3) manual operating modes, 85° to 572°F temperature range, quick clean, care control, eco mode, 6-point core temperature probe, retractable hand shower, Ethernet interface, Wi-Fi enabled, 208/240v/60Hz/3-ph, 22.4/37.4 kW, CE, IPX5, UL, cULus, NSF, ENERGY STAR®

1 kt	Model 60.74.725 Combi-Duo Stacking Kit for iCombi 6-full size (electric or gas) on iCombi 6- or 10-full size (electric only)
1 ea	NOTE: All discounts subject to approval by manufacturer
1 ea	2 years parts and labor, 5 years steam generator warranty
1 ea	Model CAP Chef Assistance Program, a RATIONAL certified Chef conducts 4 hours/location specialized application training with personnel, no charge
1 ea	Model 9999.2002 Pre-Installation Site Consultation, provides an installation consultation to ensure the site has proper space and connections for gas, electric, drain & water, one (1) Consultation is needed for every four (4) cooking systems, includes 100 miles (200 miles round trip). (see attached installation flyer for details) THIS ITEM IS NON-DISCOUNTABLE, USA ONLY (NET)
2 ea	Model 9999.2100 Commissioning iCombi Electric – for one(1) electric iCombi when not installed and commissioned by trained technicians. Includes 100 miles (200 miles round-trip). THIS ITEM IN NON-DISCOUTNABLE, USA ONLY (NET)
1 ea	Two (2) Installation kits - One (1) for each iCombi is required
1 ea	Model 8720.1563US Installation Kit, for electric iCombi/SCC/CMP 62 (208/60Hz/3ph & 240/60Hz/3ph); electric iCombi/SCC/CMP 202 (480/60Hz/3ph) THIS ITEM IS NON-DISCOUNTABLE, USA ONLY (NET)
1 ea	Model 8720.1554US (Installation Kit, for electric iCombi/SCC/CMP 102 (208/60Hz/3 & 240/60Hz/3); electric iCombi/SCC/CMP 202 (440/60Hz/3) THIS ITEM IS NON-DISCOUNTABLE, USA ONLY (NET)
1 ea	Model 1900.1158US Water Filtration Double Cartridge System, for full-size Combi-Duos or if used for more than (2) units, includes: (1) double head with pressure gauge, (2) R95-CLX filter & (1) filter installation kit (for each additional unit add (1) additional head & additional cartridge. Maximum (4) cartridges)
1 ea	Note: The RATIONAL Water Filtration Systems helps provide consistent high-quality water to your RATIONAL cooking systems. The patented carbon block technology reduces the effects of sediment, chloramines, and chlorine while delivering the required flow rates.
1 ea	Model 56.01.535 Active Green Cleaner Tabs, for all iCombi Pro/Classic, 150 pieces/bucket (minimum order quantity- 2 ea, unless ordered with a unit) (NET)
1 ea	Model 56.00.562 Care Tabs, bucket of 150 packets for all iCombi Pro/Classic models and SelfCooking Center® units from 10/2008, with CareControl - Serial SG, SH or SI series (minimum order quantity: 2pcs, unless ordered with a unit) (NET)
2 ea	Model 87.01.432 Safety Door Lock, retrofit kit recommended with all UltraVents with Certified Installation, prevents rapid door opening, requires 2-step pressing of the door handle (factory option not needed)

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	208/240	60	3	Direct			62.2/53.9	22.4			
2	208/240	60	3	Direct			103.3/90.0	37.4			

ELECTRICAL 1 REMARKS
Top Unit
ELECTRICAL 2 REMARKS
Bottom Unit

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1				3/4" GHT					
2				3/4" GHT					
3				3/4" GHT					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	2"	
2	2"	
3		

PLUMBING 1 REMARKS
Bottom Unit - 1/2" ID, Bottom Unit
PLUMBING 2 REMARKS
Top Unit - 1/2" ID, Top Unit

ITEM 1.1 - CONVECTION OVEN, ELECTRIC (2 REQ'D)

Blodgett (Middleby) Model ZEPH-100-E DBL Dimensions: 70.63(h) x 38.25(w) x 36.88(d) or approved equal

Zephaire Convection Oven, electric, double-deck, standard depth, capacity (5) 18" x 26" pans per compartment, (SSI-M) solid state infinite controls with 60 min. manual timer, two speed fan, vent connector, dependent glass doors, interior light, stainless steel front, sides and top, 6" stainless steel legs, ETL, NSF, ENERGY STAR® (Ships within 5 days)

- 2 ea 2 year parts, 2 year labor and 1 additional year door warranty (parts only), standard
- 4 ea 208v/60/3-ph, 11.0 kW, 31.0 amps, direct, 1/2 hp (per deck), standard
- 2 ea Model SSI-M Top Oven: Solid State infinite control with 60 min. manual timer
- 2 ea Model SSI-M Bottom Oven: Solid State infinite control with 60 min. manual timer
- 2 st 6" legs, adjustable, stainless steel (set), standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	208	60	3	Direct			31.0	11.0	1/2		
2	208	60	3				31.0	11.0	1/2		

ELECTRICAL 1 REMARKS
Top Oven
ELECTRICAL 2 REMARKS
Bottom Oven

ITEM 2 - HAND SINK (1 REQ'D)

John Boos Model PBHS-F-1410-SSLR-X Dimensions: 54(h) x 17(w) x 15.5(d) or approved equal

Pro-Bowl Hand Sink, floor mount, 14"W x 10" front-to-back x 5" deep bowl, 9-3/4"H backsplash with left & right side splashes, (1) centered splash mount faucet hole, 2" gooseneck spout, 3-1/2" drain opening with basket drain, double foot valves (PBF-FV2-SM-35GLF), 18/300 stainless steel construction, NSF

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1	1/2"			1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		

PLUMBING 1 REMARKS

1" centered faucet hole, 3-1/2" drain opening

ITEM 3 - KETTLE, ELECTRIC, TILTING (2 REQ'D)

Cleveland Range Model KEL60T Dimensions: 45(w) x 41.13(d) or approved equal

Kettle, electric, tilting, 60-gallon capacity, 2/3 steam jacket design, solid state water level control, open tri-leg base, 316 series stainless steel interior, flanged feet, 50 psi rating, cover & draw-off optional, IPX6

- 2 ea 1-year parts & labor warranty, standard
- 2 ea Performance start-up included at customer request after equipment is installed (Free Water Quality Check included) (contact Cleveland Sales Representative for details)
- 2 ea Standard wattage
- 2 ea 208v/60/3-ph, 14.7kW, 40.9 amps, standard
- 2 ea Standard Control Panel includes: LED indicator for heat cycle & low water, Power ON/OFF Dial with 1-10 Temperature Dial Setting
- 2 ea Model TD2 2" tangent draw-off valve with strainer

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	208	60	3				40.9	14.7			

ITEM 4 - TILTING SKILLET BRAISING PAN, ELECTRIC (1 REQ'D)

Vulcan Model VE40 Dimensions: 40.5(h) x 46(w) x 35.5(d) or approved equal

Braising Pan, electric, 40-gallon capacity, 16 kW FastBatch™ embedded heating technology, 46" wide open base, manual tilt, 9" deep stainless steel pan with gallon markings, pouring lip & removable strainer, spring assist cover with drip edge, pan holder, water tight solid state controls, includes L faucet bracket, 12" stainless steel legs with adjustable flanged feet, cULus, UL EPH Classified

- 1 ea 1 year limited parts & labor warranty, standard
- 1 ea 208v/60/1-ph, 16 kW, 77.0 amps, direct wire
- 1 ea Model SGLTS 12NZL SINGLE Pantry Deck-Mount Faucet, 12" swivel spout, includes 4" & 12" riser, NSF & Lead Reduction Compliant (Note: water connection required)
- 1 ea Model BP-PPS V Series Braising Pan Standard Security Package, includes security fasteners & tack welds, secured crank handle & pan strainer, controls protected by lockable cover, perforated flue cover (gas) or lid support (electric)

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	208	60	1	Direct			77.0	16.0			

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1				1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		

ITEM 5 - FLOOR TROUGH (1 REQ'D)

John Boos Model FTSG-1296 Dimensions: 4(h) x 96(w) x 12(d) or approved equal

Floor Trough, 96"W x 12"D, subway-style stainless steel grating, 4" deep all-welded drain pan with built-in pitch, accommodates up to a 4" diameter pipe, includes stainless steel removable perforated strainer, 14/300 stainless steel

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		4"

ITEM 6 - CLASS II HOOD (1 REQ'D)

Captive-Aire Model 32' CLASS II HOOD or approved equal

32' CLASS II HOOD

ITEM 7 - PASS-THRU MOBILE HEATED CABINET (2 REQ'D)

Vulcan Model VPT13 Dimensions: 61(h) x 27(w) x 34.5(d) or approved equal

Holding/Transport Cabinet, Pass-thru, Mobile, capacity (13) 18" x 26" x 1" or (26) 12" x 20" x 2-1/2" pans, forced air blower, side mounted push handles, recessed control panel, analog thermometer ambient to 190° F, includes (10) pair of universal tray slides adjustable 1-1/2" OC, 20 gauge stainless steel interior & exterior, 5" casters, cULus, UL EPH Classified

- 2 ea 1 year limited parts & labor warranty, standard
- 2 ea 10 year warranty on heating elements, standard
- 2 ea 120v/50/60/1-ph, 1500 watts, 12.5 amps, cord with NEMA 5-15P, standard
- 2 ea Field reversible doors, standard
- 2 ea 5" Casters, set of (4) standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	50/60	1	Cord & Plug		5-15P	12.5	1.5			

ITEM 8 - WORK TABLE, 60", STAINLESS STEEL TOP (2 REQ'D)

John Boos Model ST6-3060SSK-X Dimensions: 35.75(h) x 60(w) x 30(d) or approved equal

Work Table, 60"W x 30"D, 16/300 stainless steel flat top, with Stallion Safety Edge front & back, 90° turndown on sides, stainless steel legs & adjustable undershelf, adjustable bullet feet, NSF, CSA-Sanitation, KD (Available in Effingham and Nevada)

- 2 ea Standard flyer accessories only, NO modifications to flyer items allowed or their accessories

---

ITEM 9 - WORK TABLE, 72", STAINLESS STEEL TOP (1 REQ'D)

John Boos Model ST6-3072SSK-X Dimensions: 35.75(h) x 72(w) x 30(d)or approved equal

Work Table, 72"W x 30"D, 16/300 stainless steel flat top, with Stallion Safety Edge front & back, 90° turndown on sides, stainless steel legs & adjustable undershelf, adjustable bullet feet, NSF, CSA-Sanitation, KD (Available in Effingham and Nevada)

- 1 ea Standard flyer accessories only, NO modifications to flyer items allowed or their accessories

ITEM 10 - MICROWAVE OVEN (1 REQ'D)

Sharp Model R-21LCFS Dimensions: 12.17(h) x 20.5(w) x 18.03(d) or approved equal

Microwave Oven, medium duty, 1000 watts, 1.0 cu. ft. capacity, stainless steel door, cavity and outer wrapper, durable side-hinged see-thru door, (1) power level, 6 minutes manual light up dial timer, timer heating-time guide, timer resets to 0 when door is opened during cooking cycle, 120v/60/1-ph, 14 amp, NEMA 5-15P, UL, NSF

1 ea Warranty: 1 year parts, labor & travel, 3 years on Magnetron, standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1	Cord & Plug		5-15P	14	1			

ITEM 13 - REFRIGERATED COUNTER, SANDWICH / SALAD TOP SUPER TRAILER (2 REQ'D)

True Mfg. - General Foodservice Model TSSU-60-16-HC Dimensions: 36.75(h) x 60.38(w) x 30.13(d) or approved equal

Sandwich/Salad Unit, (16) 1/6 size (4"D) poly pans, stainless steel insulated cover, 11-3/4"D cutting board, (2) full doors, (4) PVC coated adjustable wire shelves, stainless steel top/front/sides, GalFan coated steel back, aluminum interior with stainless steel floor, R290 Hydrocarbon refrigerant, 1/3 HP, 115v/60/1-ph, 6.5 amps, NEMA 5-15P, cULus, UL EPH Classified, Made in USA

2 ea 7 year compressor warranty, 7 years parts warranty, 7 year labor warranty, standard. Visit www.truemfg.com for specifics.

2 ea Self-contained refrigeration standard

2 ea Castors, 5" (36" work surface height) standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	115	60	1	Cord & Plug		5-15P	6.5		1/3		15.0

ITEM 14 - WORK TABLE, 48", STAINLESS STEEL TOP (1 REQ'D)

John Boos Model ST6-3048SSK-X Dimensions: 35.75(h) x 48(w) x 30(d) or approved equal

Work Table, 48"W x 30"D, 16/300 stainless steel flat top, with Stallion Safety Edge front & back, 90° turndown on sides, stainless steel legs & adjustable undershelf, adjustable bullet feet, NSF, CSA-Sanitation, KD (Available in Effingham and Nevada)

1 ea Standard flyer accessories only, NO modifications to flyer items allowed or their accessories

ITEM 15 - WORK TABLE, 60", STAINLESS STEEL TOP (2 REQ'D)

John Boos Model ST4-3060SSK Dimensions: 35.75(h) x 60(w) x 30(d) or approved equal

Work Table, 60"W x 30"D, 14/300 stainless steel flat top, with Stallion Safety Edge front & back, 90° turndown on sides, stainless steel legs & adjustable undershelf, adjustable bullet feet, NSF, CSA-Sanitation, KD

ITEM 16 - HOT FOOD SERVING COUNTER / TABLE (2 REQ'D)

Duke Manufacturing Model EP305SW Dimensions: 33.38(h) x 72.38(w) x 22.44(d) or approved equal

Aerohot Steamtable Portable Hot Food Unit, 72-3/8"W, electric, (5) 12" x 20" sealed hot food wells with individual drains with valves, infinite controls, stainless steel top with 1/2" thick x 7" wide poly carving board (operator's side), stainless steel open base with undershelf, 5" casters, 6' cord & plug, cULus, UL EPH Classified

2 ea Model E305-208-1 208v/60/1-ph, 3750 watts, 18.0 amps, NEMA L6-30

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	208	60	1	Cord & Plug		L6-30	18	3.75			

ITEM 17 - WORK TABLE, 72", STAINLESS STEEL TOP (1 REQ'D)

John Boos Model ST6-2472SSK-X Dimensions: 35.75(h) x 72(w) x 24(d) or approved equal

Work Table, 72"W x 24"D, 16/300 stainless steel flat top, with Stallion Safety Edge front & back, 90° turndown on sides, stainless steel legs & adjustable undershelf, adjustable bullet feet, NSF, CSA-Sanitation, KD (Available in Effingham and Nevada)

1 ea Standard flyer accessories only, NO modifications to flyer items allowed or their accessories

ITEM 18 - MEAL TRAY DELIVERY CART (6 REQ'D)

Cambro Model MDC1411T60191 Dimensions: 63.63(h) x 60(w) x 29.25(d) or approved equal

Meal Delivery Cart, (modified for use in correctional facilities), tall profile, (3) doors, 3-compartments, holds (60) each 1411CW or 1411CP trays with 853 insert trays, 60"W x 29-1/4"D x 63-5/8"H, heavy duty aluminum handles with security screws, black finish, (1) per end, 6" heavy duty casters, lock blocks on door hinge pins, granite gray with cream color door, NSF

ITEM 19 - REACH-IN REFRIGERATOR (1 REQ'D)

True Mfg. - General Foodservice Model STG1R-1S-HC Dimensions: 77.75(h) x 27.5(w) x 33.75(d) or approved equal

SPEC SERIES® Refrigerator, reach-in, one-section, (1) stainless steel door with lock, cam-lift hinges, digital temperature control, (3) gray shelves, LED interior lights, stainless steel front, aluminum sides, aluminum interior, 5" castors, R290 Hydrocarbon refrigerant, 1/4 HP, 115v/60/1-ph, 3.8 amps, NEMA 5-15P, cULus, UL EPH Classified, Made in USA, ENERGY STAR®

1 ea 7 year compressor warranty, 7 years parts warranty, 7 year labor warranty, standard. Visit www.truemfg.com for specifics.

1 ea Door hinged right standard

1 ea Stainless steel back

1 ea (3) vinyl shelves & shelf supports standard per section

1 st 5" castors (set of 4), standard

1 ea Security Package #1, for one-section reach-in refrigerators & freezers, includes stainless breaker covers, light cover, locking hasp(s), non-removable doors, control cover, top screen/guards, security screws (includes required top screen), welded tray slides, seismic/flanged legs, tamper proof rain shield

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	115	60	1	Cord & Plug		5-15P	3.8		1/4		

ITEM 20 - WORK TABLE, 72", STAINLESS STEEL TOP (1 REQ'D)

John Boos Model ST6-3072SSK-X Dimensions: 35.75(h) x 72(w) x 30(d) or approved equal

Work Table, 72"W x 30"D, 16/300 stainless steel flat top, with Stallion Safety Edge front & back, 90° turndown on sides, stainless steel legs & adjustable undershelf, adjustable bullet feet, NSF, CSA-Sanitation, KD (Available in Effingham and Nevada)

1 ea Standard flyer accessories only, NO modifications to flyer items allowed or their accessories

ITEM 21 - INDUCTION RANGE, COUNTERTOP (1 REQ'D)

CAC China Model ELIC-600G or approved equal

Induction Cooker, single burner, 12-5/8"L x 16-1/2"W x 3-7/8"H, SCHOTT CERAN® glass surface, 1.8kW, 120v/60/1-ph, NEMA 5-15P, ETLus (QTY break = 2 each)

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1		60	1			5-15P		1.8			

ITEM 22 - MICROWAVE OVEN (1 REQ'D)

Sharp Model R-21LCFS Dimensions: 12.17(h) x 20.5(w) x 18.03(d) or approved equal

Microwave Oven, medium duty, 1000 watts, 1.0 cu. ft. capacity, stainless steel door, cavity and outer wrapper, durable side-hinged see-thru door, (1) power level, 6 minutes manual light up dial timer, timer heating-time guide, timer resets to 0 when door is opened during cooking cycle, 120v/60/1-ph, 14 amp, NEMA 5-15P, UL, NSF

1 ea Warranty: 1 year parts, labor & travel, 3 years on Magnetron, standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1	Cord & Plug		5-15P	14	1			

ITEM 23 - MICROWAVE OVEN, SHELF (1 REQ'D)

John Boos Model BMS2024-X Dimensions: 15(h) x 24(w) x 20(d) or approved equal

Microwave Shelf, wall mount, 24"W x 20"D x 15"H, Stallion Safety Edge front, 2-1/2" electric cord cut-out with rubber grommet, 16/300 stainless steel construction, NSF (Available in Effingham and Nevada)

ITEM 24 - CONVECTION OVEN, ELECTRIC (1 REQ'D)

Atosa USA, Inc. Model CTCO-25 Dimensions: 15(h) x 18.75(w) x 19.75(d) or approved equal

CookRite Convection Oven, electric, counter top, 18-3/4"W x 19-3/4"D x 15"H, stainless steel exterior & interior, doors with double pane thermal tempered glass, (3) removable 13-7/10"W x 11"D wire chrome racks, interior lighting, manual controls, 1-1/10"H legs, 1440 watts, 120v/60/1-ph, 12 amps, NEMA L5-15P, cETLus, ETL-Sanitation

1 ea 1 year parts & labor warranty (continental USA only)

ITEM 27 - HAND SINK (1 REQ'D)

John Boos Model PBHS-F-1410-SSLR-X Dimensions: 54(h) x 17(w) x 15.5(d) or approved equal

Pro-Bowl Hand Sink, floor mount, 14"W x 10" front-to-back x 5" deep bowl, 9-3/4"H backsplash with left & right side splashes, (1) centered splash mount faucet hole, 2" gooseneck spout, 3-1/2" drain opening with basket drain, double foot valves (PBF-FV2-SM-35GLF), 18/300 stainless steel construction, NSF

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1	1/2"			1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		

PLUMBING 1 REMARKS
1" centered faucet hole, 3-1/2" drain opening

ITEM 28 - SOILED DISHTABLE (1 REQ'D)

John Boos Model JDTS-20-72L-X Dimensions: 44.06(h) x 72(w) x 30.38(d) or approved equal

Dishtable, soiled, straight design, 72"W x 30"D x 44"H overall size, for left-to-right operation, (1) 20"W x 20" front-to-back x 8" deep pre-rinse sink, 10" boxed backsplash with 45° top & 2" return, (1) set of splash mount faucet holes with 8" centers, rolled front & side rims, 16/300 stainless steel top, stainless steel legs, adjustable bracing, & bullet feet, NSF, CSA-Sanitation (Available in Effingham and Nevada)

- 1 ea Standard flyer accessories only, NO modifications to flyer items allowed or their accessories
- 1 ea Krowne Model 17-108WL Krowne Royal Series pre-rinse Assembly, wall mount, 8" centers, spring action flexible gooseneck, 35"H stainless steel hose with 15" overhang & 1.2 GPM spray head, built in check valves, includes wall bracket & mounting kit, chrome plated brass base, low lead compliant, includes internal check valves to prevent backflow & cross contamination, NSF (interchangeable with most brands) (ships pre-assembled)
- 1 ea Krowne 3 year warranty, standard
- 1 ea Krowne Model 21-190L Krowne Wall Faucet Mounting Kit, (2) 1/2" NPS nipples & (2) 1/2" NPT x 1/2" threaded ells, (2) washers, (2) locknuts, low lead compliant

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									
2	1/2"			1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		
2		

PLUMBING 1 REMARKS
1" faucet holes, 8" centers, 3-1/2" drain opening

ITEM 29 - DISHWASHER, DOOR TYPE (1 REQ'D)

CMA Dishmachines Model B Dimensions: 60.5(h) x 44.25(w) x 25.25(d) or approved equal

Energy Mizer® Dishwasher, door type, 44" W, double rack, low temperature chemical sanitizing with priming switches, top mounted controls, auto "start/stop", straight-thru design, (80) racks/hour, delimer switch, extended height wrapper, Poly Pro™ scrap accumulator, stainless steel construction, includes (1) open & (1) peg rack, 1 HP wash pump, ENERGY STAR®, cULus, ETL-Sanitation

- 1 ea 115v/60/1-ph, 30.0 amps, standard
- 1 ea Model TEMP-SURE FI Factory installed Temp-Sure (self contained 12.0 kw heater), continuous supply of 140°F hot water, requires a separate 208-240V / 1 or 3 phase, cULus, NSF
- 1 ea 1 Phase

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1		
2	115	60	1				30.0				
3	208-240		3				40	12.0			

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1	3/4"								
2	1/2"								

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	2"	
2		

PLUMBING 2 REMARKS
1/2" hot water outlet

ITEM 30 - CLEAN DISHTABLE (1 REQ'D)

John Boos Model JDTC-20-72R-X Dimensions: 44.06(h) x 72(w) x 30.38(d) or approved equal

Dishtable, clean, straight design, 72"W x 30"D x 44"H overall size, for left-to-right operation, 10" boxed backsplash with 45° top & 2" return, rolled front & side rims, 16/300 stainless steel top, stainless steel legs, adjustable bracing, & bullet feet, NSF (Available in Effingham and Nevada)

ITEM 31 - CONDENSATE HOOD (1 REQ'D)

Captive-Aire Model CONDENSATE HOOD or approved equal

Condensate Hood

ITEM 32 - THREE (3) COMPARTMENT SINK (1 REQ'D)

John Boos Model 3PB20284-2D24 Dimensions: 44.06(h) x 111.25(w) x 33.5(d) or approved equal

Pro-Bowl Sink, 3-compartment, 111-1/4"W x 33-1/2"D x 44-1/16"H overall size, (3) 20"W x 28" front-to-back x 14" deep compartments, (2) 24" left & right drainboards, 10"H boxed backsplash with 45° top and 2" return, (1) set of splash mount faucet holes with 8" centers, 3-1/2" die-stamped drain opening, 16/300 stainless steel construction, stainless steel legs, adjustable front & side bracing, adjustable bullet feet, NSF, CSA-Sanitation, KD

1 ea	Krowne Model 17-108WL Krowne Royal Series pre-rinse Assembly, wall mount, 8" centers, spring action flexible gooseneck, 35"H stainless steel hose with 15" overhang & 1.2 GPM spray head, built in check valves, includes wall bracket & mounting kit, chrome plated brass base, low lead compliant, includes internal check valves to prevent backflow & cross contamination, NSF (interchangeable with most brands) (ships pre-assembled)
1 ea	Krowne 3 year warranty, standard
1 ea	Krowne Model 21-139L Krowne Add-On-Faucet, for pre-rinse, with 12" spout, 3/8" NPT male inlet, 3/8" NPT female outlet, low lead compliant (interchangeable with most brands)
1 ea	Krowne Model 21-190L Krowne Wall Faucet Mounting Kit, (2) 1/2" NPS nipples & (2) 1/2" NPT x 1/2" threaded ells, (2) washers, (2) locknuts, low lead compliant

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									
2									
3									
4	1/2"			1/2"					
5				3/8"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		
2		
3		
4		
5		

PLUMBING 1 REMARKS
3-1/2" drain opening
PLUMBING 2 REMARKS
3-1/2" drain opening
PLUMBING 3 REMARKS
(1) set of 1" faucet holes, 8" centers, 3-1/2" drain opening

ITEM 33 - DRYING RACK UNIT (2 REQ'D)

Metro Model PR48VX4-XDR Dimensions: 68(h) x 48(w) x 24(d) or approved equal

MetroMax® i Mobile Drying Rack Unit with Drip Tray, 48"W x 24"D x 68"H, 4-tier, for trays/cutting boards/sheet pans & steam pans, includes: (4) open shelf frames, (4) 63" mobile posts, (2) cutting board/tray drying racks, (2) pan racks, (1) adjustable drip tray, (4) polymer swivel casters (2 with brakes), built in Microban® antimicrobial product protection, NSF

ITEM 34 - DRYING RACK UNIT (2 REQ'D)

Metro Model MAX4-PR48VX3 Dimensions: 68(h) x 48(w) x 24(d) or approved equal

MetroMax® 4 Mobile Drying Rack Unit, 48"W x 24"D x 68"H, 4-tier, for bulk drying & trays/cutting boards/sheet pans, includes: (3) open shelf frames, (1) shelf, (4) 63" mobile posts, (2) drop-ins, (1) cutting board/tray drying rack, (4) polymer swivel casters (2 with brakes), built in Microban® antimicrobial product protection, NSF

ITEM 35 - SECURITY UNIT (1 REQ'D)

Metro Model MQSEC56E Dimensions: 66.19(h) x 62.88(w) x 26.94(d) or approved equal

MetroMax® Q Security Unit, stationary, 62-7/8"W x 26-15/16"D x 66-3/16"H, no intermediate shelves, NSF

3 ea Model MX2460G Quick Ship - MetroMax® i Shelf, 60"W x 24"D, reinforced type 304 stainless steel corners, removable open grid polymer mats, (4) wedge connectors, built in Microban® antimicrobial product protection, 750 lb. capacity per shelf, NSF

ITEM 36 - CART, UTILITY/BUSSING (3 st REQ'D)

CAC China Model BTUC-19GY Dimensions: 37.75(h) x 40.13(w) x 19.75(d) or approved equal

Utility Cart, 40-1/8"L x 19-3/4"W x 37-3/4"H, 3-tier, heavy duty shelves, 400 lbs. weight capacity, polypropylene, gray, BPA free (KD) (QTY break = 1 set)

ITEM 37 - ICE MAKER, CUBE-STYLE (1 REQ'D)

Manitowoc Model IYT0450A Dimensions: 21.5(h) x 30(w) x 24(d) or approved equal

Indigo NXT™ Series Ice Maker, cube-style, air-cooled, self-contained condenser, 30"W x 24"D x 21-1/2"H, production capacity up to 490 lb/24 hours at 70°/50° (378 lb AHRI certified at 90°/70°), easyTouch display with 13 different language options, date/time stamp display, automatic reminder/alert icon, one touch asset information, automatic detection of accessories, continuous operating status, programmable production options (time, weight, day or night), one touch cleaning with displayed instructions, Alpha-San anti-microbial protection, acoustical ice sensing probe, self-diagnostic technology, DuraTech™ exterior, half-dice size cubes, R410A refrigerant, NSF, cULus, CE, ENERGY STAR®

1 ea Model WARRANTY-ICE-SC 3 year parts & labor (Machine), 5 year parts & labor (Evaporator), 5 year parts & 3 years labor (Compressor), standard

1 ea (-161) 115v/60/1-ph, 11.9 amps

1 ea Model D570 Ice Bin, 30"W x 34"D x 50"H, with side-hinged front-opening door, side grips, 532 lbs. application capacity, AHRI certified 17.9 cu. ft., for top-mounted ice maker, Duratech exterior, NSF

1 ea Model WARRANTY-BIN/DISP 3 year parts & labor warranty, standard

1 ea Legs, 6" adjustable stainless steel, standard

1 ea Everpure Model FXI-11 FXI Water Filtration System, FXI-11, Single, (1) CTOS-10 cartridge with IsoNet®, reduces chlorine & sediment, inhibits scale, outlet pressure gauge, mounting bracket, 15,000 gallons, 1.5 gpm, 0.5 micron, 1/2" inlet, 1/2" outlet, NSF 42 (160-50105)

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	115	60	1				11.9				

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1				3/8"					
2									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	1/2"	
2	3/4"	

PLUMBING 1 REMARKS
Drain for ice maker

ITEM 38 - HAND SINK (1 REQ'D)

John Boos Model PBHS-F-1410-SSLR-X Dimensions: 54(h) x 17(w) x 15.5(d) or approved equal

Pro-Bowl Hand Sink, floor mount, 14"W x 10" front-to-back x 5" deep bowl, 9-3/4"H backsplash with left & right side splashes, (1) centered splash mount faucet hole, 2" gooseneck spout, 3-1/2" drain opening with basket drain, double foot valves (PBF-FV2-SM-35GLF), 18/300 stainless steel construction, NSF

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1	1/2"			1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		

PLUMBING 1 REMARKS
1" centered faucet hole, 3-1/2" drain opening

ITEM 39 - WORK TABLE, 96", STAINLESS STEEL TOP (1 REQ'D)

John Boos Model ST6R5-3096SSK-X Dimensions: 40.75(h) x 96(w) x 30(d) or approved equal

Work Table, 96"W x 30"D, 16/300 stainless steel top with 5" backsplash, with Stallion Safety Edge front, 90° turndown on sides, stainless steel legs & adjustable undershelf, adjustable bullet feet, NSF, CSA-Sanitation, KD (Available in Effingham and Nevada)

1 ea Standard flyer accessories only, NO modifications to flyer items allowed or their accessories

ITEM 41 - FOOD SLICER, ELECTRIC (1 REQ'D)

Hobart Model EDGE12-11 Dimensions: 21.88(h) x 26.32(w) x 23.14(d) or approved equal

Centerline by Hobart Edge Series Slicer, manual, med duty, angle feed, 12" carbon steel knife, no volt release, poly-v belt drive, permanent ring guard, removable anodized aluminum carriage & knife cover, top mounted sharpener, anodized aluminum finish, 120v/60/1-ph, 4 amp, 1/2 hp, cETLus, NSF (NET)

1 ea Standard warranty - 1-Year parts, labor & travel time during normal working hours within the USA

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1				4		1/2		

ITEM 42 - ELECTRIC FOOD CUTTER (1 REQ'D)

Hobart Model 84145-1

Food Cutter with #12 attachment hub, 14" diameter stainless steel bowl 22 RPM, double stainless steel knives 1725 RPM, bowl cover with safety interlock, push/pull on/off switch, one-piece burnished aluminum housing, 3" legs, 115v/60/1-ph, 1/2 HP

1 ea Standard warranty - 1-Year parts, labor & travel time during normal working hours within the USA

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	115	60	1	Cord & Plug					1/2		

ITEM 43 - PLANETARY MIXER (1 REQ'D)

Globe (Middleby) Model SP10 Dimensions: 38(h) x 22(w) x 23.5(d) or approved equal

(QUICK SHIP) Planetary Mixer, 10 qt. (9 liter), bench model, 3-speed (fixed), #12 attachment hub, includes: stainless steel removable bowl guard with built-in ingredient chute, 10 qt. stainless steel bowl, aluminum spiral dough hook, stainless steel wire whip & aluminum flat beater, safety interlocked bowl guard, bowl lift, gear-driven transmission, front-mounted touchpad controls with 60-minute digital timer & last batch recall, thermal overload protection, non-slip rubber feet, cast iron body, enamel gray finish, 1/3 HP, 115v/60/1-ph, 5.0 amps, cord, NEMA 5-15P, NSF, cETLus (Ships within 1-2 days)

- 1 ea Quick Ship items have limited configurations & that standard configuration may not apply. Contact factory for details
- 1 ea 2 year parts & labor warranty (1 year parts only warranty on agitator and hub accessories, no labor provided) (excludes wear items), standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	115	60	1	Cord & Plug		5-15P	5.0		1/3		

ITEM 44 - TWO (2) COMPARTMENT SINK (1 REQ'D)

John Boos Model 2B16204-2D18-X Dimensions: 44.06(h) x 71.25(w) x 25.5(d) or approved equal

"B" Series Sink, 2-compartment, 71-1/2"W x 25-1/2"D x 44-1/16"H overall size, (2) 16"W x 20" front-to-back x 14" deep compartments, (2) 18" left & right drainboards, 10"H boxed backsplash with 45° top and 2" return, (1) set of splash mount faucet holes with 8" centers, 3-1/2" die-stamped drain openings, 16/300 stainless steel construction, stainless steel legs, adjustable side bracing, adjustable bullet feet, NSF, CSA-Sanitation (Available in Effingham and Nevada)

- 1 ea Standard flyer accessories only, NO modifications to flyer items allowed or their accessories
- 1 ea Krowne Model 14-812L Krowne Royal Series Faucet, splash-mounted, 8" centers, 12" swing spout, quarter-turn ceramic cartridge valve, low lead compliant, NSF, Includes internal check valves to prevent backflow & cross contamination
- 1 ea Krowne 3 year warranty, standard
- 1 ea Krowne Model 21-190L Krowne Wall Faucet Mounting Kit, (2) 1/2" NPS nipples & (2) 1/2" NPT x 1/2" threaded ells, (2) washers, (2) locknuts, low lead compliant

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									
2									
3	1/2"			1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		
2		
3		

PLUMBING 1 REMARKS

3-1/2" drain opening

PLUMBING 2 REMARKS

(1) set of 1-1/8" faucet holes, 8" centers, 3-1/2" drain opening

ITEM 45 - WORK TABLE, 72", STAINLESS STEEL TOP (1 REQ'D)

John Boos Model ST6R5-3072SSK-X Dimensions: 40.75(h) x 72(w) x 30(d)or approved equal

Work Table, 72"W x 30"D, 16/300 stainless steel top with 5" backsplash, with Stallion Safety Edge front, 90° turndown on sides, stainless steel legs & adjustable undershelf, adjustable bullet feet, NSF, CSA-Sanitation, KD (Available in Effingham and Nevada)

1 ea Standard flyer accessories only, NO modifications to flyer items allowed or their accessories

---

ITEM 46 - PLANETARY MIXER (2 REQ'D)

Hobart Model HL400-2STD or approved equal

380-460/50/60/3 Mixer; with bowl, beater, whip & spiral dough arm; US/EXP configuration - Legacy Planetary Mixer, 1.5 hp, 40 quart capacity, (3) fixed speeds, gear-driven transmission, 20 minute timer, #12 taper attachment hub, manual bowl lift, bowl guard, stainless steel bowl, "B" beater, "D" whip, "ED" dough hook

2 ea Standard warranty: 1-Year parts, labor & travel time during normal working hours within the USA

2 ea Model TRUCK-HL4030 Legacy® Mixer Bowl Truck, aluminum, for 30 & 40 quart mixers

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1				Direct							

ITEM 47 - HAND SINK (1 REQ'D)

John Boos Model PBHS-F-1410-SSLR-X Dimensions: 54(h) x 17(w) x 15.5(d) or approved equal

Pro-Bowl Hand Sink, floor mount, 14"W x 10" front-to-back x 5" deep bowl, 9-3/4"H backsplash with left & right side splashes, (1) centered splash mount faucet hole, 2" gooseneck spout, 3-1/2" drain opening with basket drain, double foot valves (PBF-FV2-SM-35GLF), 18/300 stainless steel construction, NSF

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1	1/2"			1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		

PLUMBING 1 REMARKS

1" centered faucet hole, 3-1/2" drain opening

ITEM 48 - ONE (1) COMPARTMENT SINK (1 REQ'D)

John Boos Model 1B244-X Dimensions: 44(h) x 29(w) x 29.5(d) or approved equal

"B" Series Sink, 1-compartment, 29"W x 29-1/2"D x 44"H overall size, (1) 24"W x 24" front-to-back x 14" deep compartment, 10"H boxed backsplash with 45° top and 2" return, (1) set of splash mount faucet holes with 8" centers, 3-1/2" die-stamped drain opening, 16/300 stainless steel construction, stainless steel legs, adjustable side bracing, adjustable bullet feet, NSF, CSA-Sanitation (Available in Effingham and Nevada)

1 ea Standard flyer accessories only, NO modifications to flyer items allowed or their accessories

1 ea Krowne Model 14-812L Krowne Royal Series Faucet, splash-mounted, 8" centers, 12" swing spout, quarter-turn ceramic cartridge valve, low lead compliant, NSF, Includes internal check valves to prevent backflow & cross contamination

1 ea Krowne 3 year warranty, standard

1 ea Krowne Model 21-190L Krowne Wall Faucet Mounting Kit, (2) 1/2" NPS nipples & (2) 1/2" NPT x 1/2" threaded ells, (2) washers, (2) locknuts, low lead compliant

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									
2	1/2"			1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		
2		

PLUMBING 1 REMARKS

(1) set of 1-1/8" faucet holes, 8" centers, 3-1/2" drain opening

---

ITEM 49 - WORK TABLE, BAKERS TOP (1 REQ'D)

John Boos Model DSB08A Dimensions: 39.25(h) x 84(w) x 30(d) or approved equal

Work Table, baker's top, 84"W x 30"D, 1-3/4" thick top with 4" coved riser on back & both ends, Northern Hard Rock Maple, stainless steel legs, side & rear adjustable bracing, bullet feet, NSF, KD

ITEM 50 - DUNNAGE RACK (2 REQ'D)

CAC China Model ALDR-2048E Dimensions: 8(h) x 48(w) x 20(d) or approved equal

Dunnage Rack, 48"L x 20"W x 8"H, 1800 lbs weight capacity, heavy duty, welded, aluminum, NSF (assembled) (QTY break = 6 each)

ITEM 51 - PAN RACK, BUN (2 REQ'D)

Winholt Equipment Model AL-1820B Dimensions: 69.75(h) x 26(w) x 21(d) or approved equal

Pan Rack, mobile, full height, open sides, with slides for (40) 14" x 18" or (20) 18" x 26" sheet pans capacity, welded angle-type aluminum frame, end loading, 5" casters, NSF

ITEM 53 - WALK IN COOLER (1 REQ'D)

Imperial Brown Model WALK IN COOLER or approved equal

WALK IN COOLER

ITEM 54 - WALK IN COOLER/FREEZER (1 REQ'D)

Imperial Brown Model COMBO COOLER/FREEZER or approved equal

WALK IN COOLER/FREEZER

ITEM 55 - AIR CURTAIN (1 REQ'D)

Berner Model CLC08-1072A or approved equal

Commercial Series Low Profile Air Curtain, 72"L, unheated, (1) 1/5 hp 2-speed motor, for doors up to 8' high, interior mounting only, cULus, Made in USA

1 ea	NOTE:Contact Name / Phone Number and/or Email required at time of order
1 ea	Five year parts warranty (unheated units)
1 ea	If special freight fees are requested, (See below) all applicable fees will be added to the invoice; fees subject to change; contact factory for addition information.
1 ea	Model A 120v/60/1-ph
1 ea	White powder coat exterior finish, standard
1 ea	Model 66ADS000DMB Mounting Bracket, for plunger door switch used with manual swing doors (field mounted)

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									**1/5**		
2	**120**	**60**	**1**	**Direct**							

ITEM 57 - CAN DISPENSING RACK STATIONARY (1 REQ'D)

Winholt Equipment Model CR-162 Dimensions: 71(h) x 25.25(w) x 35(d) or approved equal

Rack, Can Storage, stationary design, self feeding gravity fed shelves, holds (162) #10 cans or (216) #5 cans, 1-1/2" welded aluminum tubing, 25 1/4"W, 35"D, 71"H, NSF

Imperial BROWN

Box Load Calculation

Quote/Order #
24-IB-12953

Imperial Brown (Portland Division) - 198 SE 223rd Ave. - Gresham, OR 97030
Phone: (800) 238.4093 - Fax: (503) 665.2929
Internet: imperialbrown.com

CCB #0091759

Box #: 1
Box Description: 17' - 8" x 24' - 0" x 9' - 3/4" rectangular indoor freezer/cooler combo
- 17' - 0" ID x 15' - 0" ID x 8' - 4" ID freezer (-10°F) (with floor)
- 17' - 0" ID x 8' - 0" ID x 8' - 8 3/4" ID cooler (35°F) (no floor)

System Name: Freezer
Holding Temp. (º F): -10
Altitude (Ft.): 3728
RH %: 90%
Ambient Temp. @ Chamber (º F): 85
Ambient Temp. @ Cond. Unit (º F): 100

System Summary: (1) RFO500L4SDB-NT w/ (1) RL6E142DDARE -
14707 BTU/H Capacity @ 10º F TD @ 17.1 hour runtime
@ 85ºF ambient / -10ºF room temp. / 3728ft altitude

Load Summary: (BTU/H)

Surfaces	4,756	33.96%	
Infiltration	7,020	50.13%	2.00 times ASHRAE's recommended infiltration load
Product	588	4.20%	ASHRAE recommended values for holding load only
Misc.	1,639	11.71%	
Total	**14,003**		

Product Data	
Product Weight (lbs.)	2,116
Pull Down Time (Hours)	24
Entering Temp. (º F)	0
Final Temp. (º F)	-10
Freezing Point (º F)	29
Specific Heat - Above	0.90
Specific Heat - Below	0.40
Latent Heat of Fusion	115.00
Respiration Load	0.00
Heat of Respiration	0.00

Misc. Data	
Motor HP Equivalence	0.18
Lighting Watts / Ft.²	0.34
Occupancy	0.09
Forklift	0.00
Misc. BTUH	0.00

RFO500L4SDB-NT
Air Cooled / Scroll

Imperial Brown (Portland Division) - 198 SE 223rd Ave. - Gresham, OR 97030
Phone: (800) 238.4093 - Fax: (503) 665.2929
Internet: imperialbrown.com

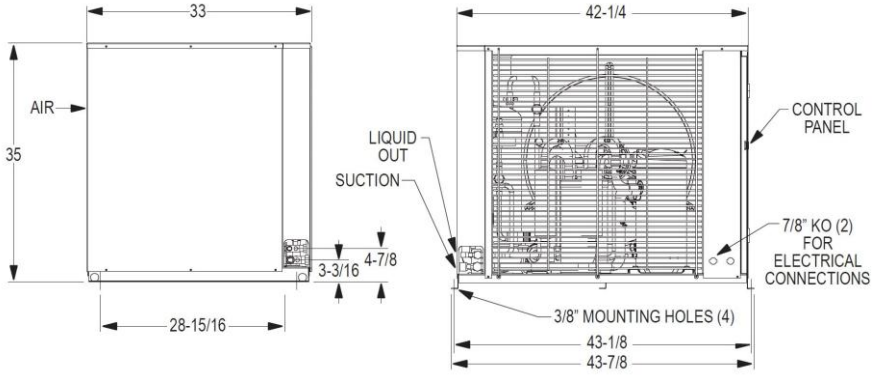
CCB #0091759

Physical Data

Refrigerant	Compressor		Connections		Receiver Capacity (90%)	Sound Data	Net Weight (lbs.)	Altitude (Feet)	Ambient Temp (ºF)
	Model #	HP	Liquid	Suction					
R448a	ZF15K4E	5	1/2"	1 1/8"	29.4	74	367	3728	100

Electrical Data

Power Supply			Compressor		MCA		MOP		Notes
Volts	Phase	Hz	RLA	LRA	Air Def.	Elec. Def.	Air Def.	Elec. Def.	MCA = Minimum Circuit Ampacity
208-230	1	60	24.7	169	35	46	50	60	MOP = Maximum Overcurrent Protection



Capacity (BTUH) @ Designated Saturated Suction Temperatures

+40º F	+35º F	+30º F	+25º F	+20º F	+15º F	+10º F	+5º F	+0º F
0	0	0	0	0	0	0	0	23,430

-5º F	-10º F	-15º F	-20º F	-25º F	-30º F	-35º F	-40º F
20,935	18,440	16,278	14,321	12,596	11,075	9,846	8,617

RL6E142DDARE
Next-gen All-temp

Imperial Brown (Portland Division) - 198 SE 223rd Ave. - Gresham, OR 97030
Phone: (800) 238.4093 - Fax: (503) 665.2929
Internet: imperialbrown.com

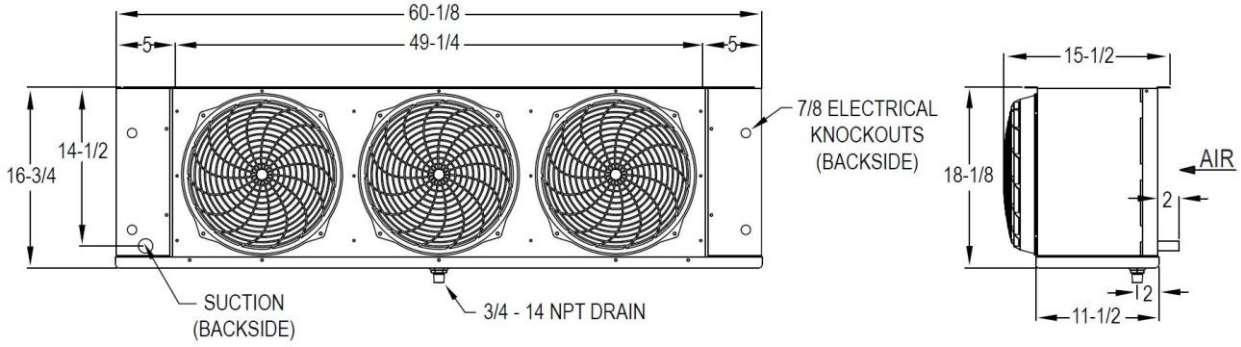
CCB #0091759

Physical and Electrical Data

Defrost Type	Air Flow	Capacity (BTUH)	Net Weight (lbs.)	Altitude (Feet)
Electric	2325	14,638	66	3728

Power Supply			Fans			Heaters		Connections		
Volts	Phase	Hz	Qty	Amps	Motor Type	Amps	Watts	Inlet	Outlet	Drain
208-230	1	60	3	1.5	EC2	14.3	3300	3/8"	1 1/8"	3/4"

Front and Right Views



Imperial BROWN

Box Load Calculation

Quote/Order #
24-IB-12953

Imperial Brown (Portland Division) - 198 SE 223rd Ave. - Gresham, OR 97030
Phone: (800) 238.4093 - Fax: (503) 665.2929
Internet: imperialbrown.com

CCB #0091759

Box #: 1
Box Description: 17' - 8" x 24' - 0" x 9' - 3/4" rectangular indoor freezer/cooler combo
- 17' - 0" ID x 15' - 0" ID x 8' - 4" ID freezer (-10°F) (with floor)
- 17' - 0" ID x 8' - 0" ID x 8' - 8 3/4" ID cooler (35°F) (no floor)

System Name: Cooler
Holding Temp. (º F): 35
Altitude (Ft.): 3728
RH %: 90%
Ambient Temp. @ Chamber (º F): 85
Ambient Temp. @ Cond. Unit (º F): 100

System Summary: (1) RFO150E4SDA-NT w/ (1) RL6A094ADARE - 10905 BTU/H Capacity @ 11.3º F TD @ 13.1 hour runtime
@ 85ºF ambient / 35ºF room temp. / 3728ft altitude

Load Summary: (BTU/H)

Surfaces	2,763	30.85%	
Infiltration	4,612	51.50%	2.00 times ASHRAE's recommended infiltration load
Product	794	8.86%	ASHRAE recommended values for holding load only
Misc.	788	8.79%	
Total	**8,957**		

Product Data	
Product Weight (lbs.)	2,257
Pull Down Time (Hours)	24
Entering Temp. (º F)	40
Final Temp. (º F)	35
Freezing Point (º F)	29
Specific Heat - Above	0.90
Specific Heat - Below	0.40
Latent Heat of Fusion	115.00
Respiration Load	0.00
Heat of Respiration	0.00

Misc. Data	
Motor HP Equivalence	0.07
Lighting Watts / Ft.²	0.34
Occupancy	0.05
Forklift	0.00
Misc. BTUH	0.00

RFO150E4SDA-NT
Air Cooled / Scroll

Imperial Brown (Portland Division) - 198 SE 223rd Ave. - Gresham, OR 97030
Phone: (800) 238.4093 - Fax: (503) 665.2929
Internet: imperialbrown.com

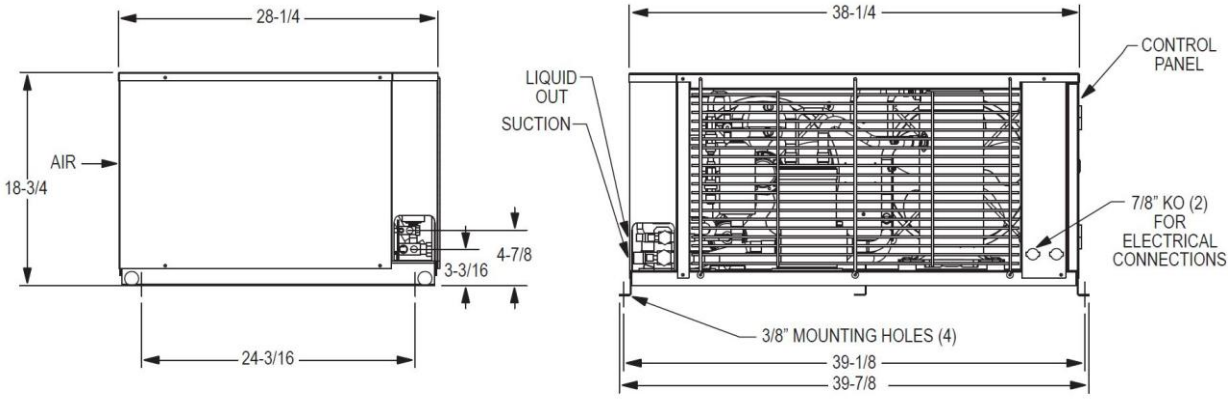
CCB #0091759

Physical Data

Refrigerant	Compressor		Connections		Receiver Capacity (90%)	Sound Data	Net Weight (lbs.)	Altitude (Feet)	Ambient Temp (ºF)
	Model #	HP	Liquid	Suction					
R448a	ZS11KAE	1.5	1/2"	7/8"	11.6	71	205	3728	100

Electrical Data

Power Supply			Compressor		MCA		MOP		Notes
Volts	Phase	Hz	RLA	LRA	Air Def.	Elec. Def.	Air Def.	Elec. Def.	MCA = Minimum Circuit Ampacity
208-230	1	60	11.3	55	16.1	26	25	30	MOP = Maximum Overcurrent Protection



Capacity (BTUH) @ Designated Saturated Suction Temperatures

+40º F	+35º F	+30º F	+25º F	+20º F	+15º F	+10º F	+5º F	+0º F
0	13,282	12,030	10,834	9,767	8,942	8,116	7,290	6,465

-5º F	-10º F	-15º F	-20º F	-25º F	-30º F	-35º F	-40º F
5,797	5,166	0	0	0	0	0	0

RL6A094ADARE
Next-gen All-temp

Imperial Brown (Portland Division) - 198 SE 223rd Ave. - Gresham, OR 97030
Phone: (800) 238.4093 - Fax: (503) 665.2929
Internet: imperialbrown.com

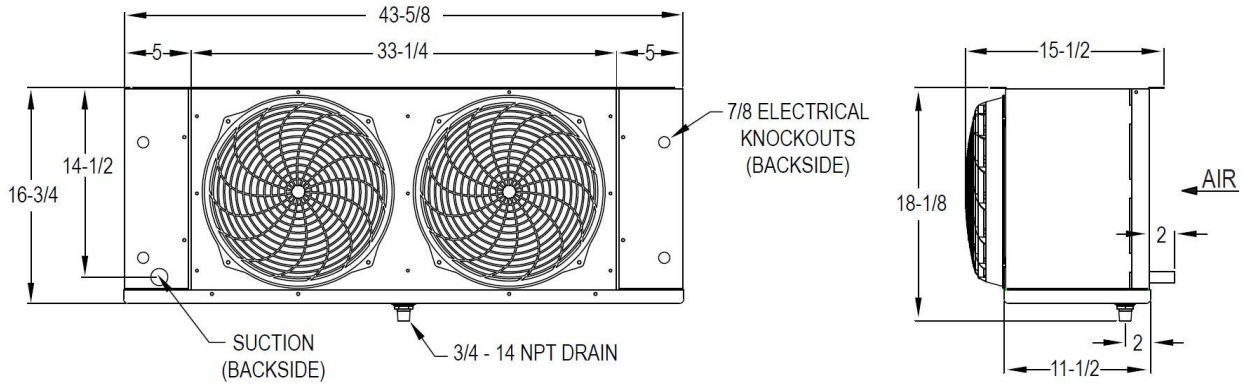
CCB #0091759

Physical and Electrical Data

Defrost Type	Air Flow	Capacity (BTUH)	Net Weight (lbs.)	Altitude (Feet)
Air	1570	9,612	45	3728

Power Supply			Fans			Heaters		Connections		
Volts	Phase	Hz	Qty	Amps	Motor Type	Amps	Watts	Inlet	Outlet	Drain
115	1	60	2	1.6	EC2	0	0	3/8"	5/8"	3/4"

Front and Right Views



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.
   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 Valves
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. ALL Ceiling Type: . Tyco Raven 1381
1. Escutcheon Plate Finish: White.

B. Exposed Area Type: Pendant upright type with guard.
1. Finish: Brass.

2. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

C. 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.

D. 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.

E. Guards: Finish to match sprinkler finish.

F. 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 of the 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. Condensate Drain Piping: Type "M" copper with sweat fittings or Schedule 40 PVC pipe and fittings.

B. Compressed Air Piping: 40-A-120 black steel pipe with black banded 300 lb. malleable iron fittings and coupling or Victaulic press-fit system.

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. 3/4 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. All black pipe connections will be threaded pipe, Mega Press fittings are not allowed.

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. Cast iron pipe is required for all drain lines with elevated temperatures including the kitchen.

B. 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.

C. 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 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. SUF100-199NE State

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.

M. All penal plumbing fixtures shall have mixing valves, Flod-Trol option, and pinned cleanout plugs.

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 4001END 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
NG	Natural 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. Rooftop Units.
      b. Exhaust Fans.
      c. Kitchen Hood.

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.

3.5 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. Ductwork Insulation
   2. Refrigerant Piping
   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 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. Elbows, fittings, and diffuser drops greater than 12 inches in length.
   4. 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 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 0923 – DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC (Carrier IVU)

PART 1 -GENERAL

1.01 SUMMARY

A. The Direct-Digital Control (DDC) System specified herein shall include materials, operator workstation, building controllers, sensors, control valves, wiring, installation, start-up, testing, documentation and training for a complete operable system as required for this project.

B. Controls Engineering shall be provided by the local controls manufacturer representative.

C. Work specified under Section 23 09 00 Instrumentation and Control for HVAC and those sections of 23 09 00 that have been specified herein shall be performed under the direct supervision of the local controls manufacturer representative.

D. Alternate techniques, modifications or changes to any aspect of these specifications may be submitted as a voluntary alternate no later than (15) days prior to the bid date and with sufficient information for a complete evaluation. This information shall include product data sheets, a UL508A Standard for Industrial Control Panels statement of compliance for any locally manufactured control panels, a detailed sequence of operation and engineered shop drawing. Shop drawings shall include the following as a minimum. Point to point wiring diagrams for each piece of equipment to be controlled, a network riser diagram that will depict quantity and location of the operator workstation, controllers, routers and repeaters required for this project.

1.02 RELATED SECTIONS

A. 01 00 00: General Requirements

B. 01 33 00: Submittal Procedures

C. 23 00 00: Heating, Ventilating, and Air Conditioning (HVAC)

D. 23 08 00: Commissioning of HVAC

E. 26 00 00: Electrical

1.03 SUBMITTALS

A. Submit engineered shop drawings, sequences of operation, third party equipment and controls integration points and product data sheets covering all items of equipment for the proposed system prior to installation for approval. Any deviation from the contract documents shall be noted and the drawings signed and dated by the Contractor. Additionally, submit a UL508A Standard for Industrial Control Panels statement of compliance for any locally manufactured control panels.

B. After completion of the installation and commissioning, a full set of as-built documentation shall be turned over to the Owner. The as-built shall include operation and maintenance manuals, sequence of operation, shop drawings and digital copies of the following.

1. Complete DDC System database backup

2. Source files for all custom written controller applications

3. Source files for graphics if required for this project

1.04 WARRANTY

A. Components, system software, and parts shall be guaranteed against defects in materials, fabrication, and execution for (1) year from date of system acceptance. Provide labor and materials to repair, reprogram, or replace components at no charge to the Owner during the warranty period.

B. Provide a list of applicable warranties for components, this list shall include warranty information, names, addresses, telephone numbers, and procedures for filing a claim and obtaining warranty services.

C. Respond to the Owner's request for warranty service within (24) hours during normal business hours. Submit records of the nature of the call, the work performed, and the parts replaced or service rendered.

D. Contractor shall request VPN access from owner and provide remote maintenance, software updates and repair service for the duration of the warranty period.

1.05 TRAINING

A. Provide a competent instructor who is factory trained and has comprehensive knowledge of system components and operations to provide full instructions to designated personnel in the system operation, maintenance, and programming. Training shall be specifically oriented to installed equipment and systems.

B. Provide (8) hours of onsite owner familiarization and training for the installed system. Training shall include system overview, time schedules, emergency operation, and programming and report generation.

C. Owner employees attending this training session shall be provided with the following documentation:

1. System layout point to point connection diagram.
2. System components cut sheets.
3. Operations and maintenance data.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Do not store or install electronic hardware on the project until non-condensing environmental conditions have been established.

PART 2 -PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. DDC Equipment: Only Carrier OPEN BACnet controls equipment will be acceptable, to match existing equipment in the building.

B. The local manufacture representative will operate a free 40 hour a week, toll free customer support hotline for additional user support services that are required.

2.02 SYSTEM LISTING COMPLIANCE

A. Locally manufactured control panels shall meet all requirements as outlined by UL 508A standard and shall be both approved and listed by Underwriters Laboratories, Inc.

2.03 COMMUNICATION

A. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135, BACnet.

B. Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.

C. Use owner provided Ethernet backbone for network segments.

2.04 OPERATOR INTERFACE

A. Description. The control system shall be as shown and consist of a high-speed, peer-to-peer network of DDC controllers and a stand-alone web server operator interface. Depict each mechanical system and building floor plan by a point-and-click graphic. A web server shall gather data from this system and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators with sufficient access level shall have an ability to make changes to all system and equipment graphics in the web server in addition to having full DDC system access to make configuration changes to the control system. Any tools required for making graphic changes shall be provided with web server.

B. Operator Interface. Furnish (1) Web server interface as shown on the system drawings.

1. With the use of an owner provided remote SMTP email server the operators interface web server shall notify personnel of an alarm and record information about an alarm in the DDC system.

2. Any required installation or commissioning software shall be provided to the owner.

C. Operator Functions. Operator interface shall allow each authorized operator to execute the following functions as a minimum:

1. Log In and Log Out
2. Point-and-click Navigation

3. View and Adjust Equipment Properties
4. View and Adjust Operating Schedules
5. View and Respond to Alarms
6. View and Configure Trends
7. Manage Control System Hardware
8. Manage Operator Access

D. System Graphics. Operator interface shall be graphical and shall include at least one graphic per piece of equipment and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using dynamic colors to represent zone temperature relative to zone setpoint.

E. Trend Configuration. Operator shall be able to configure trend sample or change of value (COV) interval, start time, and stop time for each system data object and shall be able to retrieve data for use in spreadsheets and standard database programs.

F. Reports and Logs. Operator shall be able to select, to modify, to create, and to print reports and logs. Furnish the following standard system reports.

1. Alarm Reports
2. Schedule Reports
3. Security Reports
4. Commissioning Reports
5. Equipment Reports

G. Energy Conservation

1. Outside Air Lockout. Lock out heating or cooling modes based on configurable outside air temperature limits.

2. Demand Limiting

a. System shall monitor building power consumption from building power meter pulse generator signals or from building feeder line watt transducer or current transformer.

b. The system shall include all required hardware and software necessary to receive an Automated Demand Response (ADR) signal from the utilities Demand Response Automation Server (DRAS).

c. When power consumption exceeds adjustable levels, or the system receives an ADR signal from the utility, the system shall automatically adjust set points, and take other programmatic actions to reduce demand.

3. Optimal Start. The system shall bring the conditioned space to within occupied set points prior to the occupied time period to ensure occupant comfort.

4. Demand Controlled Ventilation (DCV).Each controlled space shall have a Carbon Dioxide (CO2) sensor and shall maintain a ventilation setpoint through a DCV algorithm to fulfill the requirements of ASHRAE standard, 62-1989

"Ventilation for Acceptable Indoor Air Quality" (including Addendum 62a-1990).

2.05 CONTROLLERS

A. General. The control system shall be available as a complete package with the required input sensors and devices readily available. Provide BACnet Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC), and Sensors (SEN) as required.

B. Stand-Alone Operation. Each piece of equipment shall be controlled by a single controller to provide stand-alone control in the event of communication failure.

C. Serviceability. Controllers shall have diagnostic LEDs for power, communication, and processor.

D. Rooftop Unit Controller (RTC). Defined as Application Specific Controllers (ASC), shall be factory installed by the HVAC manufacturer and shall control all associated HVAC rooftop equipment functions in a single zone application or as part of a zoning system application.

1. Capacity control shall be based by the RTC internal time clock and setpoints (cooling and heating) coupled with a communicating room sensor. The controls shall provide separate occupied and unoccupied cooling and heating setpoints.

2. RTC shall utilize up to 2 speed of fan control, up to 3 stages of cooling, and up to 4 stages of heating.

3. RTC shall provide economizer control that has been certified for Fault Detection and Diagnostics (FDD) by California Energy Commission (CEC). The FDD system shall detect the following faults:
   a. Air temperature sensor failure/fault
   b. Not economizing when it should
   c. Economizing when it should not
   d. Damper not modulating
   e. Excess outdoor air

E. Zone Controller (ZC). Defined as Application Specific Controllers (ASC) shall be capable of independent zone control or function as part of the zoning system.

1. ZC shall have an integrated brushless actuator, onboard pressure sensor and shall perform pressure independent zone control by measuring and controlling CFM being delivered to the zone.

F. Bypass Controller (BC). Defined as Application Specific Controllers (ASC) shall be capable of reading supply static pressure and controlling the bypass damper (or a VFD speed control output) to maintain the supply static set point in the supply duct. This operation shall be provided when operating within a zoning system application, or in a stand-alone mode.

1. BC shall have an integrated brushless actuator and onboard pressure sensor to measure and control duct static pressure.

G. General Purpose Controller. Defined as Advanced Application Controller (AAC) shall be a solid state micro-controller with pre-tested and factory configured software designed for controlling building equipment using DDC algorithms and facility management routines. The controller shall be capable of operating in either a stand-alone mode or as part of a network.

2.06 FIELD INSTALLED SENSORS

A. Space Temperature Sensors shall communicate to the controller over a 4-wire communication network and have setpoint adjustment, after hours override, occupancy sensor, LCD display and a communication service port.

B. Carbon dioxide sensor (CO2) shall be integrated into the Space Temperature Sensors and have integral programming to perform automatic baseline calibration without user interface. The recommended manual recalibration period shall not be less than five years.

C. Status indication for fans or pumps shall be provided by current sensing switch. The sensor shall be installed at the motor starter or motor to provide load indication. The unit shall consist of a current transformer, a solid state current sensing circuit (with adjustable set point) and a solid state switch. A light emitting diode (LED) shall indicate the on off status of the unit.

2.07 CONTROL PANELS

A. Provide single-door, UL 508A Listed; NEMA Type 1, 3R or 4 to match environmental conditions, wall-mount enclosures for each system under automatic control. Mount relays, switches, and controllers in cabinet and indicators, pilot lights, push buttons and switches flush on enclosure exterior face as required.

B. Fabricate panels from 16 gauge steel with ANSI 61 gray finish and shall include (1) black padlock handle that will accommodate a padlock with up to a 5/16-in. locking bar for secure access to the enclosure contents. All additional latches shall be black non-locking handle type.

C. Provide engraved name plates that identify each control panel and for each component mounted to the exterior of the enclosure.

D. Provide a complete wiring diagram, bill of material for all components and markings with the following information:

1. Manufacturer’s name or trademark

2. Supply voltage, number of phases, frequency, and full-load current for each incoming supply circuit

3. Enclosure type number

PART 3 - EXECUTION

3.01 ELECTRICAL WIRING

A. This contractor is responsible for all low voltage electrical installation and wiring for a fully operational DDC System as shown on the drawings and shall perform electrical installation in accordance with local and national electrical codes and in accordance with Division 26.

B. Install all HVAC control wiring, 24vdc or less, in electrical metallic tubing (EMT) when wire is concealed in walls and in exposed areas. Rigid metal conduit (RMC) will be used when conduit will be installed on roofs. Plenum wire may be used in ceilings where anchored support is provided every 10 feet.

C. Electrical Contractor is responsible for providing power from local electrical panels to the DDC System control panels.

3.02 ACCEPTANCE PROCEDURE

A. Upon completion of the installation, the contractor shall start-up the system and perform all necessary calibration and testing to ensure the proper operation of the DDC System.

B. After all calibration and testing have been completed, the contractor shall schedule a hardware demonstration and system acceptance test to be performed in the presence of the designated owner's representatives.

C. The contractor shall be a member of the designated Commissioning Team and shall be responsible for performing procedures presented in specification and contract drawings as detailed in the Functional Performance Tests (FPT).

END OF SECTION 23 0923

SECTION 23 2300 - REFRIGERANT PIPING SYSTEMS

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 piping for refrigeration systems as described in Contract Documents.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Refrigerant piping shall be installed by a refrigeration contractor licensed by State.

PART 2 - PRODUCTS

2.1 REFRIGERANT PIPING

A. Meet requirements of ASTM B 280-88, "Specification for Seamless Copper Tube for Air Conditioning & Refrigeration Field Service", hard drawn straight lengths.

B. Do not use pre-charged refrigerant lines.

2.2 REFRIGERANT FITTINGS

A. Wrought copper with long radius elbows.

B. Approved Manufacturers:
   1. Mueller Streamline
   2. Nibco Inc
   3. Grinnell
   4. Elkhart Products Corp

2.3 SUCTION LINE TRAPS

A. Manufactured standard one-piece traps.

2.4 CONNECTION MATERIAL

A. Brazing Rods:
   1. Copper to Copper Connections:
   2. AWS Classification BCuP-4 Copper Phosphorus (6% silver).
   3. AWS Classification BCuP-5 Copper Phosphorus (15% silver).
   4. Copper to Brass or Copper to Steel Connections:
   5. AWS Classification BAg-5 Silver (45% silver).
   6. Do not use rods containing Cadmium.

2.5 FLUX

A. Approved Manufacturers:
   1. "Stay-Silv white brazing flux" by J W Harris Co
   2. High quality silver solder flux by Handy & Harmon

PART 3 - EXECUTION

3.1 INSTALLATION

A. Do not install refrigerant piping underground or in tunnels.

B. Slope suction lines down toward compressor one inch/10 feet. Locate traps at vertical rises against flow in suction lines.

C. Refrigeration system connections shall be copper-to-copper, copper-to-brass, or copper-to-steel type properly cleaned and brazed with specified rods. Use flux only where necessary.
   1. No soft solder (tin, lead, antimony) connections will be allowed in system.

D. Braze valve, sight glass, and flexible connections.

E. Circulate dry nitrogen through tubes being brazed to eliminate formation of copper oxide during brazing operation.

3.2 FIELD QUALITY CONTROL

A. Make evacuation and leak tests in presence of Architect's Engineer after completing refrigeration piping systems. Positive pressure test will not suffice for procedure outlined below.
   1. Draw vacuum on each entire system with vacuum pump to 200 microns using vacuum gauge calibrated in microns. Do not use cooling compressor to evacuate system nor operate it while system is under high vacuum. Isolate compressor from system piping using shut-off valves prior to pulling vacuum.
   2. Break vacuum with freon to be used and re-establish vacuum test. Vacuum shall hold for 24 hours at 200 microns without compressor running.
   3. Conduct tests at 70 deg F ambient temperature minimum.
   4. Do not run systems until above tests have been made and systems started up as specified. Inform Owner's Representative of status of systems at time of final inspection and schedule start-up and testing if prevented by outdoor conditions before this time.
   5. After testing, fully charge system with refrigerant and conduct test with Halide Leak Detector.

END OF SECTION 23 2300

SECTION 23 2310 - REFRIGERANT SPECIALTIES

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 refrigeration specialties as described in Contract Documents except for expansion valves on 2 through 5 ton condensing units.

PART 2 - PRODUCTS

2.1 EXPANSION VALVES

A. For pressure type distributors, externally equalized with stainless steel diaphragm, and same refrigerant in thermostatic elements as in system.

B. Size valves to provide full rated capacity of cooling coil served. Coordinate selection with evaporator coil and condensing unit.

C. Approved Manufacturers:
1. Alco
2. Henry
3. Mueller
4. Parker
5. Singer
6. Sporlan

2.2 FILTER-DRIER

A. On lines 3/4 inch outside diameter and larger, filter-drier shall be replaceable core type with Schraeder type valve.

B. On lines smaller than 3/4 inch outside diameter, filter-drier shall be sealed type using flared copper fittings.

C. Size shall be full line size.

D. Approved Manufacturers:
1. Alco
2. Mueller
3. Parker
4. Sporlan
5. Virginia

2.3 SIGHT GLASS

A. Combination moisture and liquid indicator with protection cap.

B. Sight glass shall be full line size.

C. Sight glass connections shall be solid copper or brass, no copper-coated steel sight glasses allowed.

D. Approved Manufacturers:
   1. Alco
   2. Mueller
   3. Parker
   4. Superior
   5. Virginia

2.4 MANUAL REFRIGERANT SHUT-OFF VALVE

A. Ball valves designed for refrigeration service and full line size.

B. Valve shall have cap seals.

C. Valves with hand wheels are not acceptable.

D. Provide service valve on each liquid and suction line at compressor.

E. If service valves come as integral part of condensing unit, additional service valves shall not be required.

F. Approved Manufacturers:
   1. ConBraCo (Apollo)
   2. Henry
   3. Mueller
   4. Superior
   5. Virginia

2.5 FLEXIBLE CONNECTORS

A. Provide in each liquid line and suction line at both condensing unit and evaporator on systems larger than five tons.

B. Anchor pipe near each flexible connector.

C. Connectors shall be for refrigerant service with bronze seamless corrugated hose and bronze braiding.

D. Approved Manufacturers:
   1. Anaconda "Vibration Eliminators" by Anamet
   2. Vibration Absorber Model VAF by Packless Industries
   3. Vibration Absorbers by Superior Valve Co
   4. Style "BF" Spring-flex freon connectors by Vibration Mountings

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install valves and specialties in accessible locations. Install refrigeration distributors and suction outlet at same end of coil.

END OF SECTION 23 2310

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

PART 3 - EXECUTION

3.1 INSTALLATION

A. Anchor fan units securely to structure or curb.

END OF SECTION 23 3400

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 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 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 Carrier I-Vu controls. Refer to section 23 0923

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. (Preferred)

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 2200: Dry-Type Transformers
      b) Section 26 2413: Switchboards
      c) Section 26 2417: Panelboards
      d) Section 26 2726: Wiring devices.
      e) Section 26 2816: Enclosed switches and circuit breakers.
      f) Section 26 4314: Gas Engine Driven Generator Sets
      g) Section 26 3623: Automatic Transfer Switches.
      h) Section 26 5100: Interior & Exterior lighting fixtures.
      i) Section 26 6210: Data System Cabling
      j) Section 26 6412: Intelligent VESDA Air Sampling System

   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 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 grount 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. All underground conduit installations shall be provided with tracer wires for future locating.
    b. Bury underground raceway installed outside building 24 inches deep minimum.
    c. 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 0550 - WIRE BASKET TRAY SYSTEMS

PART 1 – GENERAL

1.01 SUMMARY

A. Work covered under this section consists of the furnishing of all necessary labor, supervision, material, equipment, tests and services to completely execute a complete wire basket cable tray system (Product) as described in this specification and as shown on the drawings.

B. Related Sections:
1. Section 26 05 36 Cable Trays for Electrical Systems

1.02 REFERENCES

A. NFPA 70: National Electrical Code (2008)

B. UL CYNW Guide Info Cable Trays

C. NEMA VE 1 - Metal Cable Tray Systems.

D. NEMA VE 2 - Cable Tray Installation Guidelines.

E. ANSI/TIA-568-C.0 – Generic Telecommunications Cabling for Customer Premises

F. ANSI/TIA-569-A&B – Commercial Building Standard for Telecommunications Pathways and Spaces

G. TIA 942 – Telecommunications Infrastructure Standard for Data Centers

H. IEC 61537 (2001) Cable Tray Systems and Cable Ladder Systems for Cable Management

I. ASTM A510 - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel

J. ASTM A1011 - Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

K. ASTM A123 - Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

L. ASTM A513 - Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing

M. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel

N. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Hot-Dip Galvanized) Iron and Steel

O. ASTM A641 - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire

1.03 SUBMITTALS

A. Comply with Section 01 33 00 – Submittal Procedures.

B. Product Data:

1. Submit manufacturer's descriptive literature and product specifications for each product.

2. Manufacturer's product drawings.

1.04 QUALITY ASSURANCE

A. Source Limitations – All cable tray components shall be sourced from a single manufacturer.

C. Listing and Labeling: Provide cable trays and accessories specified in this Section that are listed and labeled.

1. The Terms "Classified" pertaining to cable trays (rather than "Listed") and "Labeled": As defined in NFPA 70, Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

3. "Classified" products shall not be modified in the field without express and advance written approval from "Listing and Labeling" Agency, Authority Having Jurisdiction (AHJ), and owner.

C. Comply with NFPA 70, *National Electrical Code, Article 392: Cable Trays*; provide UL Classification and labels.

D. All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the owner or owner's representative.

E. Supply all equipment and accessories new and free from defects.

F. Supply all equipment and accessories in compliance with the applicable standards listed in Part 1.2 of this section and with all applicable national, state and local codes.

G. All cable tray shall be Classified by Underwriters Laboratories (UL) as to their suitability for use as an equipment grounding conductor in accordance with Sections 392.3(C) and 392.7(B) of the NEC.

H. Wire basket cable tray shall be of uniform quality and appearance.

I. Comply with the NFPA 70, National Electrical Code (NEC) 2008 Edition, as applicable, relating to construction and installation of cable tray and cable channel systems (Article 392, Cable Trays).

J. Comply with NFPA 70B, "Recommended Practice for Electrical Equipment Maintenance" pertaining to installation of cable tray systems.

1.05 COORDINATION

A. Coordinate layout and installation of cable tray with other installations.

B. Revise locations and elevations from those indicated as required to suit field conditions and as approved by the Architect.

C. Storage and Handling: Avoid breakage, denting and scoring finishes. Damaged products will not be installed. Store cable trays and accessories in original cartons and in clean dry space; protect from weather and construction traffic. Wet materials will be unpacked and dried before storage.

1.06 WARRANTY

A. Product is warranted free of defects in material and workmanship.

B. Product is warranted to perform the intended function within design limits.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers:

- Cabolofil EZ Tray
- GS Metals Flex Tray
- Thomas & Betts Corporation QuickTurn™ Wire Basket Tray

2.02 DESIGN AND PERFORMANCE REQUIREMENTS

A. Provide wire basket cable tray of types and sizes indicated with support assemblies and accessories.

B. All straight section longitudinal wires shall be constructed with a straight and rigid top wire. In no case shall the top wire be bent or kinked either before or after installation.

C. All fittings for changes in direction and/or elevation shall be factory complete parts and shall be “Listed and Labeled” (“Classified”) in the same manner and by the same Agency as the straight sections. In no case shall a straight section be modified in the field to change direction or elevation.

D. Wire basket cable tray shall be made of high strength steel wires and formed into a minimum 2 inch by 4 inch wire mesh pattern with intersecting wires welded together. All mesh sections must have at least one bottom longitudinal wire along entire length of straight section.

E. Wire basket cable tray sizes shall conform to the following nominal criteria:

1. Straight sections shall be furnished in standard lengths of 120”, 96”, 60”, 24”, or 12”.

2. Wire diameter shall be 0.187” (3/16”) minimum on all mesh sections.

3. Wire tray shall have a minimum 2” usable loading depth by 6”, 8”, 12”, 18”, 24” or 36” wide.

F. Material and Finishes: Material and finish specifications are as follows:

1. Electro-Plated Zinc Galvanizing: Due to well-documented risks associated with electroplated metals, there shall be no electroplated material allowed except for that minimum necessary for purposes of bonding and grounding. All tray, fittings, supports, and accessories not required to be bare metal for bonding and grounding shall be powder coated carbon steel or stainless steel.

2. Hot Dipped Galvanizing: Straight sections shall be made from steel meeting the minimum mechanical properties of ASTM A510, Grade 1008 and shall be hot-dipped galvanized after fabrication in accordance with ASTM A123.

G. Special accessories shall be furnished as required to protect, support and install a wire basket cable tray system:

1. Divider Strips shall be installed by the manufacturer, welded into the cable tray and powder coated (or manufactured of stainless steel or hot-dipped galvanized) and shall be of the same height as the usable height specified for the cable tray.

2. Dropouts shall be manufactured of the same material and finish as the cable tray and fittings.

3. Supports shall be manufactured of .25” (1/4”) diameter wire or other material as supplied by manufacturer of cable tray. Supports shall be finished in the same manner as cable tray, fittings, and accessories with powder coat, hot-dipped galvanizing, or stainless steel.

2.3 EQUIPMENT GROUNDING CONDUCTOR PERFORMANCE

A. Under UL CYNW Cable Tray program cable tray must be *capable of* performance as an equipment grounding conductor.

1. Use only UL Classified and Labeled complete factory tray straight sections and,

2. Use only UL Classified and Labeled complete factory tray fittings for changes in direction and elevation

3. Ensure that all bonding/grounding points on tray and fittings are securely *bolted* in accordance with manufacturer’s instructions

B. Test cable tray system per NFPA 70B, Chapter 18 to verify specified maximum grounding resistance.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of cable tray supports. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install cable tray level and plumb according to drawings, original design, and referenced standards.

B. Install wire basket cable tray in accordance with NEMA VE 2 to ensure that the cable tray equipment complies with the requirements of the NEC, applicable portions of NFPA 70B, and the National Electrical Contractors Association's (NECA) 'Guide to Quality Electrical Installations' pertaining to general electrical installations practices.

C. All trays should be supported using a minimum of ¼" All Threaded Rod (ATR) or Gripple No 3 Y-Fit Cable Support. Verify Rod or Cable support capacity is adequate for cable tray, supports, cabling, and future growth.

D. Special accessories shall be furnished as required to protect, support and install a wire basket cable tray system.

E. Coordinate wire basket cable tray with other electrical work as necessary to properly interface installation of wire basket cable tray with other work.

F. Support trays and fasten to structure. Install supports at each connection point, at end of each run, and at other points to maintain spacing between supports of 6' maximum.

G. Install expansion connectors were recommended by manufacturer as indicated on drawings.

H. Install firestopping in accordance with local and NFPA regulations to sustain ratings when passing wire basket cable tray through fire-rated elements.

I. Bond and ground metal cable tray in accordance with NFPA 70, National Electrical Code, Article 392: Cable Trays.

    1. Provide continuity between wire basket cable tray components.

    2. Make connections to tray using bonding loops built into tray and carriage bolt/nut assembly supplied by cable tray manufacturer.

    3. Ground cable trays using grounding lug attached to open bonding loop on last section of tray or fitting.

J. If required, install warning signs along wire basket cable tray, located to be visible.

K. Provide sufficient space encompassing wire basket cable tray to permit access for installing and maintaining cables.

3.3 TESTING

A. Test wire basket cable tray systems to ensure electrical continuity of bonding and grounding connections, and to demonstrate compliance with specified maximum grounding resistance. See NFPA 70B, Chapter 18, for testing and test methods.

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 2200 - DRY TYPE TRANSFORMERS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Dry type two winding transformer. Sizes and Quantities as per plans.

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 secondary grounding.
   1. Section 26 0501 - Basic Electrical Requirements.

B. In the event of conflict regarding dry type transformer requirements between this Section and any other section, the provisions of this Section shall govern.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Store in warm, dry location with uniform temperature. Cover ventilating openings to keep out dust.

B. Handle transformers using only lifting eyes and brackets provided for that purpose. Protect units against entrance of rain, sleet, or snow it handled in inclement weather.

1.04 SUBMITTAL

A. Provide a separate set of shop drawings for each transformer supplied.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - DRY TYPE TWO WINDING TRANSFORMERS

A. General Electric Company
B. Square D Company (Sorgel)
C. ITE
D. Federal Pacific

2.02 DRY TYPE TWO WINDING TRANSFORMERS

A. Dry Type Transformers: NEMA ST 20; factory-assembled, air cooled dry type transformers.

B. Insulation system and average winding temperature rise for rated kVA as follows:

Rating	Class	Rise (degree C)
16-500	220	150

C. Case temperature shall not exceed 35 degrees C rise above ambient at its warmest point.

D. Winding Taps, Transformers 15 kVA and Larger: NEMA ST 20. Two 5 percent taps above and below full rated voltage.

E. Transformers 75 kVA and larger, provide an impedance of 4.5 percent minimum.

F. Sound Levels: NEMA ST 20.

G. Sound Levels: Maximum sound levels are as follows:

kVA Rating	Sound Level
1-5	30 db
6-25	40 db
26-150	42 db
151-225	43 db
226-300	47 db
301-500	51 db

H. Basic Impulse Level: 10 kV

I. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

J. Mounting: Transformers 75 kVA and less shall be suitable for wall, floor, or trapeze mounting; transformers larger than 25 kVA shall be suitable for floor or trapeze mounting.

K. Coil Conductors: Continuous windings with terminations brazed or welded.

L. Enclosure: NEMA ST 20; Type 1. Provide lifting eyes or brackets.

M. Isolate core and coil from enclosure using vibration-absorbing mounts.

N. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.

PART 3 - EXECUTION

3.01 GENERAL

A. Transformers shall be floor mounted except where indicated on the Drawings to be suspended or wall mounted.

B. Suspended transformers shall be mounted on hanger rods with a spring isolator in each rod.

C. Floor mounted transformers shall be mounted on a 4" high concrete housekeeping pads. Provide neoprene pads between transformer legs and housekeeping pad and anchor transformer to floor.

D. Provide grounding electrode conductor from transformer secondary neutral to nearest copper ground bar or building steel.

E. Conduit connected to transformer shall be flexible metal conduit, 24 inches minimum length, 60 inches maximum length.

END OF SECTION

SECTION 26 2413 - SWITCHBOARDS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide and install all switchboards and switchboard components as indicated on drawings and Specifications.

1.02 SUBMITTTALS

A. Submit product data under provisions of 26 0501.

B. Include front and side views of enclosures with overall dimensions shown: conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase, neutral, and ground; switchboard instrument details; instructions for handling and installation or switchboard; and electrical characteristics including voltage, switch size and ratings, and withstand ratings of all equipment and components.

C. Submit manufacturers' instructions under provisions of 26 0501.

1.03 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of 26 0501.

B. Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the site under provisions of 26 0501.

B. Store and protect products under provisions of 26 0501.

C. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

D. Handle in accordance with NEMA PB2.1 and manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Square D.
B. General Electric (GE)/ ABB
C. Cutler-Hammer (Eaton)

2.02 SWITCHBOARD CONSTRUCTION AND RATINGS

A. Factory-assembled, dead front, metal-enclosed, and self-supporting switchboard assembly conforming to NEMA PB 2, and complete from incoming line terminals to load-side terminations. Provide lugs appropriate for conductors used.

B. Switchboard electrical ratings and configurations as shown on Drawings. The short circuit rating indicated shall be an integrated rating of switchboard and its devices.

C. Line and Load Terminations: Accessible from the front only of the switchboard, suitable for the conductor materials used.

D. Bus Material: Copper or Aluminum with tin plating, sized in accordance with NEMA PB 2.

E. Bus Connections: Bolted, accessible from front for maintenance.

F. Enclosure shall be NEMA PB 2 Type 1 - General Purpose. Sections shall align at rear.
G. Switchboard Height: 90 inches, excluding floor sills, lifting members and pull boxes.

H. Finish: Manufacturer's standard light gray enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.

I. Future Provisions: Fully equip spaces for future devices with bussing and bus connections, suitably insulated and braced for short circuit currents. Continuous current rating as indicated on Drawings.

J. Main Switch or switches shall be electronic trip circuit breakers (field adjustable). Amperage as indicated on drawings.

K. All switchboards with circuit breakers rated 1200A or higher shall be furnished with Arc Energy Reduction Means as defined per NEC 240.87.

L. Nameplates: Per Section 26 0553. Labels to be attached with screws.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install switchboard in locations shown on Drawings, in accordance with manufacturer's written instructions and NEMA PB 2.1.

B. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

3.02 FIELD QUALITY CONTROL

A. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.

B. Measure insulation resistance of each bus section phase to phase and phase to ground for one minute each. Test voltage shall be 1000 volts, and minimum acceptable value for insulation resistance is 2 megohms.

C. Check tightness of accessible bolted bus joints using a calibrated torque wrench. Tightness shall be in accordance with manufacturer's recommended values.

3.03 ADJUSTING AND CLEANING

A. Adjust all operating mechanisms for free mechanical movement.

B. Touch up scratched or marred surfaces to match original finish.

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. Inmate Accessible Areas: Kenall Might Mac Series pn: WSP/WPP-6 or equal with Torx T-20 with center pin Fasteners.
   2. Finished Spaces: Stainless Steel.
   3. 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

263213 - GAS ENGINE DRIVEN GENERATOR SETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Controls and Instrumentation, System commissioning and General Specification Sections, apply to this section.

1.2 SUMMARY

A. This section includes packaged engine-generator sets for Standby power with the following features:

1. Gas engine
2. Cooling system
3. Paralleling Control Panel with monitoring and connections to building BMS
4. Performance requirements for sensitive loads
5. Fuel system
6. Alternator, exciter, and voltage regulator
7. Battery and battery charger
8. Outdoor enclosure
9. Exhaust
10. Mounting
11. Air make-up system
12. Vibration isolation devices

B. Related Requirements:

The list of related requirements is for informational purposes only. The purpose is to help identify by cross-reference the location of certain requirements that are not specified in this section.

26 3623 – Automatic Transfer Switches

1.3 ABBREVIATIONS AND ACRONYMS

A. Acronyms for names of standard-setting organizations are listed under the article ‘References’.

B. Other abbreviations and acronyms:

1. AHJ: Authority having jurisdiction
2. bhp: Brake horse power
3. CFR: U.S. Code of Federal Regulations.
4. DN: Diameter nominal
5. IVR: Integrated voltage regulator
6. CDVR: Digital voltage regulator
7. ECM: Engine Control Module
8. EPA: U.S. Environmental Protection Agency
9. EPS: Emergency power supply (see article 'Definitions' below)
10. EPSS: Emergency power supply system (see article 'Definitions' below)
11. Genset: Generator set, packaged generator set, engine generator
12. HVAC: Heating, ventilation, and air conditioning
13. LCD: Liquid-crystal display
14. NETA: InterNational Electrical Testing Association
15. p.f.: Power factor
16. PMG: Permanent magnet generator

1.4 DEFINITIONS

A. Definitions Related to NFPA 110

1. Emergency Power Supply (EPS): This section utilizes the definition provided by NFPA 110 as follows: 'Emergency Power Supply (EPS). The source of electric power of the required capacity and quality for an emergency power supply system (EPSS)'. For purposes of this section, the EPS is the packaged generator set that is being specified here.

2. Emergency Power Supply System (EPSS): This section utilizes the definition provided by NFPA 110 as follows: 'Emergency Power Supply System (EPSS). A complete functioning EPS system coupled to a system of conductors, disconnecting means and overcurrent protective devices, transfer switches, and all control, supervisory, and support devices up to and including the load terminals of the transfer equipment needed for the system to operate as a safe and reliable source of electric power.' For purposes of this section, the complete EPSS is not specified here.

3. EPPS Level 1: This section utilizes the definition provided by NFPA 110 as follows: 'Level 1 systems shall be installed where failure of the equipment to perform could result in loss of human life or serious injuries.' Also, 'For new Level 1 installations, the EPSS shall not be considered as meeting this standard until the acceptance tests have been conducted and test requirements met'.

4. EPPS Type: This section utilizes the definition provided by NFPA 110 as follows: 'The type defines the maximum time, in seconds, that the EPSS will permit the load terminals of the transfer switch to be without acceptable electrical power'

5. Prime mover: engine

B. Other Definitions

1. Hot Engine: An engine that has been previously loaded or fully heat soaked.

2. Cold Engine: An engine that has not been loaded recently. Typical for the initial loading of an engine in a standby/emergency application. Jacket water heater is typically continuously on for an emergency genset.

3. Genset: A generator set, a packaged engine generator, engine generator, energy converter

4. Generator: Main rotating piece of equipment attached to the engine and responsible for the conversion of rotational mechanical energy into electrical energy. Sometimes referred also as 'Main Generator', 'Main Alternator', or 'Alternator'.

1.5 REFERENCES

A. The following codes and standards are referenced throughout this section. Specific items of required compliance are listed within each article.

B. International Electrotechnical Commission (IEC)
1. IEC 60034 – Rotating electrical machines.
a. Part 1: Rating and performance

C. International Organization for Standardization (ISO)
1. ISO 3046 - Reciprocating Internal Combustion Engines – Performance
2. ISO 8528 - Reciprocating Internal Combustion Engine Driven Alternating Current Generating Sets

D. National Electrical Manufacturers Association (NEMA)
1. NEMA MG1 – Motors and Generators

E. National Fire Protection Association (NFPA)
1. NFPA 37 – Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines.
2. NFPA 70 – National Electrical Code.
3. NFPA 99 – Health Care Facilities Code.
4. NFPA 110 – Standard for Emergency and Standby Power Systems.

F. Underwriters Laboratories, Inc. (UL)
1. UL 489 – Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
2. UL 2200 – Standard for Stationary Engine Generator Assemblies.

1.6 WORK INCLUDED

A. Installation: The work includes supplying and installing a complete integrated paralleling generator system. The system consists of a gas generator sets with related component accessories as needed to parallel the generators.

B. System Test: A complete system load test shall be performed after all equipment is installed.

C. Requirements, Codes and Regulations: The equipment supplied and installed shall meet the requirements of the NEC and all applicable local codes and regulations. All equipment shall be of new and current production by a manufacturer who has 25 years of experience building this type of equipment. Manufacturer shall be ISO9001 certified.

1.7 ACTION SUBMITTALS

A. Bill of Materials: A listing shall include all panels, racks, instruments, components, and devices provided under this section.

B. Product Data: For each type of package engine generator indicated. Drawings and descriptive (catalog) data and brochures of each item of equipment including technical data sheets for the engine and generator.

1. Gas engine data:
   a. Manufacturer and model
   b. Revolutions per minute (rpm)
   c. Rated capacity brake horsepower (bhp)
   d. Make and model of governor
   e. Engine displacement (cubic inches)
   f. Fuel consumption rate at: full load, 3/4 load, 1/2 load

2. Generator Data (Main Alternator): Submit generator manufacturer's data sheet for the exact generator arrangement included in this scope. Generator data shall include:
   a. Generator specifications
   b. Kilowatt and KVA ratings, line and phase voltages, and rated current
   c. Generator efficiency at 25%, 50%, 75%, and 100% of kilowatt rating
   d. Generator reactance and time constants
   e. Stator and field resistances
   f. Short circuit ratio
   g. Voltage regulation performance
   h. Excitation voltage and current, at no-load and full-load conditions
   i. Generator center of gravity XYZ locations
   j. Generator, rotor, and stator weights
   k. Rotor balance deflection, in mm
   l. Overspeed capacity, expressed as % of synchronous speed
   m. Generator torsional data for coupling and fan, rotor, exciter end, and shaft stiffness
   n. Insulation class
   o. Generator thermal limits in kVA for:
      i) Class F and H temperature rises. 130C over 40C ambient in standby duty
   p. Motor starting capability chart at 0.4 p.f. (% voltage dip v. SKVA)
   q. Instantaneous fault currents (3-phase, line-line, and line-neutral)
   r. Current decrement data curve (instantaneous 3-phase fault current v. E time cycle)

s. Generator output characteristic curves:
   i) Open circuit curve (line-line voltage v. field current)
   ii) Short circuit curve (armature current v. field current)
   iii) Zero power factor curve (line-line voltage v. field current)
   iv) Air gap curve (line-line voltage v. field current)
   v) Reactive capability curve

3. Package data:
   a. Overall length, width, and height
   b. Weight of complete skid mounted unit
   c. Exhaust pipe size
   d. Air flow (in cubic feet per minute) of air required for combustion and ventilation
   e. Heat rejection to the atmosphere of the engine and generator in BTU/hr
   f. Cooling air volume required
   g. Emissions certification
   h. Sound data

4. Engine-generator unit and accessories to include:
   a. Enclosure
   b. Accessory sub-panel & transformer
   c. Control panels
   d. Voltage regulator
   e. Fuel system
   f. Exhaust system
   g. Batteries
   h. Battery charger
   i. Jacket water heater

5. Generator circuit breaker:
   a. Catalog data
   b. Recommended trip settings for all adjustable settings
   c. Short circuit interrupt ratings

C. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
   2. Design Calculations: Signed and sealed by a qualified professional engineer. Calculate requirements for selecting vibration isolators and vibration isolation bases.
   3. Vibration Isolation Base Details: Signed and sealed by a qualified professional engineer. Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include base weights.
   4. Wiring Diagrams: Power, signal, and control wiring.

1.8 INFORMATIONAL SUBMITTALS

A. Sizing calculation: Generator supplier to submit a project specific sizing calculation for engineering review and approval. Loading as shown on the electrical drawings.

B. Qualification Data: For installer, manufacturer, and testing agency

C. Source quality-control test reports:

1. Certified summary of prototype-unit test report.

2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.

3. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.

4. Report of sound generation.

5. Factory EPA Certificate showing compliance with applicable federal regulations.

6. Certified Torsional Vibration Compatibility: Comply with NFPA 110.

D. Field quality control test report

E. Warranty: Special warranty specified in this Section

1.9 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. In addition to items specified in Section "Operation and Maintenance Data," include the following:

1. Recommended service intervals, fluid sampling, and inspections.

2. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.

3. Operator training plan

1.10 MAINTENANCE MATERIAL

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set each of lubricating oil, and combustion air filters

1.11 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Maintenance Proximity: Not more than one (1) hours normal travel time from Installer's place of business to Project site.

2. Engineering Responsibility: Preparation of data for vibration isolators and seismic restraints of engine skid mounts, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Manufacturer Qualifications: A qualified manufacturer with a minimum of 25 years' experience building the generator sets. The manufacture shall actively maintain a 24-hour parts and service organization regularly engaged in maintenance contract programs to perform preventive maintenance and service on equipment like that specified.

C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Comply with ASME B15.1.

F. Comply with NFPA 37.

G. Comply with NFPA 70.

H. Comply with NFPA 99.

I. Comply with NFPA 110 requirements for Level 1 and Level 2 emergency / legally required power supply systems.

J. Listed to UL 2200 (600V generator output and below)

K. Exhaust Emissions: Comply with applicable federal, state, and local emissions requirements at the time of installation and commissioning.

L. Sound emissions: Comply with applicable local sound requirements

1.12 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and lot number, if any.

B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.13 PROJECT CONDITIONS

A. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: - 13°F to + 104°F

2. Altitude: Sea level to 3,700.0 feet.

1.14 WARRANTY

A. Two Year Standby Generator Set Warranty

1. The manufacturer's standard warranty shall in no event be for a period of less than two (2) years from date of initial start-up of the system and shall include repair parts, labor, reasonable travel expense necessary for repairs at the job site, and expendables (lubricating oil, filters, antifreeze, and other service items made unusable by the defect) used during the course of repair. Running hours shall be limited to 500 hours annually for the system warranty by both the manufacturer and servicing distributor. Warranty coverage of less than 500 hours a year operation will not be accepted. Warranties that are pro-rated will be rejected. Submittals received without written warranties as specified will be rejected in their entirety.

1.15 MAINTENANCE SERVICE

1. Maintenance Service: Upon award and acceptance of the contract, supplier shall propose to the owner an optional maintenance service agreement. All maintenance shall be by factory trained and certified employees of manufacturer's designated service organization. Include semi-annual exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

C. Inspection App: Equipment manufacturer to provide complementary app to inspect and document inspection data. The app shall include the following:

1. Access to standard inspections forms like Preventative Maintenance, Checklists and Daily Walk Arounds
2. Create custom check lists and inspection forms
3. Document asset condition with photos, videos and inspector comments
4. Red, Yellow, Green ratings allow for quick identification of actionable items
5. Web interface for viewing inspection data and managing inspection forms
6. Conduct Equipment, Site and fluid Inspections
7. Assign inspections to team members and evaluate the results from online at anytime
8. View Inspection Results - Inspect integrates with other Equipment Management applications
9. Optimized for mixed fleet owners – secure inspection results for assets all in one place

10. Inspection Data Integration – Completed inspection data made available for analysis through Partner API (Application Program Interface)

11. Real-Time Information – digital inspections provide real-time information for review and retention.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers or Pre-Approved Equal: Subject to compliance with requirements.
Any alternate shall be submitted for approval to the consulting engineer at least 10 days prior to bid.
Alternate bids must list any deviations from this specification.
1. Caterpillar Inc.
2. Kohler
3. Or approved equal

B. Supplier: Western States Equipment, Andrew.Erickson@wseco.com, 208-870-1665.

C. Basis-of-Design Product: Subject to compliance with requirements, provide a CAT CG18-model 500 kW gas generator set. The power system has been designed to the specified manufacturer's electrical and physical characteristics. The equipment sizing, spacing, amounts, electrical wiring, ventilation equipment, fuel, and exhaust components have all been sized and designed around Caterpillar supplied equipment. Should any substitutions be made, the CONTRACTOR shall bear responsibility for the installation, coordination, and operation of the system as well as any engineering and redesign costs, which may result from such substitutions.

2.2 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: The generator set complies with NFPA 37, NFPA 70, NFPA 99 and NFPA 110 (Type 10 Level 1)

B. UL Compliance: Comply with UL2200

D. Engine exhaust emissions:

1. NOx: 2.0 g/bhp-hr

2. CO: 4.0 g/bhp-hr

3. VOC: 1.0 g/bhp-hr

E. Noise emission: Maximum 75dBA at 23ft. while operating at 100% load.

2.3 ENGINE GENERATOR SET

A. New, manufactured, factory assembled and tested engine-generator set.

B. The electric power generating system shall consist of 500 kW, 625.0 kVA, 0.8 power factor, 480 volts, Three Phase, 4 wire, 60 hertz generator systems. Motor starting at 90% rated sustained voltage will not be accepted. Generator set shall be rated for Standby applications with typical usage of 500 hours per year. maximum usage of 500 hours per year. This rating allows to run generator set even when the utility or grid power is available. maximum usage of 500 hours per year. This rating allows generator set to run at 100% of nameplate rating at constant load in parallel to utility without exceeding 500 hours per year of operation.

C. Engine shall be capable of providing 425.9/532.4 kW, at 104°F (40.0°C) and altitude of 3,700.0 feet (1,127.7 m).

D. Mounting Frame: Provides structural framework to maintain alignment of mounted components without depending on concrete foundation, with provisions for lifting attachments. Rigging diagram shall be permanently attached to the generator set package to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.

E. Capacities and Characteristics:

1. Power Output Ratings: Nominal ratings as indicated, with capacity as required to operate as a unit as evidenced by records of prototype testing.

2. Output Connections: 480 volt three-phase, four wire connection.

F. Nameplates: For each major system component, identify manufacturer's name, model, and serial number of components.

G. Generator set performance:

1. Steady-State Voltage Operational Bandwidth: Within +/- 0.25% of rated output voltage from no load to full load.

2. Transient Voltage Performance: Not more than 25% variation for 40% step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.

3. Steady-State Frequency Operational Bandwidth: Within +/- 1.5% of rated frequency from no load to full load.

4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.

5. Transient Frequency Performance: Within 12% variation for 40% step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.

6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5% total and 3% for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50%.

7. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall sustain a minimum of 250% of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.

8. Start Time: Comply with NFPA 110, Type 10, system requirements.

1.4 GAS ENGINE

A. Fuel: Natural Gas

B. Rated engine speed: 1800 rpm

C. Lubrication system: The following items are mounted on engine or base rails:

1. Engine oil cooler.

2. Advanced high efficiency engine oil filter with 100% filtration efficiency to filter all particles > 25 microns, providing increased contamination control capability, filtration efficiency, adequate contaminant holding capacity and low pressure drop characteristics.
3. Bypass valve – For engine oil filter and for the engine oil cooler.
4. Engine oil pump with pressure relief valve – Gear type, generates pressure for engine lubrication system with relief valve controlling the maximum oil pressure.
5. Dipstick for oil level measurement.
6. Oil sump / oil pan with engine oil suction bell.
7. Supply & drain lines to turbocharger.

D. Cooling System: Temperature controlled liquid cooling system which includes gear driven coolant pump, radiator with integrated expansion tank and temperature regulator / thermostat as standard factory installed system.

1. Coolant - Contains combination of deionized water, glycol and additives as per manufacturer's fluid (coolant / antifreeze) recommendation for natural gas engine.
2. Radiator – Package Mounted
    a. The cooling system shall be sized to operate at full load conditions and 110 °F ambient air entering the enclosure.
    b. An integrated expansion tank rated to withstand maximum closed-loop coolant system pressure for engine used.
3. Temperature Control - Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
4. Coolant Hose - Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.
5. Fittings - Flanges or steel pipe nipples with clamps to suit piping and equipment connections.
6. Oil Cooler - Integral oil cooler shall be provided as required by the OEM.

E. Jacket Water Heater:

1. For improved engine cold-starting capability, an electric-immersion type, thermostatically controlled jacket water heater with an integrated pump shall be factory installed in coolant jacket system.
2. Supplied with UL, cUL and CE recognized components.
3. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity.
4. Provide isolation valves that allow for change out of the heater without having to drain the entire system.

F. Governor:

1. Engine mounted electronic governing system built into engine ECM (electronic control module), environmentally sealed, operating temperature limit : -40 °F to 185 °F , electrical noise immunity to 100 V/m, shock withstand capability to 20g, input voltage range 18 to 32 VDC (24 VDC nominal).
2. Governs speed within +/-0.2 Hz for isochronous and droop mode.
3. Engine ECM is capable of:
   a. Engine speed governing – dual speed sensing & overspeed protection.
   b. Fuel limiting & fuel injection timing
   c. Electronic monitoring
   d. Adjustable monitoring of engine vital parameters & self-diagnotics.

G. Air Intake Filter:

1. Heavy duty, dual element, engine mounted air filter.
2. Replaceable dry filter elements.

H. Muffler / Silencer:

1. The generator set manufacturer shall furnish all appropriate fittings, flanges, etc., as required between the engine and the silencer.
2. The exhaust silencer shall be mounted and insulated within the enclosure and pre-piped to the generator and exhaust stack.
3. Silencer shall have features as below:
   a. Sound attenuation at 100% load: 25 dBA.
   b. Exhaust temperature at 100% load: 968°F .
   c. End inlet / outlet can be adapted to different exhaust configurations.
   d. Satin black paint coated, rated to 1200°F .
   e. Corrosion resistance.
   f. Valved condensate drain that extends beyond the depth of the insulation.
   g. Connection flanges as per ANSI standard.

I. Starting System:

1. Dual cranking motor – Dual electric starter motor that automatically engage and release from engine flywheel without binding.
2. 24 VDC, insulated, SAE 3 mounting type with negative ground, operating temperature range -40 °F to 257 °F .
3. Cranking cycle: as required by NFPA 110 for system level Type 1.

4. Battery: Maintenance-free battery with 10% oversize capacity to accommodate starting within ambient temperature range specified in Part 1 to provide specified cranking cycle at least three time without recharging.
5. Battery Cable: Size as recommended by engine manufacturer for cable length required as per site conditions to be field verified by manufacturer's representative prior to order. Include required interconnecting conductors and connection accessories.
6. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35 A minimum continuous rating.
7. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall be UL listed and NFPA 110 compliant. It include the following features:
    a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
    b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in operating temperature from -22 °F to +131 °F to prevent overcharging at high temperatures and undercharging at low temperatures.
    c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to ±10%.
    d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
    e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
    f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.5 GAS FUEL SYSTEM

A. Factory-standard package options. Designed, sourced and shipped by generator set manufacturer along with generator set. Designed for installation for upstream of engine fuel inlet.

B. Comply with NFPA 37, NFPA 54 and NFPA 110 (Type 10 Level 1).

C. Comply with CSA 282-00 and CSA B149.3.

D. Comply with UL2200 (2nd Edition) and UL1446.

E. Shall be capable of handling gas supply pressure from 0.25 to 1.5 PSI at gas train inlet.

F. All gas piping external to the generator shall be provided and installed by qualified contractor.

G. Gas inlet connection size: DN50 (2 inch/5.08 cm)

H. Off engine gas fuel system includes following components:
1. Electronic Gas Shutoff Valve – 24VDC, energized to run, double solenoid with proof of closure switch.
2. DN65 (2.5 inch) Zero Pressure Gas Regulator.
3. Connection to engine fuel inlet: Flexible, braided hose.

I. On engine gas fuel system includes following components:
1. Fuel metering valve / Carburetor.
2. IP56 compliant, electronically controlled throttle valve.
3. IP56 compliant, electronically controlled compressor by-pass valve.

2.6 CONTROLS AND MONITORING

A. Provide a fully solid-state, microprocessor based, generator set controller. The control panel shall be designed and built by the engine manufacturer. Operation shall include control of the generator sets including start/stop, synchronizing, dead-bus arbitration, generator kW load sharing, generator kVAR load sharing, generator loading/unloading, and load shed/add to affect the specified sequence of operations. The control panel shall provide real time digital communications to all engine and regulator controls via secure communication network. Control shall be Caterpillar EMCP 4.4 model with optional Supervisory Control Panel (SCP).

B. Mounting:

1. The control panel shall be mounted on the generator set and include all interconnecting cables and harnesses.

C. Environmental

1. The generator set controller shall be tested and certified to the following environmental conditions:

a. -40°F to +158°F Operating Range

b. 100% condensing humidity, 86°F to 140°F

c. IP22 protection for rear of controller; IP55 when installed in control panel

d. 5% salt spray, 48 hours, 100°F, 36.8V system voltage

e. Sinusoidal vibration 4.3G's RMS, 24-1000Hz

f. Electromagnetic Capability (89/336/EEC, 91/368/EEC, 93/44/EEC, 93/68/EEC, BS EN 50081-2, 50082-2)

g. Shock: withstand 15G

D. Functional Requirements: The following functionality shall be integral to the control panel.

1. The control shall include a minimum 5.5 inch, 480 x 320 pixel, white backlit graphical display with text based alarm/event descriptions.

2. The control shall include a minimum of 6-line data display

3. Generator set overview screen displaying critical generator set mechanical and electrical data on a single screen.

4. Audible horn for alarm and shutdown with horn silence switch

5. Standard ISO labeling

6. Multiple language capability

7. Remote start/stop control

8. Local run/off/auto control integral to system microprocessor

9. Cooldown timer

10. Speed adjust

11. Lamp test

12. Emergency stop push button

13. Voltage adjust

14. Voltage regulator V/Hz slope - adjustable

15. Password protected system programming

E. Digital Monitoring Capability: The controls shall provide the following digital readouts for the engine and generator. All readings shall be indicated in either metric or English units.

1. Engine

a. Engine oil pressure

b. Engine oil temperature

c. Engine coolant temperature

d. Engine RPM

e. Battery volts

f. Engine hours

g. Engine crank attempt counter

h. Engine successful start counter

i. Service maintenance interval

j. Real time clock

k. Engine exhaust stack temperature

l. Engine main bearing temperature

2. Generator

a. Generator AC volts (Line to Line, Line to Neutral and Average).

b. Generator AC current (Avg and Per Phase).

c. Generator AC Frequency

d. Generator kW (Total and Per Phase).

e. Generator kVA (Total and Per Phase).

f. Generator kVAR (Total and Per Phase).

g. Power Factor (Avg and Per Phase).

h. Total kW-hr

i. Total kVAR-hr

j. % kW

k. % kVA

l. % kVAR

m. Generator bearing temperature

n. Generator stator winding temperature

o. Real kW. Load Histogram – which tracks time that the generator kW is within predefined ranges

F. Alarms and Shutdowns: The control shall monitor and provide alarm indication and subsequent shutdown for the following conditions. All alarms and shutdowns are accompanied by a time, date, and engine hour stamp that are stored by the control panel for first and last occurrence:

1. Engine Alarm/Shutdown

a. Low oil pressure alarm/shutdown

b. High coolant temperature alarm/shutdown

c. Loss of coolant shutdown

d. Overspeed shutdown

e. Overcrank shutdown

f. Emergency stop shutdown

g. Low coolant temperature alarm

h. Low battery voltage alarm

i. High battery voltage alarm

j. Control switch not in auto position alarm

k. Battery charger failure alarm

l. ATS remote start wiring failure

2. Generator Alarm/Shutdown

a. Generator phase sequence

b. Generator over voltage

c. Generator under voltage

d. Generator over frequency

e. Generator under frequency

f. Generator reverse power (real and reactive.

g. Generator overcurrent (including inverse definite minimum time. for Normally Inverse, Very Inverse, Extremely Inverse conditions as well as those based on Thermal Damage Curve configurations

h. Generator current balance

3. Voltage Regulator Alarm/Shutdown

a. Loss of excitation alarm/shutdown

b. Instantaneous over excitation alarm/shutdown

c. Time over excitation alarm/shutdown

d. Rotating diode failure

e. Loss of sensing

f. Loss of PMG

G. Inputs and Outputs

1. Programmable Digital Inputs. The Controller shall include the ability to accept programmable digital input signals. The signals may be programmed for either high or low activation using programmable Normally Open or Normally Closed contacts.

2. Programmable Discrete Outputs. The control shall include the ability to operate seventeen (17) discrete outputs, integral to the controller, which are capable of sourcing up to 200mA per input.

3. Integrated PLC Functionality. The panel shall allow the operator to create custom logic functions to provide additional user defined control of the generator set operation.

H. Accessibility and Maintenance

1. All engine, voltage regulator, control panel and accessory units shall be accessible through a single electronic service tool. The following maintenance functionality shall be integral to the generator set control:

a. Engine running hours display

b. Service maintenance interval (running hours or calendar days)

c. Engine crank attempt counter

d. Engine successful starts counter

e. 40 events are stored in control panel memory

f. Chronological status event log capable of displaying a sequence of event leading up to a generator set shutdown

g. Programmable cycle timer that starts and runs the generator for a predetermined time. The timer shall use 7 user-programmable sequences that are repeated in a 7-day cycle. Each sequence shall have the following programmable set points:

1) Day of week

2) Time of day to start

3) Duration of cycle

I. Remote Communications

1. Remote Communications. The control shall include Modbus TCP communications via Ethernet 10BASE-T and Modbus RTU communications via RS-485 half duplex with configurable baud rates from 2.4k to 57.6k.

2. Remote Monitoring Software. The control shall provide Monitoring Software with the following functionality

a. Monitor up to eight (8) generator sets, plus Cat automatic transfer switches.

b. Provide access to all date and events on generator set communications network

c. Provide remote control capability for the generator set(s)

d. Ability to communicate via Modbus RTU or remote modem

J. Local and Remote Annunciation

1. Local Annunciator (NFPA 99/110, CSA 282). Provide a local, control panel mounted, annunciator to meet the requirements of NFPA 110, Level 1.

a. Annunciators shall be networked directly to the generator set control

b. Local Annunciator shall include a lamp test pushbutton, alarm horn and alarm acknowledge pushbutton

c. Provide the following individual light indications for protection and diagnostics:

1) Overcrank

2) Low coolant temperature

3) High coolant temperature warning

4) High coolant temperature shutdown

5) Low oil pressure warning

6) Low oil pressure shutdown

7) Overspeed

8) Low coolant level

9) EPS supplying load

10) Control switch not in auto

11) High battery voltage

12) Low battery voltage

13) Battery charger AC failure

14) Emergency stop

15) Spare

16) Spare

2. Remote Annunciator (NFPA 99/110, CSA 282). Provide a remote annunciator to meet the requirements of NFPA 110, Level 1.

a. The annunciator shall provide remote annunciation of all points stated above and shall incorporate ring-back capability so that after silencing the initial alarm, any subsequent alarms will sound the horn. Ability to be located up to 4000 feet from the generator set without the use of a data repeater.

K. Sequence of Operations

1. Description: This sequence describes a system utilizing generator controllers to parallel multiple generators to each other in an island or standby application.

2. Functional Sequence of Operation:

a. The EPS Automation shall be provided with the following Modes of Operation:

1) Automatic/Standby Mode
a) The automatic transfer switches are in the normal position serving utility power to the loads.
b) The generator set main breakers are open.
c) The automation is standing by to act in response to a run request from associated automatic transfer switches.

2) Emergency Mode Entry
a) Automatic Transfer Switch Run Request is received by all generator controllers
b) Where applicable, load shed sequence is executed.
c) All available generators are started.
d) The first generator up to voltage and frequency is closed to the bus.
e) Critical loads and load shed priority 1 loads are powered.
f) The remaining generator sets are synchronized and paralleled to the bus as they come up to voltage and frequency.
g) As additional generators are paralleled to the emergency bus, Load Shed Priority levels are added, powering their associated loads.
h) The system will continuously monitor real and reactive power and proportionally share load among all generators on the bus.
i) The system is now in emergency mode.

3) Emergency Mode Exit
   a) Automatic transfer switches sense the utility source is within acceptable operational tolerances for a time duration set at the automatic transfer switch.
   b) As each automatic transfer switch transfers back to utility power, it removes it's run request from the generator plant.
   c) When the last automatic transfer switch has retransferred to the utility and all run requests have been removed from the generator plant, the tie breaker (if present) and all generator set main circuit breakers shall be opened.
   d) The generator sets are allowed to run for their programmed cool down period and shut down.
   e) The system is returned to automatic/standby mode

b. Load Sense Generator Demand
   1) The controller shall also include logic to automatically sequence the generator sets based on the total load requirement of the system. If the load exceeds a minimum reserve kW threshold, additional generator sets will automatically start, synchronize, and close the generator circuit breaker.
   2) If the site load falls below a reserve kW threshold, a generator set will automatically unload, open the generator circuit breaker, and shutdown.

c. Load Shed / Load Add
   1) Upon entrance into Emergency Mode, the system enters Conditional Load Shed mode, all programmed loads are shed. During Conditional Load Shed mode levels are added or shed based on the number of generators on the bus. After a load stabilization delay, the system enters Load Sensitive Load Shed mode. Subsequent levels are added based on the user- defined Add Percent and Add Delay settings. While in Load Sensitive Load Shed mode if the loads increase above the Shed Percent and remain above the Shed Percent set point for the Shed Delay time Load Shed will be initiated. If the loads increase above the Fast Shed Percent and remain above the Fast Shed Percent set point for the Fast Shed Delay time Load Shed will be initiated. Fast Shed will also be triggered if the bus frequency drops below the Bus Under Frequency set point and remains for the Bus Under Frequency Delay. Levels are shed in a descending order highest to lowest number, least to most important. Levels are added in the reverse order.

L. Telematics and Data Monitoring:

1. Asset Health and Data Monitoring: There shall be a monitoring and data management system available on a 24/7/365 basis, which interfaces with the asset (generator set, switchgear, etc.) via a cellular or Ethernet connection.

   a. It shall provide automated alert notification via text message and/or e-mail. These alerts shall also be displayed by a web-based system (desktop and mobile app) which will be updated automatically.

   b. Asset operating parameters being monitored will be displayed by a web-based system (desktop and mobile app) which will be updated automatically.

   c. Provide remote start/stop operation of generator set and scheduled generator set exercising options.

   d. Asset monitoring allows for remote troubleshooting to diagnose potential issues with the asset in order to upkeep asset health and performance.

2. Analytics and Data Reporting

   a. The telematics shall provide data analytics for digital insights and status updates through pre-defined KPI reports.

   b. Continual monitoring provides to offer status updates including basic engine / electrical parameters, historical performance and, potential maintenance issues available in every minute to every hour reporting.

3. Telematics and Data Security: The web-based software shall be secure, requiring a registered user name and password structure for access.

   a. Data Privacy Principles of the remote monitoring system are as follows:

      1) The manufacturer shall be transparent about data collection and protecting rights of data owners by implementing privacy policy agreement

      2) The manufacturer shall protect the data collected by following industry standards and certifications for data privacy and data protection.

4. The telematics hardware and remote monitoring user interface shall be an end-to-end system designed with multi-layer security controls and safeguards, to protect against unauthorized access and disclosure.

   a. High level security safeguards include, but not limited to:

      1) Cryptographic security controls to protect against unauthorized device software changes.

      2) Encrypted and authenticated remote connection.

      3) Only an outbound remote connection, initiated by the device, is allowed. Device shall not participate in or responds to general internet traffic.

      4) Manufacturer's corporate IT infrastructure secured utilizing generally accepted information security principles and practices.

      5) Secure web application connection with user login authentication and role based access controls.

   b. Security Principles of the remote monitoring system shall be as follows:

      1) Dedicated cybersecurity program and team

      2) Risk-based approach to multi-layers cybersecurity

      3) Proactively about cybersecurity

      4) Response and Remediation to Cyber incidence

      5) Training and awareness

5. The system will offer the user the option of having alarms and/or events handled by an expert advisor trained by the manufacturer. The advisor shall follow a user-defined procedure for handling alarms and/or events.

M. System Supervisory Control

1. The paralleling control system shall be equipped with a system supervisory control panel (CAT SCP).

The control panel shall be a wall mountable control panel which serves to provide an additional 16 stages of load add and load shed functionality to the generator control and paralleling system. The control panel shall provide monitoring and control of each generator, equivalent to the generator-mounted controls. The control panel shall provide detailed system level monitoring and control of each generator with the following functionality:

a. Manual load shed and load add capability
b. System initiate via discrete contact or engine control switch
c. Industrial Ethernet switch (10/100 base T)
d. Failsafe mode to minimize the disruption of power to loads in the event of a loss of communications
e. 500 event status log that is time/date based and contains load step events
f. System event Log
g. Best battery diode system
h. 7 Day/7 Cycle System Exerciser
i. Fuel transfer control
j. System monitoring display including:
    1. Load step display
    2. Total kW display
    3. Generator set status display
k. Load bus control screen displaying current and next load add or load shed step
l. Load bus overview display including:
    1. Status of each load step
    2. Actual load (Real and Reactive) on each generator
    3. Capacity (Real and Reactive) on each generator
m. Generator Set Status Display including:
    1. ECS position
    2. Alarm count
    3. Shutdown count
    4. kW and kVAR (% & Value)
    5. Breaker position
    6. Engine hours
    7. Load Sense Load Demand (LSLD) Status
    8. Generator and bus status

2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector shall perform the following functions:

1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110% of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms.

2. Under single or three-phase fault conditions, regulates generator to 300% of rated full-load current for up to 10 seconds.

3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the generator set.
4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

B. Generator Circuit Breaker(s):

1. UL listed, complying with UL 489.
2. Molded-case, electronic-trip type, 100% rated.
3. Electrically operated by the paralleling control panel.
4. Tripping Characteristics: LSI with adjustable current threshold and adjustable / fixed trip time.
5. Trip Settings: Selected to coordinate with generator thermal damage curve.
6. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
7. Mounting: Integrated with gen-set. Cable entry to be coordinated with paralleling gear and enclosure. Stand-alone circuit breaker structures will not be accepted.
8. High cycle contactors are not a substitute for electrically operated breaker specified and will not be accepted. The breaker and its enclosure shall be labeled per the NEC to be “Suitable for Use as Service Equipment”

2.8 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Designed in compliance with NEMA MG 1, IEC 60034-1, ISO 1940, NFC 51-111 standards.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Excitation: Self-Excited

D. Electrical Insulation: Class H insulation. Windings shall be random wound type. Temperature rise shall not exceed 130°C over 40°C ambient temperature.

E. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.

F. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125% of rating, and heat during operation at 110% of rated capacity.

G. Enclosure: Drip proof.

H. Instrument Transformers: Mounted within generator enclosure.

I. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified.

1. Voltage adjustment on control and monitoring panel shall provide ± 5% adjustment of output-voltage operating band.

J. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

K. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

L. Subtransient Reactance: 0.1153 or less.

2.9 VIBRATION ISOLATION DEVICES

A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.

1. Material: Bridge-bearing neoprene, complying with AASHTO M 251.

2. Durometer Rating: 60* (*to be confirmed by manufacturer based on final selection of vibration isolation system.)

3. Number of Layers: up to 4 (determined by manufacturer based on final vibration isolator assembly design)

2.10 ENCLOSURE

A. Sound Attenuated Enclosure

1. The complete gas engine generator set, including generator control panel and engine starting batteries, shall be enclosed in a weather protective enclosure which shall be factory installed on wide skid base.

2. A weather-resistant, sound attenuated enclosure consisting of roof, side walls and end walls:

a. 14 gauge steel enclosure designed for 150 mph

b. Enclosure Sound Attenuation: Acoustical foam shall be provided between all supports and inside doors and sound baffles on air intake and air discharge. The enclosure shall have a resulting sound level of 75 dba @ 23ft with the genset running under full load.

c. Paint: Environmentally friendly, polyester powder baked paint. WHITE in color, as coordinated with architect and owner. Enclosures of different colors will be rejected.

d. Fasteners: Either zinc plated or stainless steel.

e. Door hinges: zinc die cast or stainless steel, vertically hinged allowing 180 degree opening rotation and retention with door stays.

f. Latches / door handles: Compression door latches, provides solid seal, key lockable – all doors keyed alike.

g. Rodents and pest proof stub up area.

h. Lube oil and coolant drains shall be extended to the exterior of the enclosure and terminated with drain valves. Cooling fan and charging alternator shall be fully guarded to prevent injury.

2.11 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

2.12 SOURCE QUALITY CONTROL

A Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.

B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Reference system Commissioning Specifications for additional requirements. Include, at a minimum, the following tests:

1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.

2. Full load run.

3. Maximum power.

4. Voltage regulation.

5. Transient and steady-state governing.

6. Single-step load pickup.

7. Safety shutdown.

8. Provide 30 days’ advanced notice of tests and for observation of tests by Owner's representative.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.

B. Examine roughing-in of piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions, NFPA 110 and all local codes

B. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

C. Install packaged engine generator with restrained spring isolators having a minimum deflection of 1 inch.

D. Install black steel piping with welded joints and connect to engine muffler. Install thimble at wall. Piping shall be same diameter as muffler outlet. Flexible connectors and steel piping materials and installation requirements are specified in Section "Hydronic Piping."

1. Install condensate drain piping to muffler drain outlet full size of drain connection with a shutoff valve, stainless-steel flexible connector, black steel pipe with welded joints. Flexible connectors and piping materials and installation requirements are specified in Section "Hydronic Piping."

E. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted. Electrical wiring includes but is not limited to battery chargers, heaters, control power, load bank, grounding, remote annunciator panels, paralleling gear, remote control panels, etc. Contractor to include as part of their scope of work, wall wiring and empty conduit indicated on contract drawings, specified herein, indicated/noted on approved manufacturers shop drawings and as required to provide a fully functional system.

3.3 CONNECTIONS

A. Piping installation requirements are specified in Section "Hydronic Piping." Drawings indicate general arrangement of piping and specialties.

B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.

C. Connect cooling-system water piping to engine-generator set and with single braid corrosion resistant type 302 stainless steel wire braid and compression fittings.

D. Connect engine exhaust pipe to engine with stainless steel flexible connector.

E. Connect fuel piping to engines with a gate valve and union and stainless-steel flexible connector. Provide all required fire safe-off and solenoid valves.

F. Connect to BMS, coordinate with controls contractor.

G. Ground equipment according to Section "Grounding and Bonding for Electrical Systems."

H. Connect wiring according to Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 IDENTIFICATION

A. Identify system components according to Section "Identification for HVAC Piping and Equipment" and Section "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Field Testing: If factory service technicians cannot provide the field testing specified as part of manufacturer’s start-up, the contractor shall engage a qualified factory certified and authorized testing agency to perform tests and inspections and prepare test reports required by manufacturer.

B. Manufacturer's Field Service: Contractor to include field services of factory-authorized service representatives to provide start-up testing as well as to assist in 3rd party system commissioning as specified under the system commissioning specifications. Testing will not be concurrent so multiple travel days shall be included as per the approved schedule.

C. Perform tests and inspections and prepare test reports.

D. Tests and Inspections:

1. Perform tests recommended by manufacturer and each electrical test and visual and mechanical inspection for "AC Generators and for Emergency Systems" specified in NETA Acceptance Testing Specification. Certify compliance with test parameters. Generators shall be tested individually and in parallel.

2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test.

3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions.

   a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.

   b. Test for contact integrity of all connectors.

   c. Verify acceptance of charge for each element of the battery after discharge.

   d. Verify that measurements are within manufacturer's specifications.

4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.

5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.

6. Exhaust Emissions Test: Comply with applicable government test criteria to confirm adherence to EPA Tier rating.

7. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50% and 100% step-load increases and decreases, and verify that performance is as specified.

8. Harmonic-Content Tests: Measure harmonic content of output voltage under 25% and at 100% of rated linear load. Verify that harmonic content is within specified limits.

9. “BlackoutTest”: Automatic start-up by means of simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper system coordination. Engine coolant temperature, oil pressure, and battery charge level along with generator set voltage, amperes, and frequency shall be monitored throughout the test.

E. Coordinate tests with tests for transfer switches and run them concurrently.

F. Test instruments shall have been calibrated within the last 12 months, traceable to standards of NIST, and adequate for making positive observation of test results. Make calibration records available for examination on request.

G. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

H. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

I. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

J. Remove and replace malfunctioning units and retest as specified above.

K. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

L. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators, load bank and associated paralleling gear operations. Refer to Section "Demonstration and Training."

SECTION 26 3623 – AUTOMATIC TRANSFER SWITCHES

PART 1 GENERAL

1.01 Scope

A. Furnish and install automatic closed transition transfer & bypass-isolation switch (CTTS/BPS) with number of poles, amperage, voltage, and withstand current ratings as shown on the plans. Each CTTS/BPS system(s) shall consist of a closed transition transfer switch and a two-way bypass/isolation switch. All CTTS/BPSs and control modules shall be the product of the same manufacturer.

B. The CTTS/BPS shall transfer the load without interruption (closed transition) by momentarily connecting both sources of power only when both sources are present and acceptable. The maximum interconnection time is 100 milliseconds. The CTTS shall operate as a conventional break-before-make (open transition) switch when the power source serving the load fails.

1.02 Codes and Standards

The automatic closed transition transfer & bypass-isolation switches and accessories shall conform to the requirements of:

A. UL 1008 - Standard for Transfer Switch Equipment

B. CSA certified to CSA 22.2 No. 178 – 1978 Automatic Transfer Switches

C. IEC 60947-6-1 Low-voltage Switchgear and Controlgear; Multifunction equipment; Automatic Transfer Switching Equipment

D. NFPA 70 - National Electrical Code

E. NFPA 99 - Essential Electrical Systems for Health Care Facilities

F. NFPA 110 - Emergency and Standby Power Systems

G. IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications

H. NEMA Standard ICS10-1993 (formerly ICS2-447) - AC Automatic Transfer Switches

I. UL 508 Industrial Control Equipment

1.03 Acceptable Manufacturers:

A. Automatic closed transition transfer & bypass-isolation switches shall be ASCO 7000 Series or approved equal.
Any alternate shall be submitted for approval to the consulting engineer at least 10 days prior to bid. Alternate bids must list any deviations from this specification.

B. Supplier: Western States Equipment, Andrew.Erickson@wseco.com, 208-870-1665.

PART 2 PRODUCTS

2.01 Mechanically Held Transfer Switch

A. The transfer switch shall be electrically operated and mechanically held. The electrical operator shall be a momentarily energized, solenoid mechanism. Main operators which include overcurrent disconnect devices, linear motors or gears shall not be acceptable.

B. All transfer switch sizes shall use only one type of main operator for ease of maintenance and commonality of parts.

C. The switch shall be positively locked and unaffected by momentary outages, so that contact pressure is maintained at a constant value and contact temperature rise is minimized for maximum reliability and operating life.

D. All main contacts shall be silver composition. Switches rated 600 amperes and above shall have segmented, blow-on construction for high withstand and close-on capability and be protected by separate arcing contacts.

E. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. Switches rated 800 amps and higher shall have front removable and replaceable contacts. All stationary and moveable contacts shall be replaceable without removing power conductors and/or bus bars.

F. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.

G. Where neutral conductors are to be solidly connected as shown on the plans, a neutral conductor plate with fully rated AL-CU pressure connectors shall be provided.

2.02 Bypass-Isolation Switch

A. A two-way bypass-isolation switch shall provide manual bypass of the load to either source and permit isolation of the automatic transfer switch from all source and load power conductors. All main contacts shall be manually driven.

B. Power interconnections shall be silver-plated copper bus bar. The only field installed power connections shall be at the service and load terminals of the bypass-isolation switch. All control interwiring shall be provided with disconnect plugs.

C. Separate bypass and isolation handles shall be utilized to provide clear distinction between the functions. Handles shall be permanently affixed and operable without opening the enclosure door. Designs requiring insertion of loose operating handles or opening of the enclosure door to operate are not acceptable.

D. Bypass to the load-carrying source shall be accomplished with no interruption of power to the load (make before break contacts). Designs which disconnect the load when bypassing are not acceptable. The bypass handle shall have three operating modes: "Bypass to Normal," "Automatic," and "Bypass to Emergency." The operating speed of the bypass contacts shall be the same as the associated transfer switch and shall be independent of the speed at which the manual handle is operated. In the "Automatic" mode, the bypass contacts shall be out of the power circuit so that they will not be subjected to fault currents to which the system may

be subjected.

E. The isolation handle shall provide three operating modes: "Closed," "Test," and "Open." The "Test" mode shall permit testing of the entire emergency power system, including the automatic transfer switches with no interruption of power to the load. The "Open" mode shall completely isolate the automatic transfer switch from all source and load power conductors. When in the "Open" mode, it shall be possible to completely withdraw the automatic transfer switch for inspection or maintenance to conform to code requirements without removal of power conductors or the use of any tools.

F. When the isolation switch is in the "Test" or "Open" mode, the bypass switch shall function as a manual transfer switch.

G. Designs requiring operation of key interlocks for bypass isolation or ATSs which cannot be completely withdrawn when isolated are not acceptable.

2.03 Microprocessor Controller

A. The controller's sensing and logic shall be provided by a single built-in microprocessor for maximum reliability, minimum maintenance, and the ability to communicate serially through an optional serial communication module.

B. A single controller shall provide twelve selectable nominal voltages for maximum application flexibility and minimal spare part requirements. Voltage sensing shall be true RMS type and shall be accurate to ± 1% of nominal voltage. Frequency sensing shall be accurate to ± 0.2%. The panel shall be capable of operating over a temperature range of -20 to +60 degrees C and storage from -55 to +85 degrees C.

C. The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance. Sensing and control logic shall be provided on multi-layer printed circuit boards. Interfacing relays shall be industrial grade plug-in type with dust covers. The panel shall be enclosed with a protective cover and be mounted separately from the transfer switch unit for safety and ease of maintenance. The protective cover shall include a built-in pocket for storage of the operator's manuals.

D. All customer connections shall be wired to a common terminal block to simplify field-wiring connections.

E. The controller shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows:

1.	EN 55011:1991	Emission standard - Group 1, Class A
2.	EN 50082-2:1995	Generic immunity standard, from which:
	EN 61000-4-2:1995	Electrostatic discharge (ESD) immunity
	ENV 50140:1993	Radiated Electro-Magnetic field immunity
	EN 61000-4-4:1995	Electrical fast transient (EFT) immunity
	EN 61000-4-5:1995	Surge transient immunity
	EN 61000-4-6:1996	Conducted Radio-Frequency field immunity

2.04 Enclosure

A. The CTTS/BPS shall be furnished in a Type 1 enclosure unless otherwise shown on the plans.

B. All standard and optional door-mounted switches and pilot lights shall be 16-mm industrial grade type or equivalent for easy viewing & replacement. Door controls shall be provided on a separate removable plate, which can be supplied loose for open type units.

PART 3 OPERATION

3.01 Controller Display and Keypad

A. A four line, 20 character LCD display and keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and limited control through the serial communications input port. The following parameters shall only be adjustable via DIP switches on the controller:

1. Nominal line voltage and frequency
2. Single or three phase sensing
3. Operating parameter protection
4. Transfer operating mode configuration
(Open transition, Closed transition or Delayed transition)

All instructions and controller settings shall be easily accessible, readable and accomplished without the use of codes, calculations, or instruction manuals.

3.02 Voltage, Frequency and Phase Rotation Sensing

A. Voltage and frequency on both the normal and emergency sources (as noted below) shall be continuously monitored, with the following pickup, dropout and trip setting capabilities (values shown as % of nominal unless otherwise specified):

Parameter	Sources	Dropout / Trip	Pickup / Reset
Undervoltage	N&E,3ϕ	70 to 98%	85 to 100%
Overvoltage	N&E,3ϕ	102 to 115%	2% below trip
Underfrequency	N&E	85 to 98%	90 to 100%
Overfrequency	N&E	102 to 110%	2% below trip
Voltage unbalance	N&E	5 to 20%	1% below dropout

B. Repetitive accuracy of all settings shall be within ± 0.5% over an operating temperature range of -20°C to 60°C.

C. Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad or remotely via serial communications port access.

D. The controller shall be capable (when activated by the keypad or through the serial port) of sensing the phase rotation of both the normal and emergency sources. The source shall be considered unacceptable if the phase rotation is not the preferred rotation selected (ABC or CBA).

E. Source status screens shall be provided for both normal and emergency to provide digital

readout of voltage on all three phases, frequency and phase rotation.

F. The controller shall include a user selectable algorithm to prevent repeated transfer cycling to a source on an installation which experiences primary side, single phase failures on a Grounded Wye – Grounded Wye transformer which regenerates voltage when unloaded. The algorithm shall also inhibit retransfer to the normal (utility) source upon detection of a single phasing condition until a dedicated timer expires, the alternate source fails, or the normal source fails completely and is restored during this time delay period. The time delays associated with this feature shall be adjustable by the user through the controller keypad and LCD.

3.03 Time Delays

A. An adjustable time delay of 0 to 6 seconds shall be provided to override momentary normal source outages and delay all transfer and engine starting signals. Capability shall be provided to extend this time delay to 60 minutes by providing an external 24 VDC power supply.

B. A time delay shall be provided on transfer to emergency, adjustable from 0 to 60 minutes, for controlled timing of transfer of loads to emergency.

C. An adjustable time delay of 0 to 6 seconds to override momentary emergency source outage to delay all retransfer signals during initial loading of engine generator set.

D. Two time delay modes (which are independently adjustable) shall be provided on re-transfer to normal. One time delay shall be for actual normal power failures and the other for the test mode function. The time delays shall be adjustable from 0 to 60 minutes. Time delay shall be automatically bypassed if the emergency source fails and the normal source is acceptable.

E. A time delay shall be provided on shut down of engine generator for cool down, adjustable from 0 to 60 minutes.

F. A time delay activated output signal shall also be provided to drive an optional external relay(s) for selective load disconnect control. The controller shall have the ability to activate an adjustable 0 to 5 minute time delay in any of the following modes:

1. Prior to transfer only.
2. Prior to and after transfer.
3. Normal to emergency only.
4. Emergency to normal only.
5. Normal to emergency and emergency to normal.
6. All transfer conditions or only when both sources are available.

G. The controller shall also include the following built-in time delays for Closed Transition Transfer with Bypass-Isolation operation:

1. 1 to 5 minute time delay on failure to synchronize normal and emergency sources prior to closed transition transfer.
2. 0.1 to 9.99 second time delay on an extended parallel condition of both power sources during closed transition operation.

H. All time delays shall be adjustable in 1 second increments, except the extended parallel time, which shall be adjustable in .01 second increments.

I. All time delays shall be adjustable by using the LCD display and keypad or with a remote device connected to the serial communications port. The time delay value displayed on the LCD or remote device shall be the remaining time until the next event occurs.

3.04 Additional Features

A. A three position momentary-type test switch shall be provided for the *test / automatic / reset* modes. The test position will simulate a normal source failure. The reset position shall bypass the time delays on either transfer to emergency or retransfer to normal. Switches which require utilizing the keypad and display function or have no manual time delay bypass means are not acceptable.

B. A SPDT contact, rated 5 amps at 30 VDC, shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down setting, regardless of whether the normal source restores before the load is transferred.

C. Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of one contact, closed when the CTTS is connected to the normal source and one contact closed, when the CTTS is connected to the emergency source.

D. LED indicating lights (16 mm industrial grade, type 12) shall be provided; one to indicate when the CTTS is connected to the normal source (green) and one to indicate when the CTTS is connected to the emergency source (red).

E. LED indicating lights (16 mm industrial grade, type 12) shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal and emergency sources, as determined by the voltage sensing trip and reset settings for each source.

The following features shall be built-in to the controller, but capable of being activated through keypad programming or the serial port only when required by the user:

F. Provide the ability to select “commit/no commit to transfer” to determine whether the load should be transferred to the emergency generator if the normal source restores before the generator is ready to accept the load.

G. An Inphase monitor shall be provided in the controller. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents, and shall not require external control of power sources. The inphase monitor shall be specifically designed for and be the product of the CTTS manufacturer. The inphase monitor shall be equal to ASCO Feature 27.

H. The controller shall be capable of accepting a normally open contact that will allow the transfer switch to function in a non-automatic mode using an external control device.

I. Engine Exerciser - The controller shall provide an internal engine exerciser. The engine exerciser shall allow the user to program up to seven different exercise routines. For each routine, the user shall be able to:

1. Enable or disable the routine.

2. Enable or disable transfer of the load during routine.

3. Set the start time, .
   - time of day
   - day of week
   - week of month (1st, 2nd, 3rd, 4th, alternate or every)

4. Set the duration of the run.

At the end of the specified duration the switch shall transfer the load back to normal and run the generator for the specified cool down period. A 10-year life battery that supplies power to the real time clock in the event of a power loss will maintain all time and date information.

The following feature shall be built - into the controller, but capable of being activated through keypad programming or the communications interface port.

J. Terminals shall be provided for a remote contact which opens to signal the CTTS to transfer to emergency and for remote contacts which open to inhibit transfer to emergency and/or retransfer to normal. Both of these inhibit signals can be activated through the keypad or serial port.

K. System Status - The controller LCD display shall include a "System Status" screen which shall be readily accessible from any point in the menu by depressing the "ESC" key a maximum of two times. This screen shall display a clear description of the active operating sequence and switch position. For example,

Normal Failed
Load on Normal
TD Normal to Emerg
2min15s

Controllers that require multiple screens to determine system status or display "coded" system status messages, which must be explained by references in the operator's manual, are not permissible.

L. Self Diagnostics - The controller shall contain a diagnostic screen for the purpose of detecting system errors. This screen shall provide information on the status input signals to the controller which may be preventing load transfer commands from being completed.

M. Data Logging – The controller shall have the ability to log data and to maintain the last 99 events, even in the event of total power loss. The following events shall be time and date stamped and maintained in a non-volatile memory:

1. Event Logging
   1. Date and time and reason for transfer normal to emergency.
   2. Date and time and reason for transfer emergency to normal.
   3. Date and time and reason for engine start.
   4. Date and time engine stopped.
   5. Date and time emergency source available.
   6. Date and time emergency source not available.

2. Statistical Data
   1. Total number of transfers.
   2. Total number of transfers due to source failure.
   3. Total number of days controller is energized.

4. Total number of hours both normal and emergency sources are available.

N. Communications Module - For remote interfacing of furnished transfer switch. Shall allow the vendor's monitoring products to monitor and control the transfer switch equipment with the utilization of 128 – Bit AES encryption standard. An embedded webpage shall be provided for switch status, metered values and list up to 99 events in the log. Modbus and Simple Network Management Protocol (SNMP) shall be supported for open monitoring of ASCO products. Hardware shall include:

1. 10/100Mbps Ethernet port with connector for RJ45
2. RS-485 port (2 wire or 4 wire)
3. 24 VDC input for optional remote power
4. DIN rail mountable
5. Onboard status LED's shall be provided for the following:
   a. Receiving operational power
   b. Transmitting and receiving data
   c. Ethernet and network status
   d. Diagnostic analysis

This option shall be equivalent to ASCO accessory 72E

O. External DC Power Supply – An optional provision shall be available to connect an external 24 VDC power supply to allow the LCD and the door mounted control indicators to remain functional when both power sources are dead. This option shall be equivalent to ASCO accessory 1G.

PART 4 ADDITIONAL REQUIREMENTS

4.01 Withstand and Closing Ratings

A. The CTTS/BPS shall be rated to close on and withstand the available RMS symmetrical short circuit current at the CTTS/BPS terminals with the type of overcurrent protection shown on the plans.

B. The CTTS/BPS shall be UL listed in accordance with UL 1008 and be labeled in accordance with that standard's 0.025 and 0.05 second, time based ratings. CTTS/BPSs which are not tested and labeled with time based ratings and have series, or specific breaker ratings only, are not acceptable.

4.02 Tests and Certification

A. The complete CTTS/BPS shall be factory tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency, and time delay settings are in compliance with the specification requirements.

B. Upon request, the manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this specification including compliance with the above codes and standards, and withstand and closing ratings. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications, other than those stipulated at the time of the submittal, shall be included in the certification.

C. The CTTS/BPS manufacturer shall be certified to ISO 9001:2008 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation, and servicing in accordance with ISO 9001:2008

4.03 Service Representation

A. The CTTS/BPS manufacturer shall maintain a national service organization of company-employed personnel located throughout the contiguous United States. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year, with a local certified technician within 25 miles of the project site.

B. The manufacturer shall maintain records of each switch, by serial number, for a minimum of 20 years.

SECTION 26 4313 - SURGE PROTECTION DEVICES FOR PANELBOARDS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This section describes the materials and installation requirements integrated Transient for Voltage Surge Suppressor (TVSS), also referred to as Surge Protective Device (SPD), in panelboards. These devices are used to protect AC electrical circuits from the effect of lightning induced currents, substation switching transients and internally generated transients resulting from inductive and or capacitive load switching.

1.02 REFERENCES

A. UL 1449 Second Edition 2005 - Transient Voltage Surge Suppressors
B. UL 1283 - Electromagnetic Interference Filters
C. ANSI/IEEE C62.41.1-2002 - IEEE Guide on the Surge Environment in Low Voltage (1000 V and Less) AC Power Circuits; C62.41.2-2002 - IEEE Recommended Practice on Characterization of Surge Voltages in Low Voltage AC Power Circuits; and C62.45-2002 - IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits.
D. NEC 2005, Article 285

PART 2 - PRODUCT

2.01 SURGE PROTECTIVE DEVICE

A. Integral Surge Suppressor
   1. TVSS or SPD shall be Listed in accordance with UL 1449 Second Edition 2005 and UL 1283, Electromagnetic Interference Filters.
   2. Integrated surge protective devices (SPD) shall be Component Recognized in accordance with UL 1449 Second Edition, Revision 2/9/2005 Section 37.3 and 37.4 at the standard's highest short-circuit current rating (SCCR) of 200 kA, including intermediate level of fault current testing that will be effective 2/9/2007.
   3. TVSS or SPD shall be tested with the ANSI/IEEE Category C High exposure waveform (20kV-1.2/50µs, 10kA-8/20µs).
   4. TVSS shall provide suppression for all modes of protection: L-N, L-G, and N-G in WYE systems.
   5. The manufacturer of the TVSS or SPD shall be the same as the manufacturer of the service entrance and distribution equipment in which the devices are installed and shipped. Also, this distribution equipment shall be fully tested and certified to the following UL standards:
      a) UL 67 = Panelboards,
      b) UL 845 = Motor Control Centers,
      c) UL 857 = Busway,
      d) UL 891 = Switchboards,

e) UL 1558 = Low Voltage Switchgear.

6. Recommended TVSS or SPD ratings:
   a) Minimum surge current rating shall be 160 kA per phase (80 kA per mode) for service entrance and 80 kA per phase (40 kA per mode) for distribution applications.
   b) UL 1449 clamping voltage must not exceed the following:

VOLTAGE	L-N	L-G	N-G
240/120	800/400V	800/400V	400V
208Y/120	400V	400V	400V
480Y/277	800V	800V	800V
600Y/347	1200V	1200V	1200V

   c) Pulse life test: Capable of protecting against and surviving 5000 ANSI/IEEE Category C High transients without failure or degradation of clamping voltage by more than 10%.
7. TVSS or SPD shall be designed to withstand a maximum continuous operating voltage (MCOV) of not less than 115% of nominal RMS voltage.
8. TVSS shall be constructed of one self-contained suppression module per phase.
9. Visible indication of proper TVSS or SPD connection and operation shall be provided. The indicator lights shall indicate which phase as well as which module is fully operable. The status of each TVSS or SPD module shall be monitored on the front cover of the enclosure as well as on the module. A push-to-test button shall be provided to test each phase indicator. Push-to-test button shall activate a state change of dry contacts for testing purposes.
10. TVSS or SPD shall be equipped with an audible alarm which shall activate when any one of the surge current modules has reached an end-of-life condition. An alarm on/off switch shall be provided to silence the alarm. The switches and alarm shall be located on the front cover of the enclosure.
11. A connector shall be provided along with dry contacts (normally open or normally closed) to allow connection to a remote monitor or other system. The output of the dry contacts shall indicate an end-of-life condition for the complete TVSS or SPD or module.
12. Terminals shall be provided for necessary power and ground connections.

2.02 MANUFACTURERS

A. Basis of Design:
   1. Square D/Schneider Electric, Surgelogic IMA Series

B. Approved Manufacturers:
   1. GE
   2. Cutler-Hammer

END OF SECTION

SECTION 26 4314 - SURGE PROTECTION DEVICES FOR SWITCHGEAR

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This section describes the materials and installation requirements integrated Transient for Voltage Surge Suppressor (TVSS), also referred to as Surge Protective Device (SPD), in panelboards. These devices are used to protect AC electrical circuits from the effect of lightning induced currents, substation switching transients and internally generated transients resulting from inductive and or capacitive load switching.

1.02 REFERENCES

A. UL 1449 Second Edition 2005 - Transient Voltage Surge Suppressors
B. UL 1283 - Electromagnetic Interference Filters
C. ANSI/IEEE C62.41.1-2002 - IEEE Guide on the Surge Environment in Low Voltage (1000 V and Less) AC Power Circuits; C62.41.2-2002 - IEEE Recommended Practice on Characterization of Surge Voltages in Low Voltage AC Power Circuits; and C62.45-2002 - IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits.
D. NEC 2005, Article 285

PART 2 - PRODUCT

2.01 SURGE PROTECTIVE DEVICE

A. Integral Surge Suppressor
   1. TVSS or SPD shall be Listed in accordance with UL 1449 Second Edition 2005 and UL 1283, Electromagnetic Interference Filters.
   2. Integrated surge protective devices (SPD) shall be Component Recognized in accordance with UL 1449 Second Edition, Revision 2/9/2005 Section 37.3 and 37.4 at the standard's highest short-circuit current rating (SCCR) of 200 kA, including intermediate level of fault current testing that will be effective 2/9/2007.
   3. TVSS or SPD shall be tested with the ANSI/IEEE Category C High exposure waveform (20kV-1.2/50µs, 10kA-8/20µs).
   4. TVSS shall provide suppression for all modes of protection: L-N, L-G, and N-G in WYE systems.
   5. The manufacturer of the TVSS or SPD shall be the same as the manufacturer of the service entrance and distribution equipment in which the devices are installed and shipped. Also, this distribution equipment shall be fully tested and certified to the following UL standards:
      a) UL 67 = Panelboards,
      b) UL 845 = Motor Control Centers,
      c) UL 857 = Busway,

d) UL 891 = Switchboards,

e) UL 1558 = Low Voltage Switchgear.

6. Recommended TVSS or SPD ratings:
   a) Minimum surge current rating shall be 160 kA per phase (80 kA per mode) for service entrance and 80 kA per phase (40 kA per mode) for distribution applications.
   b) UL 1449 clamping voltage must not exceed the following:

VOLTAGE	L-N	L-G	N-G
240/120	800/400V	800/400V	400V
208Y/120	400V	400V	400V
480Y/277	800V	800V	800V
600Y/347	1200V	1200V	1200V

   c) Pulse life test: Capable of protecting against and surviving 5000 ANSI/IEEE Category C High transients without failure or degradation of clamping voltage by more than 10%.
7. TVSS or SPD shall be designed to withstand a maximum continuous operating voltage (MCOV) of not less than 115% of nominal RMS voltage.
8. TVSS shall be constructed of one self-contained suppression module per phase.
9. Visible indication of proper TVSS or SPD connection and operation shall be provided. The indicator lights shall indicate which phase as well as which module is fully operable. The status of each TVSS or SPD module shall be monitored on the front cover of the enclosure as well as on the module. A push-to-test button shall be provided to test each phase indicator. Push-to-test button shall activate a state change of dry contacts for testing purposes.
10. TVSS or SPD shall be equipped with an audible alarm which shall activate when any one of the surge current modules has reached an end-of-life condition. An alarm on/off switch shall be provided to silence the alarm. The switches and alarm shall be located on the front cover of the enclosure.
11. A connector shall be provided along with dry contacts (normally open or normally closed) to allow connection to a remote monitor or other system. The output of the dry contacts shall indicate an end-of-life condition for the complete TVSS or SPD or module.
12. Terminals shall be provided for necessary power and ground connections.
13. The TVSS or SPD shall be equipped the following optional items:
    a) A transient voltage surge counter shall be located on the diagnostic panel on the front cover of the enclosure. The counter shall be equipped with a manual reset and battery backup to retain memory upon loss of AC power.

2.02 MANUFACTURERS

A. Basis of Design:
   1. Square D/Schneider Electric, Surgelogic IMA Series

B. Approved Manufacturers:
   1. GE
   2. Cutler-Hammer

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

2.9 WIRELESS ACCESS POINTS

A. Ceiling-mounted WiFi 6E AP with 10 spatial streams and 6 GHz support to provide seamless, multi-band coverage within high client density environments.
   1. WiFi 6E with 6 GHz support
   2. 10 spatial streams
   3. 140 m² (1,500 ft²) coverage
   4. 600+ connected devices
   5. Powered using PoE+
   a. GbE uplink

B. Manufacturer:
   1. Ubiquiti Networks U6 Enterprise Series.

C. Provide all components for complete installation, coordinate installation ceiling type and provide accessories as requited for installation. Provide AP Arm Mount kit when ceiling mount is not possible.

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 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 the existing Potter 1000 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 shall be compatible with the existing Potter 1000 Fire alarm Panel

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.
5. All sampling points shall be Stainless Steel Tamperproof, compatible with tubing system.

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.

JAIL PHYSICAL SECURITY INFORMAITON MANAGEMENT & CONTROL SYSTEM

PART 1 - GENERAL

1.1 DESCRIPITON

A. Summary:
1. Twin Falls County expects the Contractor to be an expert and to provide all software, hardware, infrastructure, programming, installation, power requirements, and necessary materials for a turnkey jail control system. The Contractor is responsible for any items or components that are not mentioned, omitted, or missing from this specification, and to ensure that the system functions according to code, operates as a typical detention environment, and can be reasonably customized to meet the client's needs. All security electronic systems provided for the project shall be designed to be expandable or upgradable to accommodate future additions, remote connection to existing jail controls, and as a complete bid package.

B. General:
1. Furnish all labor, materials, tools, equipment, and services for the Security Management System as indicated in accordance with the provisions of the Contract Documents.
2. The product numbers contained herein are for reference only and may not be the most current available or a complete listing of all features or options required. Where a manufacturer is listed without a product number, an equivalent item of the specified manufacturer is acceptable. Determination of equivalent is at the sole discretion of the Architect/Engineer. Where a conflict exists between the written description and the product number, the written description shall govern.
3. Coordinate with work of all other trades.
4. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, and devices incidental to or necessary for a sound, secure and complete installation.
5. New jail control system capable to connect to current jail system currently being implemented at Twin Falls County Jail 504 Gooding St N, Twin Falls, ID 83301
6. Bidders are required to provide a complete proposal for all specialty electronic systems/products in the jail system's specifications. Proposals for providing individual products or product lines without the other necessary components or other product lines to complete a turnkey jail system shall be rejected.
7. Disclosure of all ongoing subscription costs, software licensing requirements, or hidden fees in detail in the bidder proposal. Further, any other ongoing cost(s) that are required to ensure the continued functioning of the system.

C. Related Documents:
Requirements of drawings, general and supplementary conditions and Division 1 apply to this section.

1.2 SUBMITTALS:

1. Contractor shall submit for review full system design, headend drawings, camera call programming matrix, standard jail control matrix, datasheets with equipment selected, wiring connections, and any other documents necessary to articulate the function of the jail post award.

1.3 OPERAITNG AND MAINTENANCE DATA:

1. Contractor provides all operating and maintenance manuals for the system provided by manufacturers of equipment and basic operating practices for the new detention control system created by this project.

1.4 WARRANTY:

1. Contractor shall provide standard parts, labor, and programming labor for a period of 1 year and pass along all equipment manufactures warranty to the owner.

1.5 QUALITY ASSURANCE:

1. The system is to be fully reviewed and tested by owners or their agents for the function and quality of installation. Any portion of the system that does not meet expectations will be required to be fixed at no cost to the owner.

1.6 WEATHERPROOF EQUIPMENT AND LOCAITONS:

1. All equipment that is located on the exterior of the facility or in areas with moisture such as showers or kitchens to be exterior rated.

PART 2 – PRODUCTS & EXECUITON

2.1 GENERAL

A. Summary:

1. Twin Falls County has a control, maintenance and safety objective that requires all jail systems to have common parts, control interfaces, and the ability to control each facility remotely on control stations.

B. Major Component Manufacturer(s): Manufacturer must have an authorized service organization within 150 miles of the **Twin Falls County Wright Avene Jail** project.

1. Jail Security Integration Management System:

   A. Base: Peregrine Control Interface Platform by M2 Automation & Control Services, Inc. 6067 Corporal Ln, Boise, ID 83704
   (208) 853-3411 (http://www.m2automation.com)

   B. Approved Equal to Above

2. Intercom and Jail Communications:

   A. Base: Harding Instruments 9564 Yellowhead Trail NW Edmonton AB T5G 0W4 Canada. (780) 462-7100 (https://harding-tech.com/)

   B. Approved Equal to Above

3. CCTV/IP Camera System:

   A. Base: Avigilon by Motorola Solutions, Inc. 1717 McKinney Ave Ste 1590 Dallas, TX, 75202. (801) 698-8674 Idaho Representative Robby Goins (https://www.Avigilon.com/)

   B. Approved Equal to Above

4. PLC System:

A. PLC controllers are to be selected by security contractors and must meet requirements for operating on the Peregrine control interface.

5. Network Switches:

A. Base: UniFi 7201 West Friendly Avenue, Greensboro, North Carolina, 27410. https://ui.com/

B. Approved Equal to Above

6. Network Router:

A. Base: Fortinet 909 Kifer Road, Sunnyvale, CA 94086. https://www.fortinet.com/

B. Approved Equal to Above

7. Infrastructure:

A. Base: APC One Boston Place, 201 Washington Street, Suite 2700, Boston, MA 02108. https://www.apc.com/

B. Approved Equal to Above

2.2 JAIL SECURITY INTEGRAITON MANAGEMENT SYSTEM

A. General

1. This document is intended to specify the general requirements for the equipment, materials, labor, documentation, programming, and services necessary to develop/furnish a complete and operational Jail Security Integration Management system (JSIM). The specifications herein represent general, minimally-acceptable criteria. Detailed systems descriptions will be developed in-conjunction with the Security Electronics Systems Integrator during the submittal process.

B. Description

1. Provide a complete, fully integrated control and monitoring system for man-machine interface (MMI) at locations indicated on the drawings utilizing Security Control and Monitoring System Workstations (WKS) connected to the JSIM network. Each WKS shall be capable of complete individual and simultaneous security control and monitoring. Provide all labor, materials, equipment, software, programming, and supervision to configure, integrate, install, calibrate, adjust, demonstrate, test, train, warrant, and maintain the total system.

2. The JSIM system shall consist of a fully automated computer-based integrated security, control, and management system, including, but not limited to, the following functions and capabilities:

A. Integration with the Close Circuit Television System (CCTV) and Network Video Recorder (NVR) to provide automatic camera call-up display on alarm/event monitors or designated others, manual camera call-up display and automatic/manual Video control. Integration with the Video Management System (VMS) Digital Video to provide automatic video/voice channel call-up display/playback or record on alarm/event monitors, manual channel call-up display/playback or record and automatic/manual Video. Capable of direct IP camera call-up without CCTV/DVR/NVR interaction.

B. Integration with doors for alarm/event annunciation and Electronic Entry (Access) Control Systems (ACS).

C. Integration with Perimeter Intrusion Detection Systems (PIDS) to provide automatic alarm/event annunciation and control.

D. Integration with Interior Intrusion Detection Systems (IIDS) to provide automatic alarm/event annunciation and control.

E. Integration control of the Intercom and IP Telephony system to provide communications between master control and all substations.

F. Integration with Infant Security systems to provide lockdown of zones to protect against infant theft.

G. Integration to Patient Wandering systems to indicate loitering and wander alarms protecting long term patient care facilities.

3. The system equipment and installation shall comply with all provisions and requirements of this specification as well as any and all applicable federal, state, and local codes and standards.

C. System Components

1. The basic components of the new Integrated Security Management System (JSIM) shall include:

A. JSIM server package complete with computer CPU, keyboard, color monitor, all required database management, configuration software, database storage system software and hardware, as well as a complete JSIM software package.

B. The software user interface shall be optionally touch screen and/or mouse driven, utilizing point and click buttons, pop-up menus and user defined graphical icons.

C. The JSIM system shall also support optional software modules for access control, video badge creation, database archive and retrieval, door control, CCTV, intrusion alarm monitoring, intercom, and fire alarm (secondary annunciation and display only) RFID tracking subsystem integration, automatic report and log function export to security and time-tracking reporting subsystems and other subsystem functions as defined in this specification and other contract documents.

D. The JSIM server shall communicate with ISMS client workstations over an industry standard Ethernet Local Area Network (LAN) or Wide Area Network (WAN).

E. The JSIM server shall be located in a designated location.

F. The JSIM operator workstations package shall be equipped complete with computer CPU's, 27” color touch screen, single or multi-screen if required monitors, mouse and keyboards for automatic alarm/event annunciation, system device control, database entry and operator requested reports.

G. The software user interface shall be touch screen, mouse or event driven, utilizing point and click buttons, pop-up menus, text-to-speech (TTS) annunciation, and user-defined graphical icons.

H. The JSIM operator workstations shall communicate with the JSIM server over an industry standard Local Area Network (LAN).

I. Network hub, router, and switches shall be provided by systems integration contractor to support LAN communications between the JSIM server and all JSIM workstations.

J. Quantity and location of network hubs shall be as required by the systems integration contractor to provide a complete and operational system.

K. Communication modems and line drivers shall be provided (as-required) to support direct communications between the JSIM server and all sub-systems as defined in contract documents.

L. Quantity and location of modems and line drivers shall be as required by the systems integration contractor to provide a complete and operational system.

D. JSIM Software

The system software shall utilize server and client stations specified in section 2.3 INSTALLAITON, EQUIPMENT, AND GENERAL FUNCITON.

1. System software utilizing 16-bit operating systems such as DOS or 32-bit operating systems that do not support multi-threaded operations are not acceptable. JSIM Application Software that does not support the above-specified functions is unacceptable.

2. Software Manufacturer:

A. Base: Peregrine Control Interface Platform by M2 Automation & Control Services, Inc. 6067 Corporal Ln, Boise, ID 83704. (208) 853-3411 (http://www.m2automation.com)

E. JSIM Software Features

1. Program Capabilities: The JSIM software shall be object-based with tree management features to provide full and complete Graphical User Interface (GUI).

A. System Integration Capabilities: The JSIM shall support electronic security system and facility control operations from specific manufactures. The JSIM shall support the following system integration features:

1. The integration of IP Video/CCTV Systems, from specific verified manufacturers. The method of integration shall be at the device level, utilizing direct-device-communications, via either: direct-device protocol, or, application programming interface (API). The following table specifies compatibility supported by the JSIM:

IP Video/CCTV Systems Integration Support List

Description	**Device Compatibility**
Avigilon	ACC7 software, Unity 8 software, hosted on Avigilon Premium NVR series or higher

2. The integration of Access Control Systems (ACS). The ACS hardware should include Peer-to-Peer communications for panel commands, and threat level changes, should communication to the server become interrupted. The method of integration shall be at the device level, utilizing direct-device-communications, via either: direct-device protocol, or, API. The following table specifies compatibility supported by the JSIM:

Card Access Control Integration Support List

Description	**Device Compatibility**
Mercury Security (Avigilon ACM)	LP1501, LP1502, LP2500, LP4502, MR16IN, MR16OUT,MR62e, MR50-S3, MR-52-S3 Legacy: EP Series Hardware and MR51e

3. The integration of Perimeter Intrusion Detection Systems (PIDS). The method of integration shall be at the device level, utilizing direct-device-communications, via either: direct-device protocol, or, API. The following table specifies compatibility supported by the JSIM:

Perimeter Intrusion Detection Integration Support List

Description	Device Compatibility
Senstar	FlexZone, FiberPatrol, IntelliFiber, LM100, OmniTrax, & UltraWave.

4. The integration of Internal Communications Systems (ICS) and IP Telephony Systems (IPTel). The method of integration shall be at the device level, utilizing direct-device-communications, via either: direct-device protocol, or, API. The following table specifies compatibility supported by the JSIM:

Intercom and IP Telephony Integration Support List

Description	Device Compatibility
Harding Instruments	DXL platform

5. The integration of Radio Frequency Identification (RFID) systems. The method of integration shall be at the device level, utilizing direct-device-communications, via either: direct-device protocol, or, API. The following table specifies compatibility supported by the JSIM:

RFID Integration Support List

Description	Device Compatibility
Accutech Security	All LC, ES, IS, and LS Series Equipment
Actall	Crisis controller Version 1.0
TRES	All TRES900 and TRES433 receivers

6. The integration of the D6600 is a compact design Communications Receiver/Gateway that incorporates Digital Signal Processing (DSP) techniques to receive and analyze different communication data formats. With the capability to receive multiple formats from multiple communication paths, the D6600 provides the flexibility to handle almost any of your security communication requirements.

Alarm Receiver Integration Support List

Description	Device Compatibility
Radionics	D6600 Computer Interface

7. The integration of Programable Logic Controllers (PLC) systems. The method of integration shall be at the device level, utilizing direct-device-communications, via Modbus TCP. The following table specifies compatibility supported by the JSIM:

Programable Logic Controller Integration Support List

Description	Device Compatibility
Security Contractor Selected	Modbus TCP (Required)

8.The integration of Simple Host Integration Protocol (SHIP) systems, Allows 3rd party software to send Engine-Based actions to Peregrine. This interface allows a 3rd party to write a program to interface with Peregrine.

Simple Host Interface Protocol Support List

Description	Device Compatibility
SHIP	Simple Host Interface Protocol

Communication Protocol Support List

Description	Device Compatibility
Modbus	Modicon Modbus Protocol Application Protocol Specification V1.1b. (PI-MBUS-300 Rev. J)

B. Graphical User Interface (GUI) Capabilities: The JSIM shall fully support all of the GUI capabilities listed and described in the following sections.

1. Screens: The JSIM shall allow user interface screens with user defined objects to be created and linked in any order. All screens, screen links and screen functions shall be defined by the system administrator in real time and become active immediately upon definition. Screen definition, including the addition of intelligent, screen-control objects shall be accomplished by graphical, drag-and-drop methods or dropdown combo boxes. All definitions shall be able to be changed while the system is on-line and operational. The Screen management software shall be a fully-integrated module of the JSIM. The screen management software module shall allow a system administrator to define:

A. Any sequence of "linked" screens. Navigation buttons, from screen-to-screen, shall be automatically created by simply dragging-and-dropping one screen onto another.

B. Any number of "screen control objects" from any screen and link them directly to any other screen. Screen control objects may be defined as the following types:

1. Frame – a 3D-style animated button.

2. Rectangle – a 2D or 3D-style rectangle with, or without border.

3. Rectangle – a 2D or 3D-style rectangle with filleted corners and with, or without border.

4. Ellipse – a 2D or 3D-style ellipse or circle with, or without border.

5. Triangle – a 2D or 3D-style 3-sided object with, or without border.

6. Diamond – a 2D or 3D-style 4-sided, diamond-shaped object with, or without border.

7. Pentagon – a 2D or 3D-style 5-sided object with, or without border.

8. Hexagon – a 2D or 3D-style 6-sided object with, or without border.

9. Octagon – a 2D or 3D-style 8-sided object with, or without border.

10. Arrow – a 2D or 3D-style, arrow-shaped object with, or without border.

11. 4-pointed Star – a 2D or 3D-style, 4-ponted star-shaped object with, or without border.

12. 5-pointed Star – a 2D or 3D-style, 5-pointed star-shaped object with, or without border.

13. Cube – a 2D or 3D-style, isometric cube-shaped object with, or without border.

14. Cylinder – a 2D or 3D-style, isometric cylinder-shaped object with, or without border.

15. Circle-Slash - a 2D or 3D-style, circle-with-slash (international "No" symbol)-shaped object with, or without border.

16. Polygon/Polyline – a 2D or 3D-style, multipoint vector object with an irregular shape.

C. Images and Screen Objects: Any standard image to be used in a user interface screen, either as a background image or as the foreground image for a screen control object. Any number of "actions" steps, of any series of control selections, may be assigned to each screen control object. Each screen object shall be capable of being assigned up to 255 states. A screen control object's state shall be determined by the state of one or more evaluation criteria objects. Evaluation criteria objects describe the real-time status of I/O points, Doors, Call Stations, Alarm Zones, Current Computers, Current Logged-on User(s), Current Security Access Level, Current Screen, or database field(s). Each state shall be capable of being assigned up to 255 commands sequences for each instance of:

1. Mouse-Down - When the left mouse button (or touch screen touch) occurs within the active area of the screen object.

2. Mouse-Up - When the left mouse button (or touch screen touch) is released while within the active area of the screen object.

3. On-Active - When a display control (based upon evaluation criteria) is in its active state – causing the screen object to switch to that state. The Active state of any screen object may be determined by the active condition of any number of separate, evaluation criteria objects.

4. Inactive- When a display control (based upon evaluation criteria) is in its Inactive state – causing the screen object to switch to that state. The Inactive state of any screen object may be determined by the inactive condition of any number of separate, evaluation criteria objects.

5. Mouse Enter – When a mouse enters the images surface or hovers over a screen object.

6. Mouse Leave – When a mouse leaves the image surface and no longer is hovering over a screen object.

7. It shall be possible to associate the evaluation criteria objects via Boolean relationships, i.e.: AND, OR, XOR, etcetera.

8. It shall be possible to qualify evaluation criteria objects as inverted (NOT), acknowledged (ACK), or shunted (SHUNT).

D. The following image file types shall be allowed:

1. Graphics Interchange Format (*.gif)

2. Tagged Image File Format (*.tif)

3. Portable Network Graphics Format (*.png)

4. JPEG Format (*.jpg)

5. Windows Bitmap Format (*.bmp)

6. Windows Metafile Format (*.wmf)

E. All graphical screen control objects shall be completely configurable with regard to visual effects. Visual effects may be programmer-selectable as follows:

1. Borders –

A. Inside, middle and outside with and raised (3D) effects.

B. Border colors – selectable from complete 32-bit color pallet.

C. Highlight and shadow effects.

2. Interior –

A. Hatch styles selectable from 45 different patterns and color-selectable from complete, 32-bit color pallet.

B. Solid color fill – selectable from complete 32-bit color pallet.

C. Gradient color fill – selectable from 9 different gradient patterns and 2-color selectable from complete, 32-bit color pallet.

D. Texture fill – selectable from any number of bit-mapped textures. Textures will automatically "tile" to fit the object fill.

3. Image – An image many display on the screen control object. Said image may be stretched to fill the object or not.

4. Flash – screen control objects may flash between statesG. Invisible – screen control objects may be rendered invisible on a state-by-state basis.

F. Font – Any Windows-compatible font style and script style with full range of standard font effects, i.e., bold, italic, strikeout and underline, with color selectable from a 16-color high-contrast color pallet.

G. Hover Text – custom hover text may be defined by the programmer on a state-by-state basis

2. Rules and Logic Capabilities: The JSIM shall support a robust and complete rules and logic engine with the following minimum capabilities:

A. Any number of "automation" objects that will enable the user to define and execute complex Boolean operations related to any series of control selections or I/O activity.

B. Any number of "control counter" objects that will allow the user to execute threshold increment and/or decrement operations related to any series of control selections or I/O activity. It shall be possible for the user may to define control counter values as executable "set-points" within the range of a control counter object.

C. Any number of "timer" objects that shall allow the user to execute flexible timer operations related to any series of control selections or I/O activity.

D. Any number of "database-link" objects that shall allow the user to view and manipulate database table fields while in run mode from the Graphical User Interface.

E. Any number of "access control tracking" objects that will allow the user to track access control activity, including photos and cardholder data-fields, for any selected access control reader object.

F. Any number of "shared-screen" objects that will allow the user to define screen object functionality in a single, centralized User Interface (UI). The shared screen objects shall be capable of being assigned to any number of different screens.

G. Any number of "door construct" objects that will allow the user to define all door-related activities from a single UI. The door construct object will contain all of the programming with regard to standard and exceptional door activities, including:

1. Entry and exit events and I/O point assignments (authorized entry/exit)
2. Timer properties for:
    A. Door Lock time (strike time)
    B. Door Re-Lock delay time
    C. Door Open Too Long (DOTL)
    D. Door Unlock Too Long (DUTL)
3. Alarm properties for:
    A. Door Forced
    B. Door Open Too Long (DOTL)
    C. Door Unlock Too Long (DUTL)
4. Integration of ancillary Door-Related Devices to include:
    A. Entry and Exit Intercom stations
    B. Entry and Exit CCTV Cameras
    C. Entry and Exit Auxiliary Alarm devices
5. User-configurable door action properties for:
    A. Door Unlock
    B. Door Open
    C. Communication Failure
    D. General Camera Call-up
    E. Camera Call-up on Entry
    F. Camera Call-up on Exit
6. User-configurable, Entry-or-Exit specific door action properties for:
    A. Authorized Entry
    B. Authorized Exit
    C. Denied Entry for:
        1. Undefined Card

2. Invalid Card
3. Invalid Reader
4. Invalid Time
5. Escort Required
6. Passback violation

D. Denied Exit for:

1. Undefined Card
2. Invalid Card
3. Invalid Reader
4. Invalid Time
5. Escort Required
6. Passback violation

H. Any number of "mustering" objects that will allow the user to define and maintain mustering points that can provide a real-time list of "mustered" personnel in the event of an evacuation emergency. The mustering event shall be capable of being user-configured such that an emergency will automatically forgive all passback violations.

I. Any number of "interlock" groups that will allow the user to define and maintain interlocking door relationships from a single UI. Interlock objects shall allow any number of doors to be interlocked together through PLC or SPLC Ladder programming. Host dependent or physical relay / door position switch interlocking shall not be permitted. Interlock objects must support interlock override and violation – exception – handling as standard functions, requiring no additional programming. Interlocking objects shall offer the option for approved user authentication for violating the rules.

J. Any number of "call station" objects that will allow the user to define all call station-related activities from a single UI. The call station object will contain all of the programming with regard to standard and exceptional call station activities, including:

1. Call In Input
2. Call In Output
3. Secondary Call In Output
4. Active Call Input
5. Disabled Point
6. Auto-Re-enable Counter
7. Selected Counter Value
8. Tamper Point List
9. Acknowledge Timeout, Timeout Override Counter, and Timeout Output
10. Process Timeout, Timeout Override Counter, and Timeout Output
11. Ability for the Acknowledge and Process Timeouts to be in seconds or minutes.

12. Automated actions for the following event types:

A. Call In

B. Call In Acknowledgement

C. Call In Acknowledge Timeout

E. Disabled

F. Enabled

G. Selected

H. Deselected

I. Processed or Answered

J. Process Timeout

K. Tamper

L. Tamper Restore

K. Any number of "alarm zone" objects that will allow the user to define all alarm zone-related activities from a single UI. The alarm zone object will contain all of the programming with regard to standard and exceptional alarm zone activities, including:

1. Optional Alarm Expressions to determine alarms

2. Sensor List for determine alarms, each sensor having optional points for:

A. Latching

B. Failure

C. Disable

D. Control Output

E. Alarm Output

F. Access/Mask Input

G. Auto-secure Timeout

H. Auto-secure Timeout counter override

I. Selected Counter Value

J. Tamper Point List

K. Acknowledge Timeout, Timeout Override Counter, and Timeout Output

L. Process Timeout, Timeout Override Counter, and Timeout Output

3. Ability for the Acknowledge and Process Timeouts to be in seconds or minutes.

4. Auto-Acknowledge and Auto-Process Inputs

5. Multiple Sensor Alarms for determining alarm state based on multiple sensor in the same or multiple zones in a given time period.

6. Automatic camera switching on alarm

7. Tamper List

8. Failure List

9. Disabling an alarm zone when in failure

10. Automated actions for the following event types:

    A. Selected

    B. Deselected

    C. Alarm

    D. Multiple Alarm

    E. Acknowledged

    F. Processed

    G. Tamper

    H. Failure

    I. Access/Mask

    J. Secure

11. Automated actions for the following event types on a per sensor basis:

    A. Alarm

    B. Failure

    C. Disable

12. Any number of "Guard tour" objects that will allow the user to set up and maintain sequenced and random guard tours utilizing any number of check-in points defined in the system.

13. Full administrative control of alarm and event routing, and display masking, based on workstation, user, or a combination of workstation and user.

14. Full administrative control of alarm and event queue displays such that it is possible to define any number of queues, assign subsets of event activities based on hardware type, area, or any other logical grouping of like functionality. The number of simultaneously displayed queues shall be limited only by the availability of viewable screen area. It shall be possible to "pop-up" queues as they are populated by active events and "pop-off" queues automatically once all events are cleared. It shall be possible to manually "pop-up" and "pop-off" queues by user selection.

15. The ability to program control and routing parameters such that it is possible to assign, wrest or release control of alarm and events from any workstation in real time and on demand.

16. Any number of Custom Script objects that allow the programmer to define multi-step "macro" functionality. The scripts shall be portable for import and export.

17. Any number of Conditional Operations for rules evaluation, including IF-THEN-ENDIF programming structures.

18. Any number of formatted Event outputs that allow the programmer to define external event formats to be automatically written to disk or sent to a TCP/IP port such as TAP.

2. System Configuration Capabilities: System configuration (project file development) shall have the following, minimum, capabilities:

A. A graphic drawing system that is screen object orientated which allows the user the capability to arrange and modify objects. (I.e. Align Top, Align Bottom, Align Left, Align Center Points, Space vertical, Send to Front, Send to Back, Space Horizontal, Rotate, label, Make Same Size, Paint Fonts, Paint Colors and Effects, etc.)

B. System Configuration shall be accomplished with drag and drop point references from a tree structure file system display. No script language shall be necessary to accomplish operational and functional requirements specified. Tree elements shall be capable of drag and drop duplication and movement within the tree display. It shall be possible to "localize" the tree display in order to provide an abbreviated view of any element of the tree for ease of programming. Graphical image and sound directory objects and their children shall be capable of drag and drop directly from the tree to the screen map objects. User defined text descriptors for tree parent and children objects shall be supported with file names of up to 255 characters in length. Duplicate file names shall be supported.

C. System programming wizards shall allow the user to reprogram system elements from the parent node in the tree structure. The reprogramming wizard shall allow the user to reprogram the parent node only or all children of the parent node as well. The reprogramming wizard shall allow for text changes and re-assignment of I/O points to any object or objects within a parent-child structure.

D. Object copy wizards shall allow a copy of an object to be reprogrammed - I/O point assignments, text changes, and object associations – automatically upon copy.

E. Object creation wizards shall automatically create "smart" objects when dragged-and-dropped from the tree onto a screen.

F. Object replication shall allow for automatic creation of multiple "smart" objects that derive their point references from the tree without the necessity for programming each element individually.

G. An unlimited number of user defined site maps as the user interface and control screen. The JSIM shall allow the site maps to be generated off line and imported into the system. The JSIM shall allow the system administrator to place Icons representing each integrated device function on any map screen. The JSIM shall allow the system administrator to define site maps, icons, and icon definitions in real time, to ensure that normal system operations are not disrupted.

H. System functions assignable to any screen shall include 1) command sets to be automatically executed by the system upon an operator request or any combination of requests, and 2) command sets to be automatically executed by the system upon the occurrence of a pre-selected system alarm or event or any combination of alarms or events. Command sets shall be a collection of system commands as selected by the system administrator. Commands available for selection by the system administrator to create a command set shall include all commands supported by the integrated

device or subsystems. Command set shall be categorized by like function and shall include:

1. I/O Control

   A. SetOn - Sets and I/O point to its ON state

   B. SetOff - Sets and I/O point to its OFF state

   C. Pulse - Temporarily sets and I/O point ON then OFF

   D. TempPulse – Sets an I/O point to its ON state for a user-entered number of minutes (0-999).

   E. Toggle -Toggles an I/O point

   F. ForceOn – Forces an I/O point to remain in an ON condition. All other commands for this point will be ignored except ForceOff and ForceNormal.

   G. ForceOff - Forces an I/O point to remain in an OFF condition. All other commands for this point will be ignored except ForceOn and ForceNormal.

   H. ClearForce- Returns an I/O Point to its normal operating condition without changing the state of the point.

   I. IncrementCounter – Increments a Counter I/O point by the user-programmed interval.

   J. DecrementCounter – Decrements a Counter I/O point by the user-programmed interval.

   K. ResetCounter – Resets the Counter I/O point to its user-programmed "start" state.

   L. StartTimer – Starts a user-defined Timer I/O point.

   M. KillTimer – Stops the user-defined Timer I/O point and prevents the execution of any actions assigned to the Timer.

   N. ForceTimer – Forces a Timer I/O point to complete its cycle and execute any actions assigned to it.

   O. StartScript – Execute a script object containing commands and actions

   P. StopScript – Terminate the execution of a script object

   Q. PauseScript – Pause the execution of a script object

   R. ResumeScript – Resume the execution of a paused script object

2. Door Control

   A. LockDoor – Sets the door lock point on a Door Construct to its locked state.

   B. UnLockDoor – Sets the door lock point on a Door Construct to its unlocked state.

   C. TempUnLockDoor - Sets the door lock point on a Door Construct to its unlocked state for a user-entered number of minutes (0-999).

   D. PulseDoor - Causes the door lock point on a Door Construct to cycle through its unlock-lock cycle (unlocks for the programmed strike time).

E. SwitchEntryCamera – Switches the camera view for the entry side of the door construct.

F. SwitchExitCamera – Switches the camera view for the exit side of the door construct.

G. ConnEntryIntercom – Connects to the entry-side intercom station.

H. DiscEntryIntercom – Disconnects the entry-side intercom station.

I. ConnExitIntercom - Connects to the exit-side intercom station.

J. DiscExitIntercom - Disconnects the exit-side intercom station.

K. StartEntryAlarm – Sets the entry-side auxiliary alarm point to its ON state.

L. StopEntryAlarm - Sets the entry-side auxiliary alarm point to its OFF state.

M. StartExitAlarm - Sets the exit-side auxiliary alarm point to its ON state.

N. StopExitAlarm - Sets the exit-side auxiliary alarm point to its OFF state.

3. Screen Control

A. PopUp/PopUpDialog – Causes a Screen to "pop up" at a user-defined XY-coordinate and overlay the current screen. The screen displayed with PopUpDialog contains controls so the user can move the screen around and dismiss it.

B. PopOff – Causes a "pop up" screen to be dismissed from view.

C. Display– Causes a new screen to display.

D. PopUpQueue - Causes a user-defined queue to be displayed at user-defined XY-coordinates on the screen.

E. PopOffQueue – Causes a user-defined, popped-up queue to pop off.

4. Database

A. MoveFirst – move focus to the first record in the selected record set.

B. MovePrevious – move to the previous record in the selected record set.

C. MoveNext - move to the next record in the selected record set.

D. MoveLast - move to the last record in the selected record set.

E. RecordAdd – add a record to the selected table.

F. RecordChange – edit a record in the selected table.

G. RecordDelete – delete a record from the selected table.

H. RecordCancel – cancel add/edits/deletes.

I. RecordSave – save the record in the selected table.

J. FilterNew – build a new query filter.

K. FilterBy – set filter query specifics.

L. MatchExact – match query to exact specifics.

M. MatchPartial – match query to partial specifics.

N. MatchPartialStart – match query to partial specifics “starts with – “wildcards.

O. MatchPartialEnd – match query to partial specifics “ends with – “wildcards.

P. MatchNotEqual – match query to not-equal value.

Q. MatchLessThan – match query to less than value.

R. MatchGreaterThan – match query to greater than value.

S. MatchLessOrEqual – match query to less-than-or-equal value.

T. MatchGreaterOrEqual - match query to greater-than-or-equal value.

U. SortBy – sort query results by field name.

V. FilterSet – executes a filter command sequence.

5. General

A. Play – used to play a sound wave file. The target for this action must be a sound or TTS message.

B. Authenticate – requires supervisory concurrence prior to execution of the next command.

C. Validate – similar to Authenticate. If the target computer, user or System Mask does not match the current, the remaining actions in the action grid are not executed. Does not require specific user interaction.

D. StartMustering – begins a Mustering Event.

E. StopMustering – ends a Mustering Event.

6. Event –Popup Alarm Queue and Information Manager (IM) Actions

A. SelectEvent – used to open an event from the the target popup Alarm Queue. If no target is supplied, open the event from the Queue Control tab within the IM. It functions the same as right-clicking the mouse to open the Alarm Acknowledge/Clear Dialog.

B. AckEvent – used to acknowledge the selected alarm in the target popup Alarm Queue. If no target supplied acknowledge the selected alarm in the Queue Control of the IM.

C. ClearEvent – used to clear the selected alarm from the the target popup Alarm Queue. If no target is supplied, then the Queue Control of the IM is the target queue.

D. CurrentEvent – highlights and selects an event (if none is highlighted) in the target popup Alarm Queue, or if no target is supplied, the Queue Control of the IM. It functions the same as a single left mouse click on a highlight alarm event.

E. UpEvent – used to move up one event on the target popup Alarm Queue, or if no target is supplied, the Queue Control of the IM.

F. DownEvent – used to move down one event on the target popup Alarm Queue, or if no target is supplied, the Queue Control of the IM.

G. AckAllEvent – used to acknowledge all listed events on the target popup Alarm Queue, or if no target is supplied, the Queue Control of the IM.

H. ClrAllEvent – used to clear all listed events on the target popup Alarm Queue, or if no target is supplied, the Queue Control of the IM.

I. SelectTopEvent – select the highest priority event in the popup Alarm Queue, or if no target is supplied, the Queue Control of the IM

7. Conditionals – If-Then-Else conditional actions

8. Computer

A. MaskComputer – selects a target computer for the actions ForceMask and ForceRoutingMask. The target for this action must be a computer node.

B. ForceMask – forces a System Mask to the computer set with the MaskComputer action. The MaskComputer action must precede this action. The target for this action must be a System Mask.

C. ForceRoutingMask – forces a Routing Mask to the computer set with the MaskComputer action. The MaskComputer action must precede this action. The target for this action must be a Routing Mask

D. LockWorkstation – locks the target computer out from managing/operating the Peregrine Project. The target for this action must be a computer node.

E. UnlockWorkstation – unlocks a currently locked out target computer, re-establishing managing/operating functionality to the target computer. The target for this action must be a computer node.

9. Call Station

A. SelectCallStation – selects a Call Station

B. DeselectCallStation – clears the selection of a Call Station

C. DisbleCallStation – disable the Call Station

D. EnableCallStation – enable the Call Station

E. AckCallIn – Acknowledge the call for the Call Station

F. ProcessCallIn – Mark the call as processed for the Call Station

10. Panel

A. SendCommand – builds a command and sends it to the driver.

B. VirtualizePanel – sets a Panel from a live state to a virtual state. The target for this action must be a Panel.

C. UnVirtualizePanel – sets a Panel from a virtual state to a live state. The target for this action must be a Panel.

D. OnlineDriver – brings the targeted Panel's driver online. The target for this action must be a Panel.

E. OfflineDriver – brings the targeted Panel's driver offline. The target for this action must be a Panel.

F. DownloadSettings – forces a download of settings (parameters) to an Access Control device.

G. DownloadCards - forces a download of card data to an Access Control device.

H. DownloadHolidays – forces a download of holiday settings to an Access Control device

I. DownloadTimeZones – forces a download of time zone settings to an Access Control device

J. DownloadAccess – forces a download of access settings to an Access Control device

K. DownloadComplete – forces a download of all settings and cards to an Access Control device

L. DownloadFirmware – forces a download of firmware to an Access Control device if applicable

11. Reports

A. ZoneReport – shows all cardholders whose presence is within the target zone. The target for this action is an APB Zone.

B. MusterReport – shows all cardholders whose presence is not within a Mustering Zone or Outside. There is no target for this action.

C. RunReport – causes a pre-defined report to run.

D. PrintReport – sends a pre-defined report to the printer.

12. Alarm Zone

A. SelectZone – select the alarm zone

B. DeselectZone – deselect the alarm zone

C. AckZone – acknowledge any of alarm conditions (tamper, fail, sensor, alarm or multiple alarm) that may be in the alarm state for an alarm zone

D. ProcessZone – mark the alarm zone as processed

E. AccessZone – set the alarm zone in the Access state. In this state, all alarms are ignored because the alarm zone is in a purposely unsecure state.

F. SecureZone – clear the Access state of the alarm zone rendering it secure

G. ClearZoneTamper – clear any zone tamper states for an alarm zone.

H. ClearZoneFailure – clear any zone failure states for an alarm zone

I. All icon command sets must be defined by the system administrator in real time and become active immediately upon definition. All definitions must be able to be changed while the system is on-line and operational.

J. All system functions shall be implemented by command set definitions. The functions to be performed automatically by command sets and shall be limited only by the type of devices and subsystems that have been integrated and the capabilities of those devices. No limit shall be set on the number of commands that may be included in a command set, the number of command sets and the number of icons to which the command sets can be assigned.

K. Command sets shall be capable of being modified by the system administrator at any time without interruption of the system's normal operation. Command set modifications made in real time shall provide the system with the ability to have its functionality redefined, upon demand, in response to different managerial, operational, or security concerns, as they may occur.

3. System Administration: The JSIM shall support the following, minimum, System Administration capabilities:

A. Operator access to the system to be defined by the system administrator. Each authorized operator shall have a log on name and password as well as a predefined authorization to access and/or perform certain system functions. Authorized user accounts may, upon system administrator selection, be derived from Windows User accounts or Windows User Group accounts. Windows strong authentication is used for user accounts. The JSIM shall remain active, processing all information and shall not allow the last operator to log off the system without a pop-up warning. When no user is logged on to the system, system alarms and prompts are accumulated by the system until an operator logs on and takes the necessary actions to clear the alarms and prompts. If no operator is logged on, the JSIM shall display the log-on prompt within a welcome screen to be defined by the owner. The log-on prompt contains operator fields for users to enter their log-on name and password. If an operator enters their log-on name and password sequences, and if the system verifies them as being valid, then the JSIM shall display the user's pre-defined home screen. The JSIM shall allow an operator to select a Log Off button from the command bar and return to the Log-on window. The JSIM shall also be capable of preventing administrator-defined operators from logging off the system. Logon shall be accomplished via keyboard input, card read input, or on-screen keyboard/randomized hex keypad (on the touch screen console). Logon may also be granted variously based upon user and workstation combinations.

B. The JSIM shall be capable of being operated from a remote location utilizing LAN/WAN TCPIP communications by a technical support specialist. The remote capabilities shall support diagnostic and help-desk operations and include the ability to upgrade software.

C. The JSIM shall be capable of providing server redundancy. In the event of a primary server failure, the backup server will assume operation of the system automatically with no loss of data or interruption of I/O activity. Redundancy implementation shall not include the use of third-party software or hardware, and shall not involve the use of a manual or automatic hardware "fail-over controller." Redundancy must be able to optionally support dual redundant Ethernet communications paths via multiple NICs.

4. JSIM Database

A. The JSIM shall utilize an industry standard Object Database Manager System (ODBMS), MS SQL, or PostgreSQL to support all system functions. The ODBMS shall be capable of supporting full SQL functions as well as data import/export operations utilizing a LAN/WAN or dial-up communications. Systems that do not support SQL functions are not acceptable. Systems that utilize a unique proprietary database are not acceptable.

B. The JSIM shall utilize a system database that contains system information, which defines the JSIM, devices installed, and their configuration. Administrative and other internal files, such as authorized user access, system status and operator logs, shall also be maintained in the system database.

C. The JSIM shall also utilize an application database that contains database information for all subsystems, such as access; alarm monitoring, intercom, CCTV, and door control. The JSIM shall consolidate all application databases as required to support a single point of administration, data entry and reporting.

D. The JSIM shall also utilize a history database that contains system transaction event records for all transactions that occur within the JSIM. The history database shall store the most recent 500,000 transaction events on the internal hard disk.

E. The JSIM shall provide a built-in archiving and automated backup facility that can be set to automatically back up all operational data to any local or network-accessible mass storage media at a user-defined interval, or upon user demand. The archiving and automated backup facility shall be fully integrated into the JSIM and shall not require 3rd-party support software.

F. Database provided shall be a proven, mature, off-the-shelf, multi-user, relational database program and generate all required data structures and linkage between related databases. Either a LAN version or a host version is acceptable.

G. The JSIM application shall support PostgreSQL or MS SQL Server.

H. The database program furnished as part of this work shall provide for the complete management of distributed relational databases and shall be furnished with programming and query capabilities that use ANSI Standard Structured Query Language (SQL).

I. The database program shall generate, store, and mirror on each file/print server identical copies of all databases that are required for critical and essential functions. Data records and files generated by other JSIM application programs shall be stored on the file server(s) in a format, which is compatible with, and directly accessible by, the database program.

J. It shall be possible to display, and to print each database record in separate, Owner-forgettable configurations.

5. JSIM Reports

A. The system shall be capable of producing the following reports, based on logged historical events over a specified date and time period, both individually and in any combination. The user shall be able to display report data on screen as well as print a hard copy to any JSIM printer:

1. Report of JSIM alarm transaction events for a selected alarm or group of alarms.

2. Report of JSIM operator acknowledgments for a selected alarm or group of alarms.

3. Report of JSIM operator entered comments in conjunction with alarm acknowledgments.

4. Report of JSIM manual operator system commands such as camera call-ups, input point activation/deactivation, door locking and unlocking, interlock override, Intercom calls, emergency release functions, and auxiliary relay activation/deactivation.

5. Report of JSIM automatic time controlled system commands such as automatic input point activation/deactivation, and automatic auxiliary relay activation/deactivation.

6. Report of JSIM system activity such as port traffic, system start up and shutdowns, and system failures.

B. All reports shall be selectable by time and date range as selected by user.

C. All reports shall be capable of running automatically, based upon a user-defined time schedule.

D. Report generation software shall be provided to develop generic and advanced reports in industry standard RPT report format files. Modification of reports and data shall be user definable and be relational to active database information. Report management software shall not require system to be idle for query and report generation.

6. System Operation Requirements:

A. Alarm Processing.

1. The operator shall be able to select the alarms or events displayed in the event queue(s) by priority. Up to 255 priority levels shall be supported.

2. The operator shall be able to view and acknowledge alarms and events from any mode of operation.

3. It shall be possible to inform the operator of an alarm condition via an audible tone, a pop-up display, or any combination of animation types on the screen. Alarm acknowledgment may be performed on all alarms, alarms in a single group, alarms in a collection of groups defined in an alarm group hierarchy, or on a point-by-point basis.

4. Pre-recorded audio messages shall be linked to alarms based on user selection.

5. An ALARM QUEUE, or multiple, user-defined ALARM QUEUES, window(s) shall be provided that will display all alarms, subject to window size. Information to be displayed includes the priority of the alarm, the time alarm occurred, the alarm description text, and the status of the monitored point. This window shall be separated into three partitions, one for active events and alarms, one for all events, transactions, and alarms displayed in a log file, and one for all system points that have been overridden or shunted. Events listed in the active alarm queue shall be sorted by priority (highest priority at the top of the list) and by time of occurrence. Scroll bars adjacent to each partition shall permit the operator to view all alarms and events in each partition separately.

6. An ALARM PROCESSING window shall be provided that will display descriptions and instruction text for the alarm presently being processed, and provide for entry of operator comments. This pop-up window shall open when the operator selects an alarm for processing from the ALARM QUEUE window(s).

7. Any alarm point that has a digital video channel recording parameter (pre-and-post alarm) shall be displayed with a distinctive alarm symbol indicating to the operator that there is recorded video associated with the alarm. The operator shall be able to select the special icon and immediately recall the recorded alarm event as recorded video-on-demand. In addition, the user shall be able to search previous alarm events for associated video and retrieve the event-recorded video on demand.

8. Selection of any alarm, in either partition, shall automatically bring the ALARM PROCESSING window to the foreground, displaying the associated information in the ALARM PROCESSING window, display the alarm's associated map (if so defined), and cause the alarm selected for processing to be highlighted in the ALARM QUEUE window.

9. It shall be possible for the system administrator to pre-define alarm acknowledgement comments for alarm events. The operator may then select a pre-defined comment for inclusion in the event log my selecting the pre-defined comment. It shall also be possible for the operator to edit and/or append custom comments to the pre-defined acknowledgement comments.

10. Any I/O point shall be capable of submitting alarm event via email or a text message via a TAP server upon activation. It shall be possible for the user to define email and text alarms on a point-by-point basis, and, at minimum, to identify the recipient or multiple recipients (up to 255 accounts). Email or text notifications shall be selectable based upon activation (hi), clear (low), or upon any state change (hi or low transition) of any I/O point.

A. Integrated video event capture capability that will allow the user to capture and store video still and clip events related to any series of control selections or I/O activity.

B. The interaction time between system input at the touch screen and the activation of a field device shall not exceed one quarter (0.25) second. The interaction time between field input device and display on the operator screen shall not exceed one quarter (0.25) second. The interaction time to recall a complete graphic screen shall not exceed one half (0.5) second under normal operation and one (1.0) second under single station control of entire facility.

2.3 INSTALLAITON, EQUIPMENT, AND GENERAL FUNCITON

1. General:
    a. Abbreviations:
        i. DPS: Door Position Switch
        ii. JB: 4" square deep junction box

2. CUITTNG AND PATCHING: Any modifications to the facility will need to be covered and concealed. Any patch work created by contractors post other trades completion that is not covered by equipment will need to be patched by contractor up to standards of original finished product.

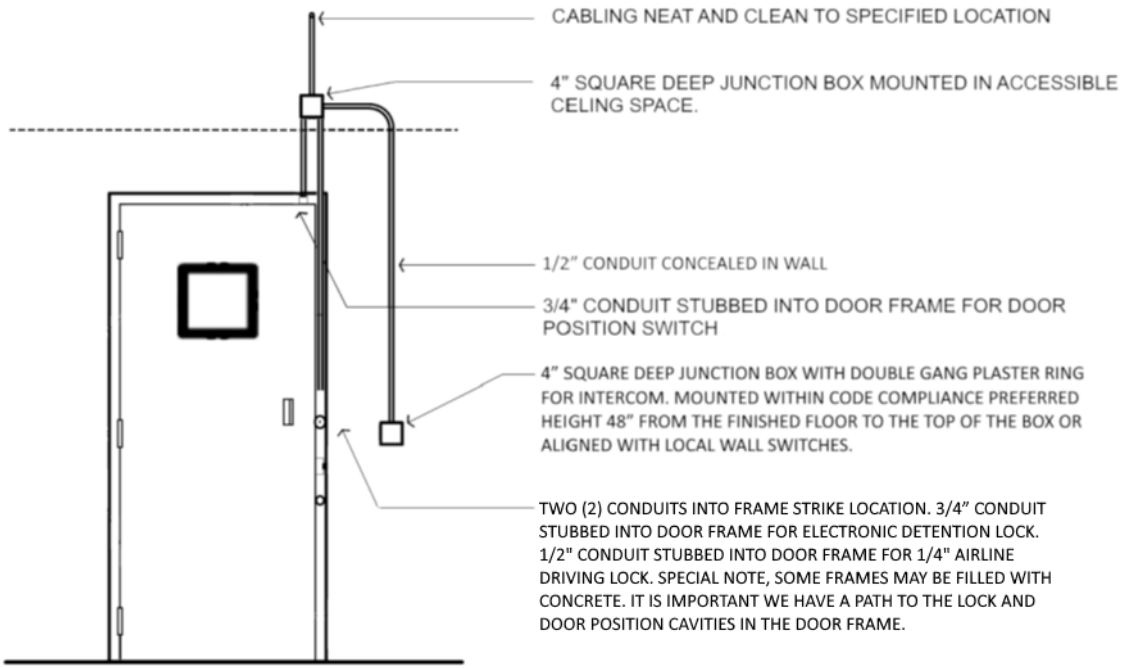
3. INSTALLAITON: See each object's individual installation requirements, all cabling to be cleanly labeled at headend with associated device abbreviated name or better.

    a. Minimum Cable Requirements: Electrical contractor to verify the necessity plenum wiring.

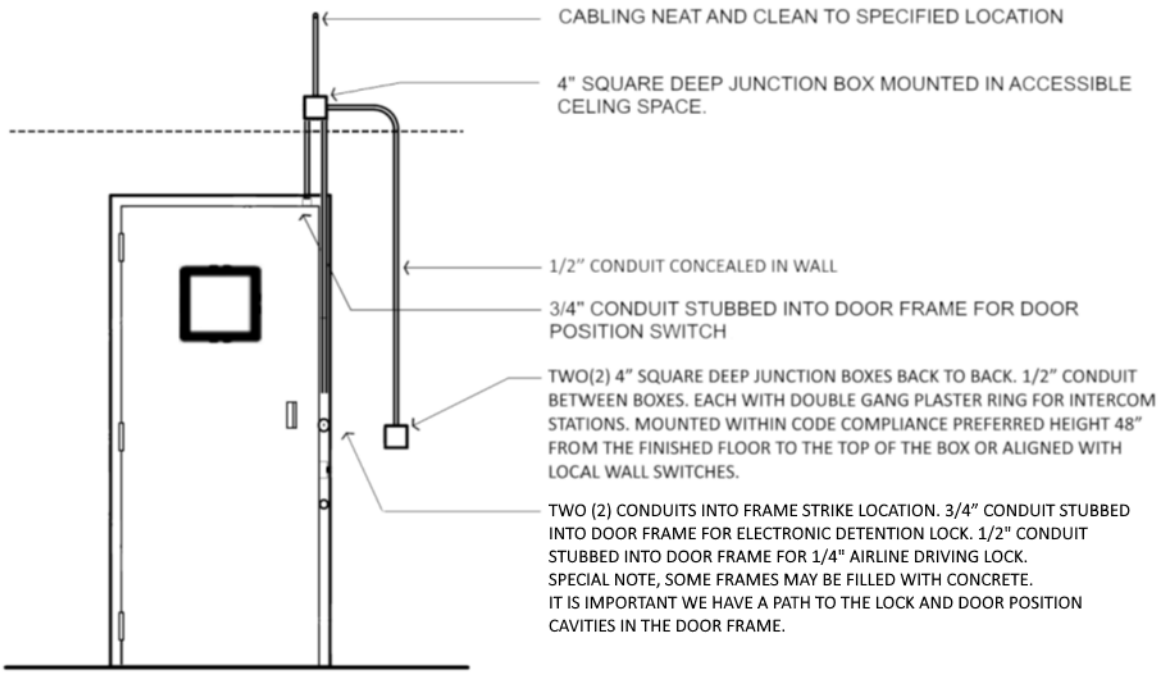
i. Genesis 22165509 18/6 Stranded Shielded Riser Cable
ii. Genesis 32165012 18/6 Stranded Shielded Plenum Cable
iii. Genesis 22145509 18/2 Stranded Shielded Riser Cable
iv. Genesis 32141012 18/2 Stranded Shielded Plenum Cable
v. Genesis 50922101 CAT6 Plus Riser Cable
vi. Genesis 51022101 CAT6 Plus Plenum Cable

b. Typical controlled doors below show the locations and requirements for control systems. Modifications in conduit paths may be necessary to fit onsite conditions. Certain door types, including Door Type 8 Detention Monitoring, will only require rough-in for door position monitoring, while other rough-in components, like detention lock stub-ins, can be omitted from a Door Type 8 configuration.

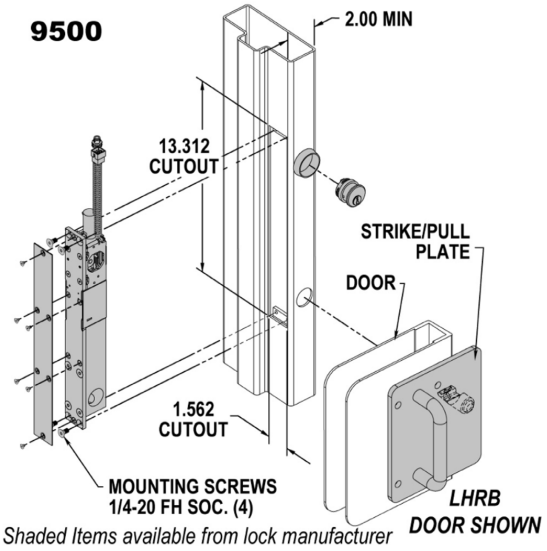
Detention Doors:

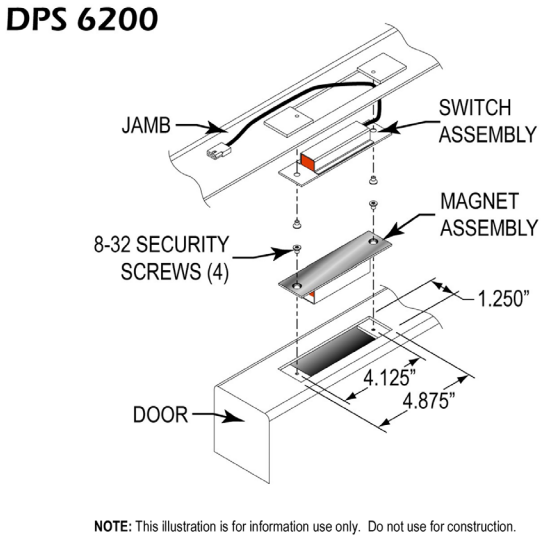


TYPICAL DETENTION DOOR WITH SINGLE SIDED INTERCOM
SCALE: NONE

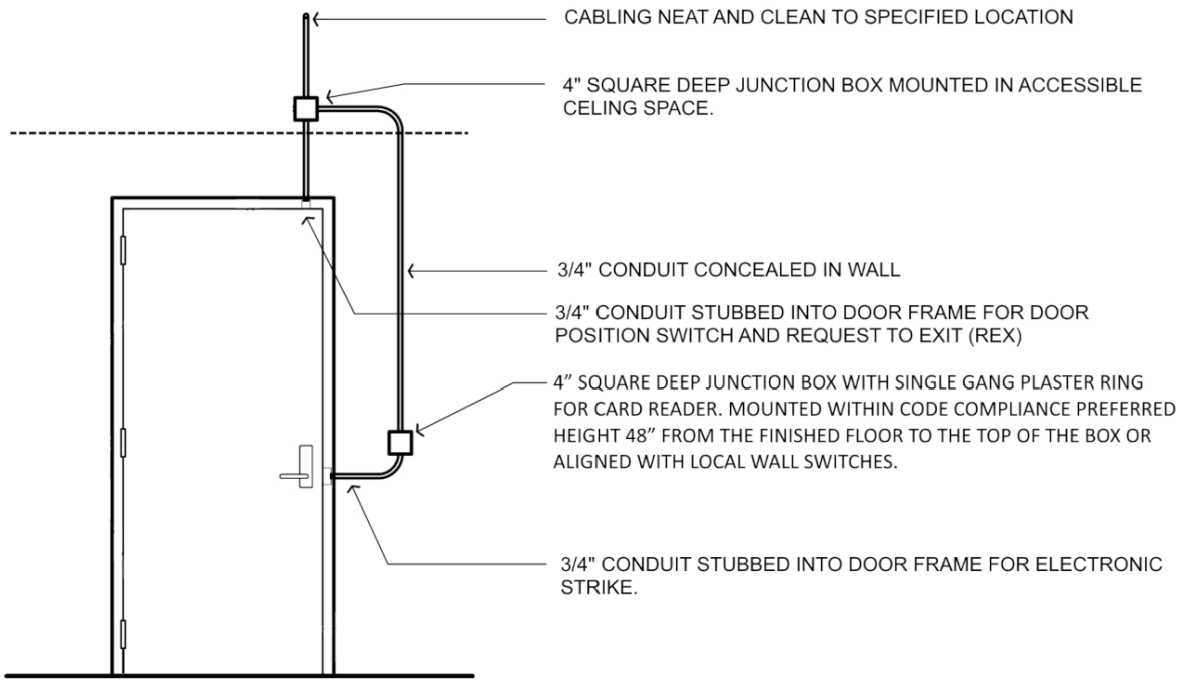


DETENTION DOOR ELECTRONIC LOCK MANUFACTURERS DRAWING: (Reference Only)



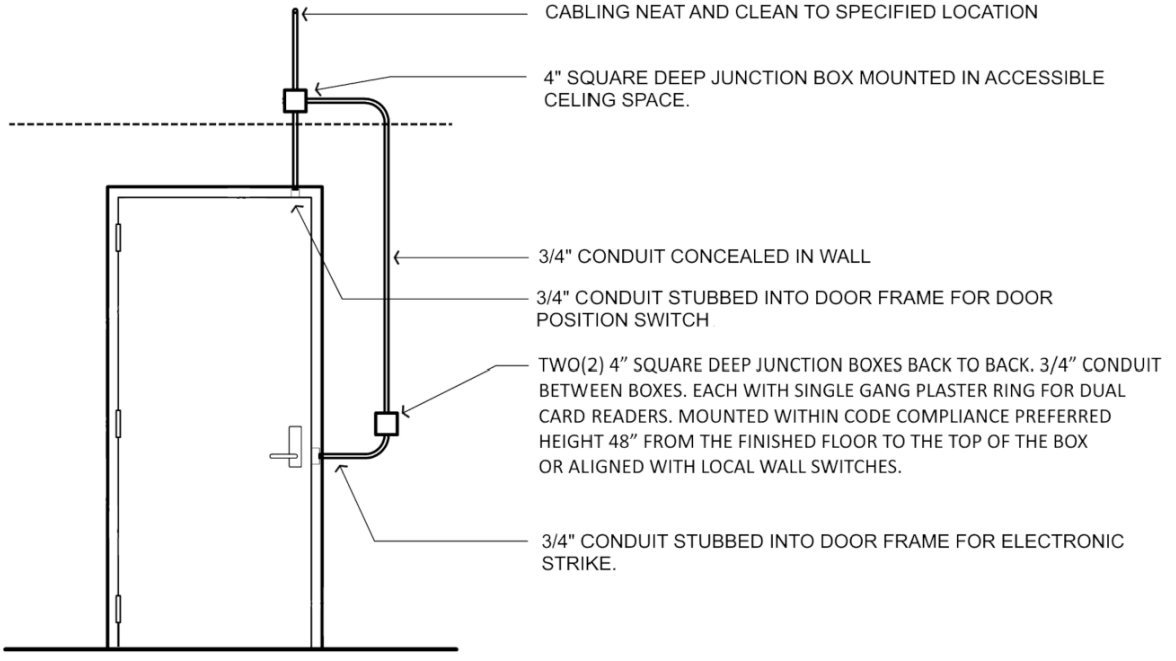


Card Access Doors



TYPICAL SINGLE CARD READER CONTROLLED DOOR

SCALE: NONE



TYPICAL DUAL CARD READER CONTROLLED DOOR

SCALE: NONE

4. FIELD QUALITY CONTROL: Installation to be reviewed by owner or their agent(s) during entirety of project for quality of work and ease of future service.

5. PERFORMANCE TEST: Checkout and testing to be performed by owner and their agents.

6. ADJUST AND CLEAN: All equipment installed and associated with this project will be cleans of dust and debris. All cameras need to be cleaned, and lenses positioned at the owners' direction.

7. RECORD DRAWINGS: Finalized drawings are required before final sign off of system, reflecting all actual equipment, wiring connections, paths and programming matrixes.

8. OWNER TRAINING:
    a. Provide training of owner personnel in proper operation and maintenance of control system.
    b. Training Outline - Maintenance Staff
        i. Systems Operation
        ii. Touch Screen / Control Panels
        iii. Panel Operation
        iv. Component Review
        v. Routine Maintenance/Adjustments
        vi. Troubleshooting/Repair
        vii. Training Outline - Operational staff
        viii. Systems Operation
        ix. Touch Screen / Control Panels
        x. Functions performed
        xi. Monitor Functions
        xii. Control Functions
        xiii. Emergency Release

9. JSMI

    a. Control Station Type 1:
        i. Rough-in, EMT, Cabling, Installation:
            1. Under desk CAT6 network jack labeled and installed on wall plate.
            2. Cabling Needs:
                a. CAT6 Cable from device wall plate to the specific IT Rooms below.
                    i. Devices in Area E Run IT room 11
                    ii. Devices in Area A&B Run to IT room 109B
            3. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
            4. 4 wall outlets 120VAC for control station and monitors
            5. Connect to associated security switch
            6. Computer not allowed to be placed on floor

ii. Equipment:
1. Computer Minium:
a. OptiPlex Small Form Factor Plus 7020
b. CPU: Intel Core i7 14700 vPro
c. OS: Windows 11 Pro
d. RAM: 32GB
e. OS Drive: 512GB NVMe SSD Class 35
f. GPU: NVIDIA® T1000 8GB
g. Warranty: 5 yr Pro Plus
2. (2) Elo 2703LM 27" Touchscreen Monitors
3. Wireless keyboard & mouse
4. Rack Mount UPS SU750RTXLCD2U
5. Wall Rack (under desk) Middle Atlantic VPM-4

iii. Function:
1. Load Peregrine control system client software
2. Dual display control interface
3. Control Station via Peregrine to communicate with all sub-systems as defined in this specification to support the functions and operations of the jail. All systems shall be interfaced in a seamless single user interface working simultaneously without the use of hardware data switches. All subsystems control and monitoring shall be logged to record sub-system-specific history data, including operator interaction, by date and time of occurrence.

b. Control Station Type 2:
i. Rough-in, EMT, Cabling, Installation:
1. Under desk CAT6 network jack installed on wall plate.
2. Cabling Needs:
a. CAT6 Cable from device wall plate to the specific IT Rooms below.
i. Devices in Area E Run IT room 11
ii. Devices in Area A&B Run to IT room 109B
3. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
4. 4 wall outlet 120VAC for control station and monitors
5. Connect to associated security switch

ii. Equipment:
1. Computer Minium:
a. OptiPlex Small Form Factor Plus 7020
b. CPU: Intel Core i7 14700 vPro

c. OS: Windows 11 Pro
d. RAM: 32GB
e. OS Drive: 512GB NVMe SSD Class 35
f. GPU: NVIDIA® T1000 8GB
g. Warranty: 5 yr Pro Plus

2. Elo 2403LM 24" Touchscreen Monitor
3. Wireless keyboard & mouse
4. Rack Mount UPS SU750RTXLCD2U
5. Wall Rack (under desk) Middle Atlantic VPM-4

iii. Function:

1. Load Peregrine control system client software
2. Single limited control interface
3. Control Station via Peregrine to communicate with all sub-systems as defined in this specification to support the functions and operations of the jail. All systems shall be interfaced in a seamless single user interface working simultaneously without the use of hardware data switches. All subsystems control and monitoring shall be logged to record sub-system-specific history data, including operator interaction, by date and time of occurrence.

c. Control Viewing Station Type 3:

i. Rough-in, EMT, Cabling, Installation:

1. CAT6 network jack labeled and installed on wall plate. Location to be coordinated with Owner and Security Contractor.
2. Cabling Needs:
   a. CAT6 Cable from device wall plate to the specific IT Rooms below.
      i. Devices in Area E Run IT room 11
      ii. Devices in Area A&B Run to IT room 109B
      iii.
3. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
4. 4 wall outlets 120VAC for control station and monitors. Location to be coordinated with owner and Security Contractor in room Control 31.
5. Monitors to be installed in from ceiling to location determined by Owner and Security Contractor. Monitors sized to 40-43" for space accommodations in room Control 31. Monitors will be installed high on wall, mounted to ceiling or wall. NOTE: Wall is detention glass and will require special considerations.

6. Connect to associated security switch
7. Computer not allowed to be placed on floor

ii. Equipment:
1. Computer Minium:
a. OptiPlex Small Form Factor Plus 7020
b. CPU: Intel Core i7 14700 vPro
c. OS: Windows 11 Pro
d. RAM: 32GB
e. OS Drive: 512GB NVMe SSD Class 35
f. GPU: NVIDIA® T1000 8GB
g. Warranty: 5 yr Pro Plus
2. (4) 40-43" flat panel monitor with minimum .28 DPI, resolution 1920x1080 with associated cables and adapters
3. Wireless keyboard & mouse
4. Rack Mount UPS SU750RTXLCD2U
5. Wall Rack (under desk) Middle Atlantic VPM-4
6. (4) Monitor Mounts, Wall or Ceiling

iii. Function:
1. Load Avigilon Matrix Software
2. Viewing station to display any and all cameras onsite for overall visual reference. Viewing station monitors can be customizable by Owner post construction and initially customized by Contractor to owners needs.

d. JSMI Headend & Control Server(s):
i. Rough-in, EMT, Cabling, Installation:
1. Installed in Security Contractor provided data rack(s) located in room IT 11
2. Connect to associated security switch

ii. Equipment:
1. Server Minium:
a. Dell Precision 7960 Rack Workstation
b. CPU: Intel Xeon Silver 4410Y
c. OS: Win 11 Pro
d. RAM: 32GB
e. Video: NVidia T400 4GB
f. OS Drive: 512GB NVMe Class 40 SSD
g. (2) Storage: 2 TB, Solid State Drive Enterprise RAIDED
h. Power: Dual Redundant Hot Swap 1100W
i. IDRAC: iDRAC9 Enterprise
j. Warranty: 5yr Pro Plus
2. Peregrine Server Software & Require License

iii. Function:

1. Load Peregrine control server software & software licenses
2. Data storage and schedule back-ups
3. Control server via Peregrine to communicate with all sub-systems as defined in this specification to support the functions and operations of the jail. All systems shall be interfaced in a seamless single user interface working simultaneously without the use of hardware data switches. All subsystems control and monitoring shall be logged to record sub-system-specific history data, including operator interaction, by date and time of occurrence.

10. INTERCOM & COMMUNICAITON SYSTEM

a. Intercom Type 1:
   i. Rough-in, EMT, Cabling, Installation:
      1. 4" square deep junction box w/ 2 gang mud ring (Intercom JB)
      2. ½" Conduit from mechanical, electrical, accessible celling spaces JB, to intercom JB on secure side of door
      3. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate with masonry contractor on necessary cutting of existing and patch of existing CMU walls. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor. Intercoms to be flush mount in all walls.
      4. Cabling Needs:
         a. 18/2 Shielded from device JB to the specific IT Rooms below.
            i. Devices in Area E Run IT room 11
            ii. Devices in Area A&B Run to IT room 109B
      5. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
      6. Connect to associated intercom headend terminals
   ii. Equipment:
      1. Harding Detention Grade Intercom
   iii. Function:
      1. Integrate intercom into Peregrine control system
      2. Upon pressing the intercom button, the system will alert both Detention Control & reception in Office 4, upon selection of alert, Peregrine will utilize and associated cameras in area around intercom station. Specific camera associations and changes beyond standard function programming to be determined by the client

later. Detention Control and Office 4 have capabilities to allow entry into area.

b. Intercom Type 2:
    i. Rough-in, EMT, Cabling, Installation:
        1. Existing: VERIFY conduit drop to door and path for cabling and continuity.
        2. Reutilize cabling, connect to terminal block enclosure near IT room 11. Extend cabling to IT room 11 racks, labeled accordingly.
        3. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
        4. Connect to associated intercom headend terminals
    ii. Equipment:
        1. Harding Detention Grade Intercom
    iii. Function:
        1. Integrate intercom into Peregrine control system
        2. Upon pressing the intercom button, the system will alert both Detention Control & reception in Office 4, upon selection of alert, Peregrine will utilize and associated cameras in area around intercom station. Specific camera associations and changes beyond standard function programming to be determined by the client later. Detention Control and Office 4 have capabilities to allow entry into area.

c. Intercom Type 3 Dual Sided Intercom Door (Shared EMT Drop):
    i. Rough-in, EMT, Cabling, Installation:
        1. (Shared Drop) ½" Conduit from mechanical, electrical, accessible celling spaces junction box, to intercom JB(s) on eaxh side of door.
        2. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate with masonry contractor on necessary cutting of existing and patch of existing CMU walls. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor. Intercoms to be flush mount in all walls.
        3. Cabling Needs:
            a. 18/2 Shielded from device JB to the specific IT Rooms below.
                i. Devices in Area E Run IT room 11
                ii. Devices in Area A&B Run to IT room 109B

4. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
5. Connect to associated intercom headend terminals

ii. Equipment:
1. (2) Two Harding Detention Grade Intercoms

iii. Function:
1. Integrate intercom into Peregrine control system
2. Upon pressing the intercom button, the system will alert both Detention Control & reception in Office 4, upon selection of alert, Peregrine will utilize and associated cameras in area around intercom station. Specific camera associations and changes beyond standard function programming to be determined by the client later. Detention Control and Office 4 have capabilities to allow entry into area.

d. Intercom Type 4 Detention Intercom:
i. Rough-in, EMT, Cabling, Installation:
1. 4” square deep junction box w/ 2 gang mud ring (Intercom JB)
2. ½” Conduit from mechanical, electrical, accessible celling spaces JB, to intercom JB on secure side of door
3. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate with masonry contractor on necessary cutting of existing and patch of existing CMU walls. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor. Intercoms to be flush mount in all walls.
4. Cabling Needs:
a. 18/2 Shielded from device JB to the specific IT Rooms below.
i. Devices in Area E Run IT room 11
ii. Devices in Area A&B Run to IT room 109B
5. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
6. Connect to associated intercom headend terminals

ii. Equipment:
1. Harding Detention Grade Intercom

iii. Function:

1. Integrate intercom into Peregrine control system
2. Upon pressing the intercom button, the system will alert Detention Control upon selection of alert, Peregrine will utilize and associated cameras in area around intercom station. Specific camera associations and changes beyond standard function programming to be determined by the client later. Detention Control has capabilities to allow entry into area.

e. Intercom Type 5 Dual Sided Intercom Door (Shared EMT Drop):
   i. Rough-in, EMT, Cabling, Installation:
      1. (2) 4" square deep junction box w/ 2 gang mud ring (Intercom JB) on both sides of the door.
      2. (Shared Drop) ½" Conduit from mechanical, electrical, accessible celling spaces junction box, to intercom JB(s) on eaxh side of door.
      3. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate with masonry contractor on necessary cutting of existing and patch of existing CMU walls. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor. Intercoms to be flush mount in all walls.
      4. Cabling Needs:
         a. 18/2 Shielded from device JB to the specific IT Rooms below.
            i. Devices in Area E Run IT room 11
            ii. Devices in Area A&B Run to IT room 109B
      5. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
      6. Connect to associated intercom headend terminals
   ii. Equipment:
      1. (2) Two Harding Detention Grade Intercoms
   iii. Function:
      1. Integrate intercom into Peregrine control system
      2. Upon pressing the intercom button(s), the system will alert Detention Control upon selection of alert, Peregrine will utilize and associated cameras in area around intercom station. Specific camera associations and changes beyond standard function programming to be determined by the client later. Detention Control has capabilities to allow entry into area.

f. Intercom Type 5.1 Overhead Speaker Type:

i. Rough-in, EMT, Cabling, Installation:
    1. Install specialty speaker backbox flush in ceiling
    2. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate with masonry contractor on necessary cutting of existing and patch of existing CMU walls. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
    3. Cabling Needs:
        a. 18/2 Shielded from device Speaker Backbox to the specific IT Rooms below.
            i. Devices in Area E Run IT room 11
            ii. Devices in Area A&B Run to IT room 109B
    4. 18/2 Shielded Run to Associated Speaker Mullion Mount Detention Call Button
        a. Rout wire to button through hollow frame to the mullion mount detention intercom call button location on door frame. Installation height of 48” to the top of the call button.
    5. Install Mullion Call Button
    6. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
    7. Connect to associated intercom headend terminals

ii. Equipment:
    1. Speaker Installation Backbox, Provided by Security Contractor
    2. Overhead Speaker
    3. Harding Detention Grade Intercom Control Board
    4. Mullion Mount Detention Call Button

iii. Function:
    1. Integrate intercom speaker into Peregrine control system
    2. Upon pressing the intercom button(s), the system will alert Detention Control upon selection of alert, Peregrine will utilize and associated cameras in area around intercom station. Specific camera associations and changes beyond standard function programming to be determined by the client later. Detention Control has capabilities to allow entry into area.

g. Intercom Type 6 Master Station(s):
    i. Rough-in, Cabling:
        1. Under desk CAT6 network jack installed on wall plate.

2. Cabling Needs:
    a. CAT6 Cable from device wall plate JB to the specific IT Rooms below.
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
3. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
4. Connect to associated security switch

ii. Equipment:
1. Harding Detention IP Master Station Desktop Touchscreen Interface Type

iii. Function:
1. Integrate intercom into Peregrine control system
2. Upon receiving intercom call from facility, Peregrine software will initiate answering call upon touch of device on screen. The operator will then utilize button on Master Station to mute/unmute conversation. Upon canceling call master station will disconnect intercom connection automatically. Master station will have the ability to listen to other intercoms in the facility without notice to those stations.

h. Overhead Speaker Type 1:
i. Rough-in, EMT, Cabling, Installation:
1. Install Specialty Speaker Backbox in Ceiling
2. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate with masonry contractor on necessary cutting of existing and patch of existing CMU walls. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
3. Cabling Needs:
    a. 18/2 Shielded from device Speaker Backbox to the specific IT Rooms below.
        i. Devices in Area E CAT6 IT room 11
        ii. Devices in Area A&B Run to IT room 109B
4. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as

trays and J-hooks to keep cabling off ground and run to destination.
5. Connect to associated Talkback amplifier

ii. Equipment:
1. Speaker Installation Backbox Provided by Security Contractor
2. Overhead Speaker

iii. Function:
1. Integrate intercom into Peregrine control system
2. Detention Control can announce messages both pre-recorded and staff created. These messages can be sent as an all call or individual zones. Speakers can be zoned with both Type 2 area speakers and local cell or door intercoms.

i. Overhead Speaker Type 2 (second speaker):
i. Rough-in, EMT, Cabling, Installation:
1. Install Specialty Speaker Backbox in Ceiling
2. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
3. Cabling Needs:
a. 18/2 Shielded from device Speaker Backbox to nearest Type 1 Speaker Backbox within common space.
4. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
5. Connect to associated Talkback amplifier

ii. Equipment:
1. Speaker Installation Backbox Provided by Security Contractor
2. Overhead Speaker

iii. Function:
1. Integrate intercom into Peregrine control system
2. Detention Control can announce messages both pre-recorded and staff created. These messages can be sent as an all call or individual zones. Speakers can be zoned with both Type 1 area speakers and local cell or door intercoms.

j. Overhead Speaker Type 3:
i. Rough-in, EMT, Cabling, Installation:
1. Install 4” square deep junction box (Speaker JB) on ceiling for pendant mount speaker, run cabling in ½” Conduit from

mechanical, electrical, accessible celling spaces junction box, to (Speaker JB).

2. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
3. Cabling Needs:
    a. 18/2 Shielded from device Speaker JB to the specific IT Rooms below.
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
    b. Leave device wire long for pendant device.
4. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
5. Connect to associated Talkback amplifier

ii. Equipment:
1. Overhead Pendant Speaker

iii. Function:
1. Integrate intercom into Peregrine control system
2. Detention Control can announce messages both pre-recorded and staff created. These messages can be sent as an all call or individual zones. Speakers can be zoned with both Type 4 area speakers and local cell or door intercoms.

k. Overhead Speaker Type 4 (second speaker):
i. Rough-in, EMT, Cabling, Installation:
1. Install 4” square deep junction box (Speaker JB) on ceiling for pendant mount speaker, run cabling in ½” Conduit from mechanical, electrical, accessible celling spaces junction box, to local Type 3 overhead speaker.
2. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
3. 18/2 Shielded from device Speaker JB to nearest Type 3 Speaker JB within common space.
4. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as

trays and J-hooks to keep cabling off ground and run to destination.
5. Connect to associated Talkback amplifier

ii. Equipment:
1. Overhead Pendant Speaker

iii. Function:
1. Integrate intercom into Peregrine control system
2. Detention Control can announce messages both pre-recorded and staff created. These messages can be sent as an all call or individual zones. Speakers can be zoned with both Type 3 area speakers and local cell or door intercoms.

l. Intercom Headend and Server(s)

i. Rough-in, EMT, Cabling, Installation:
1. Installed in Security Contractor provided data rack(s) located in room IT 11 & 109B
2. Cables from field devices to be run to the center of the IT room(s) celling from the celling to the floor to accommodate equipment being installed in date racks
3. All terminal block installed in rear of data racks

ii. Equipment
1. DCC Server, associated server expansion units, server mounts, hardware and software to accommodate system size.
2. Talkback Overhead Speaker Amplifier, and associated mounts, hardware and software to accommodate system size.

iii. Function:
1. Licensed and programmed manufactures baseline software to accommodate standard detention functionality and other custom programming requested by client, within software's capability.
2. Data storage and schedule back-ups
3. Ability to for operator to hear through overhead speakers.
4. Server(s) to facilitate intercom facility communications, overhead paging and prerecorded messages working though the Peregrine JSMI system interface.

11. DOOR CONTROL & OPERAITON

a. Door Type 1 Key Card Access Control:

i. Rough-in, EMT, Cabling, Installation:
1. Standard electrical rough in of access control system utilizing ¾" conduit from mechanical, electrical, accessible celling spaces JB, to Reader JB, REX JB (Above Door or on Ceiling), and stubbed into door strike location on door frame for strike and DPS.

Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.

2. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate with masonry contractor on necessary cutting of existing and patch of existing CMU walls. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
3. Cabling Needs:
    a. Access Control Composite Cabling (22AWG/2C + 22AWG/4C + 18AWG/4C + 22AWG/6C Shielded)from door device end point location wiring location(s) (Reader, REX, DPR, Strike) to the specific IT Rooms below.
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
4. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
5. Connect to associated access control controllers

ii. Equipment:
1. Card Reader (Standard), Rex Motion, DPS. Card Reader to be capable of reading county current card formats & credentials.
2. Electronic Strike provided and installed by Division 08, Division 28 to make electronic connection to equipment provided by Division 08.

iii. Function:
1. Integrate door into county enterprise access control system Avigilon ACM
2. Integrate door into Peregrine control system
3. Upon valid card read, system will allow entry and mask any alerts or door activity to Peregrine control system.
4. Upon Peregrine system valid access, system will allow entry and mask any alerts or door activity to access control system
5. Upon invalid entry or attempted entry access control system will alert Peregrine control operators.

b. Door Type 2 Key Card Access Control (Existing):
i. Rough-in, EMT, Cabling, Installation:
1. Existing: VERIFY conduit drop to door and path for cabling.
1. Cabling Needs:

a. Access Control Composite Cabling (22AWG/2C + 22AWG/4C + 18AWG/4C + 22AWG/6C Shielded)from door device end point location wiring location(s) (Reader, REX, DPR, Strike) to the specific IT Rooms below.
i. Devices in Area E Run IT room 11
ii. Devices in Area A&B Run to IT room 109B
2. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
3. Connect to associated access control controllers

ii. Equipment:
1. Card Reader (Mullion), Rex Motion, DPS. Card Reader to be capable of reading county current card formats & credentials.
2. Electronic Strike provided and installed by Division 08, Division 28 to make electronic connection to equipment provided by Division 08.

iii. Function:
1. Integrate door into county enterprise access control system Avigilon ACM
2. Integrate door into Peregrine control system
3. Upon valid card read, system will allow entry and mask any alerts or door activity to Peregrine control system.
4. Upon Peregrine system valid access, system will allow entry and mask any alerts or door activity to access control system
5. Upon invalid entry or attempted entry access control system will alert Peregrine control operators.

c. Door Type 3 Dual Reader Key Card Access Control:
i. Rough-in, EMT, Cabling, Installation:
1. Dual reader electrical rough in of access control system utilizing ¾" conduit from mechanical, electrical, accessible celling spaces JB, to Reader 1 JB, Reader 2 JB (Readers JB's on both sides of the door), and stubbed into door strike location on door frame for strike and DPS. Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.
2. Standard electrical rough in of access control system utilizing ¾" conduit from mechanical, electrical, accessible celling spaces JB, to Reader JB, REX JB (Above Door or on Ceiling), and stubbed into door strike location on door frame for strike and DPS. Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.

3. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate with masonry contractor on necessary cutting of existing and patch of existing CMU walls. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
4. Cabling Needs:
    a. Access Control Composite Cabling (22AWG/2C + 22AWG/4C + 18AWG/4C + 22AWG/6C Shielded)from door device end point location wiring location(s) (Reader, REX, DPR, Strike) to the specific IT Rooms below.
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
5. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
6. Connect to associated access control controllers

ii. Equipment:
1. (2) Two Card Reader's (Standard), DPS. Card Readers to be capable of reading county current card formats & credentials.
2. Electronic Strike provided and installed by Division 08, Division 28 to make electronic connection to equipment provided by Division 08.

iii. Function:
1. Integrate door into county enterprise access control system Avigilon ACM
2. Integrate door into Peregrine control system
3. Upon valid card read, system will allow entry and mask any alerts or door activity to Peregrine control system.
4. Upon Peregrine system valid access, system will allow entry and mask any alerts or door activity to access control system
5. Upon invalid entry or attempted entry access control system will alert Peregrine control operators.

d. Door Type 4 Key Card & PIN Access Control:
i. Rough-in, EMT, Cabling, Installation:
1. Standard electrical rough in of access control system utilizing ¾" conduit from mechanical, electrical, accessible celling spaces JB, to Reader JB, REX JB (Above Door or on Ceiling), and stubbed into door strike location on door frame for strike and DPS.

Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.

2. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate with masonry contractor on necessary cutting of existing and patch of existing CMU walls. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
3. Cabling Needs:
    a. Access Control Composite Cabling (22AWG/2C + 22AWG/4C + 18AWG/4C + 22AWG/6C Shielded)from door device end point location wiring location(s) (Reader, REX, DPR, Strike) to the specific IT Rooms below.
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
4. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
5. Connect to associated access control controllers

ii. Equipment:
1. Card w/PIN Reader (Standard), Rex Motion, DPS. Card Reader to be capable of reading county current card formats & credentials.
2. Electronic Strike provided and installed by Division 08, Division 28 to make electronic connection to equipment provided by Division 08.

iii. Function:
1. Integrate door into county enterprise access control system Avigilon ACM
2. Integrate door into Peregrine control system
3. No entry without both a valid card and valid PIN
4. Upon valid entry, system will allow entry and mask any alerts or door activity to Peregrine control system.
5. Upon Peregrine system valid access, system will allow entry and mask any alerts or door activity to access control system
6. Upon invalid entry or attempted entry access control system will alert Peregrine control operators.

e. Door Type 5 Detention Control:
i. Rough-in, EMT, Cabling, Installation:
1. Rough in of detention control system utilizing ¾” conduit & ½” conduit (two separate) from mechanical, electrical, accessible

celling space JB, to door strike location on door frame. Add conduit from door frame strike location to DPS on door frame (Generally top). ½" conduit is acceptable from strike location to DPS location. Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.

2. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate with masonry contractor on necessary cutting of existing and patch of existing CMU walls. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
3. Cabling Needs:
    a. 18/6 Shielded from door device end point location to the specific IT Rooms below.
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
4. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
5. Connect to associated PLC controllers

ii. Equipment:
1. Electronic Detention Locks & Detention DPS provided and installed by Division 08, Division 28 to make electronic connection to equipment provided by Division 08.

iii. Function:
1. Integrate door into Peregrine control system
2. Upon pressing the local intercom button, the system will alert Detention Control, upon selection of alert, Peregrine will utilize associated cameras in area around door station. Specific camera associations and changes beyond standard function programming to be determined by the client later. Detention Control has capabilities to allow entry into area.

f. Door Type 6 Detention Control:
i. Rough-in, EMT, Cabling, Installation:
1. Existing: VERIFY conduit drop to door and path for cabling and continuity.
2. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate with masonry contractor on necessary cutting of

existing and patch of existing CMU walls. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.

3. Reutilize cabling, connect to terminal block enclosure near IT room 11. Extend cabling to IT room 11 Racks
4. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
5. Connect to associated PLC controllers

ii. Equipment:

1. Electronic Detention Locks & Detention DPS provided and installed by Division 08, Division 28 to make electronic connection to equipment provided by Division 08.

iii. Function:

1. Integrate door into Peregrine control system
2. Upon pressing the local intercom button, the system will alert Detention Control, upon selection of alert, Peregrine will utilize associated cameras in area around door station. Specific camera associations and changes beyond standard function programming to be determined by the client later. Detention Control has capabilities to allow entry into area.

g. Door Type 7 Detention Control Sliders and Overhead Doors:

i. Rough-in, EMT, Cabling, Installation:

1. Rough in of detention control system utilizing ¾" conduit from mechanical, electrical, accessible celling spaces JB, to manufactures door control box. Add conduit from control box location to DPS on location door frame or rails (DPS connection maybe in control box). ½" conduit is acceptable from control box location to DPS location. Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.
2. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate with masonry contractor on necessary cutting of existing and patch of existing CMU walls. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
3. Cabling Needs:
    a. (2)18/6 Shielded from door device end point location to the specific IT Rooms below.
        i. Devices in Area E Run IT room 11

ii. Devices in Area A&B Run to IT room 109B

4. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
5. 120VAC separate connection to door control box
6. Connect to associated PLC controllers

ii. Equipment:

1. Controlled Slider Door w/ DPS & Overhead Door Controller(s) provided and installed by others, Division 28 to make electronic connection to equipment.
2. (2) Garage Sally Port Rail DPS (Two per garage door)

iii. Function:

1. Integrate door into Peregrine control system
2. Upon pressing the local intercom button, the system will alert Detention Control, upon selection of alert, Peregrine will utilize associated cameras in area around door station. Specific camera associations and changes beyond standard function programming to be determined by the client later. Detention Control has capabilities to allow entry into area.

h. Door Type 8 Detention Monitoring:

i. Rough-in, EMT, Cabling, Installation:

1. Rough in of detention control system utilizing ¾" conduit from mechanical, electrical, accessible celling spaces JB, to DPS on location door frame. Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.
2. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate with masonry contractor on necessary cutting of existing and patch of existing CMU walls. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
3. 18/2 Shielded from door device end point location to the specific IT Rooms below.
    i. Devices in Area E Run IT room 11
    ii. Devices in Area A&B Run to IT room 109B
4. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.

5. Connect to associated PLC controllers

ii. Equipment:
1. DPS

iii. Function:
1. Integrate door into Peregrine control system
2. Upon opening door, the system will alert Detention Control, upon selection of alert, Peregrine will utilize associated cameras in area around door. Specific camera associations and changes beyond standard function programming to be determined by the client later.

i. PLC Control Headend

i. Rough-in, EMT, Cabling, Installation:
1. Installed in Security Contractor provided data rack(s) located in IT Rooms
2. All PLC(s) will utilize terminal block between headend and field device. Terminal block to be installed in the rear of data racks for easy access. Spacing requirements to be determined by security contractor. Rack rear doors must be closeable. Terminal block and wiring look to be clean, neat, and labeled.
3. PLC(s) to be installed in rack on or in rack shelves or drawers Spacing requirements to be determined by security contractor.
4. Cables from field devices to be run to the center of the IT room(s) celling from the celling to the floor to accommodate equipment being installed in date racks
5. Connect to associated security switch

ii. Equipment
1. Security contractor to select PLC to accommodate the size and scope of the project that is expandable for later phases. PLC must be compatible with Modbus TCP The interaction time between system input at the touch screen or workstation and the activation of a field device shall not exceed 0.75 second. The interaction time between field input device and display on the touch screen control panel shall not exceed 0.75 second.
2. Security contractor to select power supplies large enough to accommodate PLC system and detention door control needs. Power supplies to mount inside of rack. Security contractor is responsible for designing and creating the PLC control system.

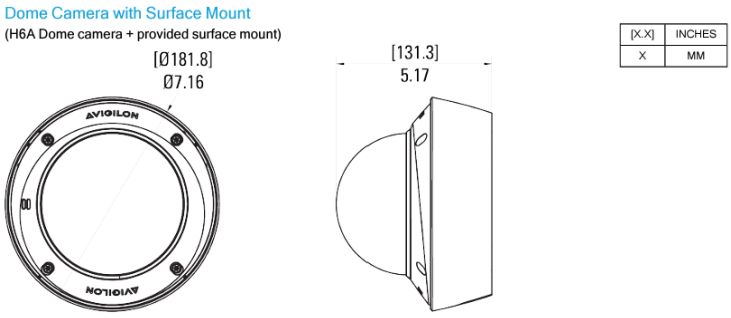
iii. Function:
1. Licensed and programmed manufactures baseline software to accommodate standard detention functionality and other custom programming requested by client, within software's capability.

2. Data storage and schedule back-ups
3. All associated inputs and outputs on project working though the Peregrine JSMI system interface for monitoring and control.

j. Keycard Access Control Headend
   i. Rough-in, EMT, Cabling, Installation:
      1. Installed in Security Contractor provided data rack(s) located in IT rooms.
      2. Security Contractor to determine necessary headend requirements to accommodate the function and equipment rough in at access doors.
      3. All access control panels and power supplies will utilize terminal block between headend and field device. Terminal block to be installed in the rear of data racks for easy access. Spacing requirements to be determined by security contractor. Rack rear doors must be closeable. Terminal block and wiring look to be clean, neat, and labeled.
      4. Access control controller and power supplies to be installed in rack drawer, spacing requirements to be determined by security contractor.
      5. Connect to associated security switch
   ii. Equipment
      1. As needed Power Supply and rack enclosure T2RM7CK1e
      2. As needed Controller AC-MER-CONT-LP1502
      3. As needed Sub-Controller AC-MER-CON-MR52-S3B
   iii. Function:
      1. Tie into county existing Avigilon Unity access control server
      2. All associated inputs and outputs on project working though the Peregrine JSMI system interface for monitoring and control.

12. CAMERA SYSTEM

a. Camera Type 1 Dome Camera No Audio:
   i. Rough-in, EMT, Cabling, Installation:
      1. Rough in of detention control camera utilizing ½” conduit from mechanical, electrical, accessible celling spaces JB, to camera 4” square deep junction box JB (Camera JB) Installed flush with ceiling with 2” spacing from any/all walls. Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.

2. 

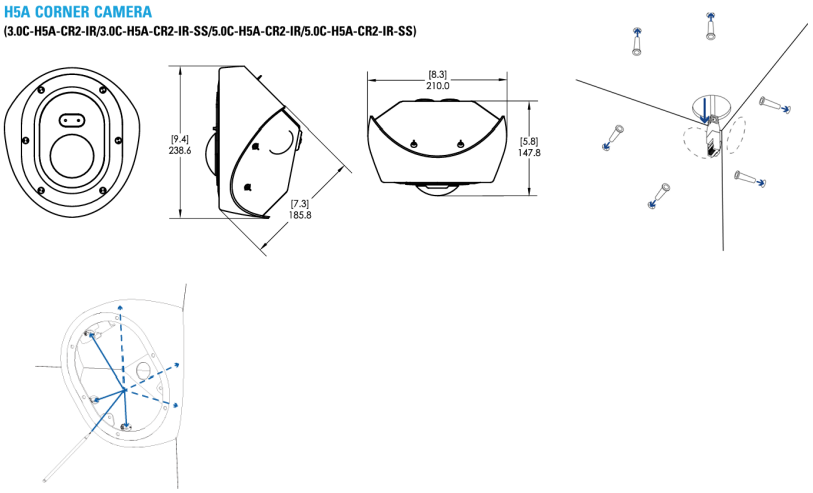
3. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
4. Cabling Needs:
    a. CAT6 Cable from camera JB to the specific IT Rooms below.
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
5. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
6. Connect to associated security switch

ii. Equipment:
1. Camera 2.0C-H6A-DO1-IR

iii. Function:
1. Integrate camera into Peregrine control system
2. Integrate camera into county enterprise camera system Avigilon ACC
3. Physical microphone switch disabled
4. Selection of doors or camera on Peregrine system will display live camera on designated control displays in Detention Control. Specific camera associations and changes beyond standard function programming to be determined by the client later.

b. Camera Type 2 Detention Corner Camera No Audio:

i. Rough-in, EMT, Cabling, Installation:
1. Rough in of detention control camera utilizing ½” conduit from mechanical, electrical, accessible celling spaces JB, to stub-out in ceiling corner, tight to corner as possible and flush to the ceiling. See image below. Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.

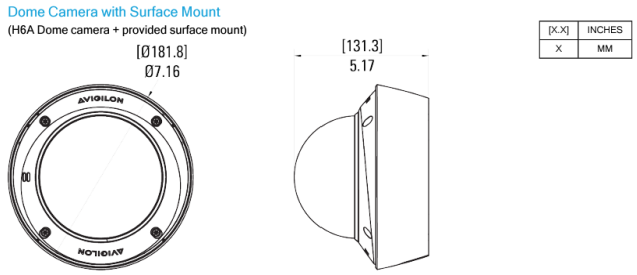


2. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
3. Cabling Needs:
    a. CAT6 Cable from camera corner to the specific IT Rooms below.
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
4. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
5. Connect to associated security switch

ii. Equipment:
1. Camera 5.0C-H5A-CR2-IR-SS

iii. Function:
1. Integrate camera into Peregrine control system
2. Integrate camera into county enterprise camera system Avigilon ACC
3. Physical microphone switch disabled
4. Red indicator light disabled
5. Selection of doors or camera on Peregrine system will display live camera on designated control displays in Detention Control. Specific camera associations and changes beyond standard function programming to be determined by the client later.

c. Camera Type 3 Dome Camera No Audio:
i. Rough-in, EMT, Cabling, Installation:

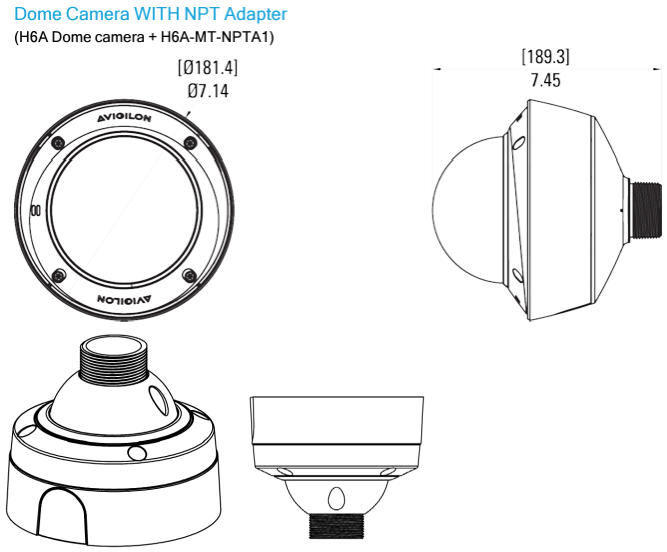
1. Rough in of detention control camera utilizing ½" conduit from mechanical, electrical, accessible celling spaces JB, to camera 4" square deep junction box JB (Camera JB) Installed flush with ceiling with 2" spacing from any/all walls. Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.
2. 

3. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
4. Cabling Needs:
    a. CAT6 Cable from camera JB to the specific IT Rooms below.
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
5. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
6. Connect to associated security switch

ii. Equipment:
1. Camera 4.0C-H6A-DO1-IR

iii. Function:
1. Integrate camera into Peregrine control system
2. Integrate camera into county enterprise camera system Avigilon ACC
3. Physical microphone switch disabled
4. Selection of doors or camera on Peregrine system will display live camera on designated control displays in Detention Control. Specific camera associations and changes beyond standard function programming to be determined by the client later.

d. Camera Type 3a Dome Camera No Audio:
i. Rough-in, EMT, Cabling, Installation:

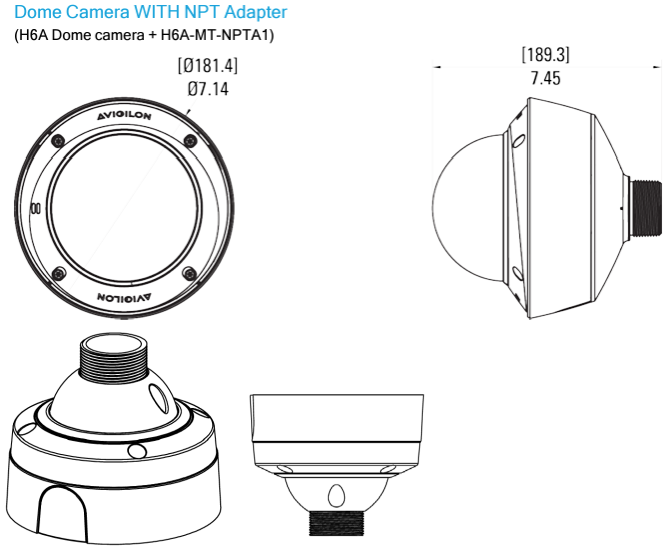
1. Rough in of detention control camera utilizing ½" conduit from mechanical, electrical, accessible celling spaces JB, to camera 4" square deep junction box JB (Camera JB) Installed on ceiling for ceiling pendant camera mount. Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.
2. 

3. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
4. Cabling Needs:
    a. CAT6 Cable from camera JB to the specific IT Rooms below. (Leave cable long at device for pendant mount)
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
5. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
6. Connect to associated security switch

ii. Equipment:
1. Camera 4.0C-H6A-DO1-IR
2. Pendant Mount H6A-MT-NPTA1
3. Ceiling Mount AXIS T91B51
4. (2) Ceiling Pole AXIS T91B52
5. 1.5" NPT Coupling

iii. Function:
1. Integrate camera into Peregrine control system

2. Integrate camera into county enterprise camera system Avigilon ACC
3. Physical microphone switch disabled
4. Selection of doors or camera on Peregrine system will display live camera on designated control displays in Detention Control. Specific camera associations and changes beyond standard function programming to be determined by the client later.

e. Camera Type 3b Dome Camera No Audio:
   i. Rough-in, EMT, Cabling, Installation:
      1. Rough in of detention control camera utilizing ½" conduit from mechanical, electrical, accessible celling spaces JB, to camera 4" square deep junction box JB (Camera JB) Installed on ceiling for ceiling pendant camera mount. Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.
      2. 

      3. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
      4. Cabling Needs:
         a. CAT6 Cable from camera JB to the specific IT Rooms below. (Leave cable long at device for pendant mount)
            i. Devices in Area E Run IT room 11
            ii. Devices in Area A&B Run to IT room 109B
      5. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as

trays and J-hooks to keep cabling off ground and run to destination.

6. Connect to associated security switch

ii. Equipment:

1. Camera 4.0C-H6A-DO1-IR
2. Pendant Mount H6A-MT-NPTA1
3. Ceiling Mount AXIS T91B50
4. 1.5” NPT Coupling

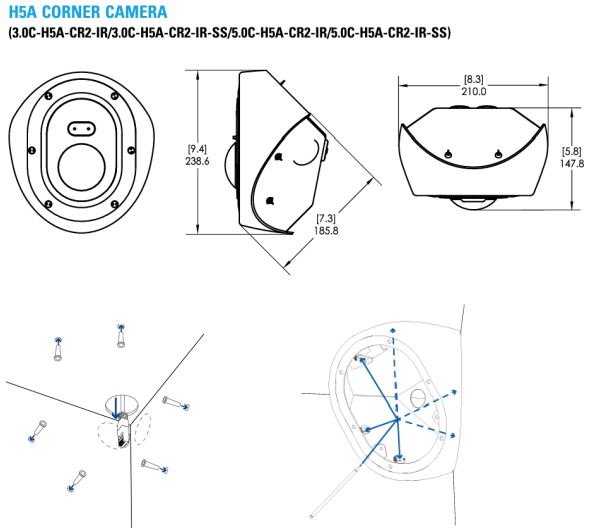
iii. Function:

1. Integrate camera into Peregrine control system
2. Integrate camera into county enterprise camera system Avigilon ACC
3. Physical microphone switch disabled
4. Selection of doors or camera on Peregrine system will display live camera on designated control displays in Detention Control. Specific camera associations and changes beyond standard function programming to be determined by the client later.

f. Camera Type 4 Detention Corner Camera Audio:

i. Rough-in, EMT, Cabling, Installation:

1. Rough in of detention control camera utilizing ½” conduit from mechanical, electrical, accessible celling spaces JB, to stub-out in ceiling corner, tight to corner as possible and flush to the ceiling. See image below. Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.

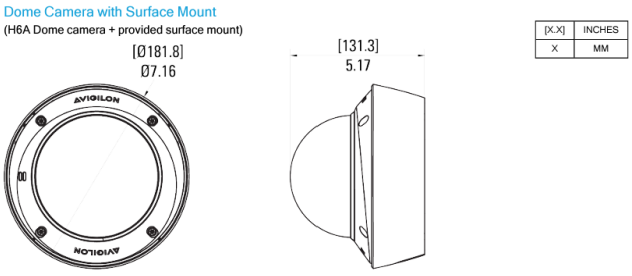


2. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.

3. Cabling Needs:
    a. CAT6 Cable from camera corner to the specific IT Rooms below.
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
4. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
5. Connect to associated security switch

ii. Equipment:
1. Camera 5.0C-H5A-CR2-IR-SS

iii. Function:
1. Integrate camera into Peregrine control system
2. Integrate camera into county enterprise camera system Avigilon ACC
3. Physical microphone switch enabled
4. Red indicator light disabled
5. Selection of doors or camera on Peregrine system will display live camera on designated control displays in Detention Control. Specific camera associations and changes beyond standard function programming to be determined by the client later.

g. Camera Type 5 Dome Camera Audio:
i. Rough-in, EMT, Cabling, Installation:
1. Rough in of detention control camera utilizing ½" conduit from mechanical, electrical, accessible celling spaces JB, to camera 4" square deep junction box JB (Camera JB) Installed flush with ceiling with 2" spacing from any/all walls. Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.
2. 

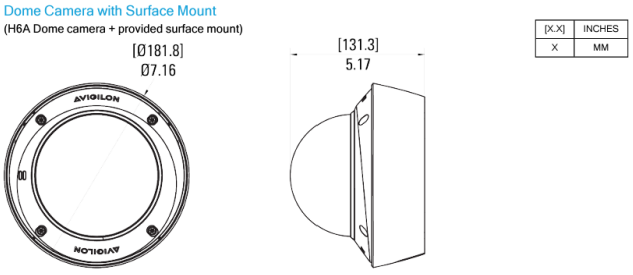
3. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor

to coordinate roughing of Precast wall device locations with precast contractor.

4. Cabling Needs:
    a. CAT6 Cable from camera JB to the specific IT Rooms below.
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
5. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
6. Connect to associated security switch

ii. Equipment:
1. Camera 4.0C-H6A-DO1-IR

iii. Function:
1. Integrate camera into Peregrine control system
2. Integrate camera into county enterprise camera system Avigilon ACC
3. Physical microphone switch enabled
4. Selection of doors or camera on Peregrine system will display live camera on designated control displays in Detention Control. Specific camera associations and changes beyond standard function programming to be determined by the client later.

h. Camera Type 6 Dome Camera Audio:
i. Rough-in, EMT, Cabling, Installation:
1. Rough in of detention control camera utilizing ½" conduit from mechanical, electrical, accessible celling spaces JB, to camera 4" square deep junction box JB (Camera JB) Installed flush with ceiling with 2" spacing from any/all walls. Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.
2. 

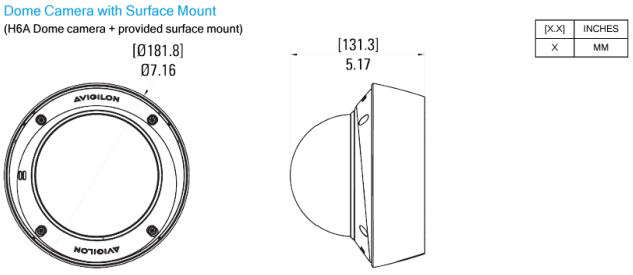
3. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor

to coordinate roughing of Precast wall device locations with precast contractor.

4. Cabling Needs:
    a. CAT6 Cable from camera JB to the specific IT Rooms below.
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
5. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
6. Connect to associated security switch

ii. Equipment:
1. Camera 2.0C-H6A-DO1-IR

iii. Function:
1. Integrate camera into Peregrine control system
2. Integrate camera into county enterprise camera system Avigilon ACC
3. Physical microphone switch enabled
4. Selection of doors or camera on Peregrine system will display live camera on designated control displays in Detention Control. Specific camera associations and changes beyond standard function programming to be determined by the client later.

i. Camera Type 7 Dome Camera Audio:
i. Rough-in, EMT, Cabling, Installation:
1. Rough in of detention control camera utilizing ½" conduit from mechanical, electrical, accessible celling spaces JB, to camera 4" square deep junction box JB (Camera JB) Installed flush with ceiling with 2" spacing from any/all walls. Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.
2. 

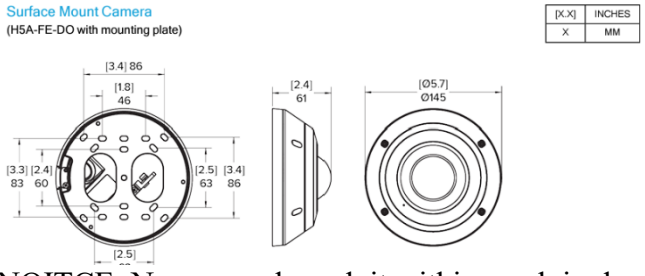
3. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor

to coordinate roughing of Precast wall device locations with precast contractor.

4. Cabling Needs:
    a. CAT6 Cable from camera JB to the specific IT Rooms below.
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
5. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
6. Connect to associated security switch

ii. Equipment:
1. Camera 8.0C-H6A-DO1-IR

iii. Function:
1. Integrate camera into Peregrine control system
2. Integrate camera into county enterprise camera system Avigilon ACC
3. Physical microphone switch enabled
4. Selection of doors or camera on Peregrine system will display live camera on designated control displays in Detention Control. Specific camera associations and changes beyond standard function programming to be determined by the client later.

j. Camera Type 8 360 Camera Audio:
i. Rough-in, EMT, Cabling, Installation:
1. Rough in of detention control camera utilizing ½" conduit from mechanical, electrical, accessible celling spaces JB, to camera 4" square deep junction box JB (Camera JB). Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.
2. 

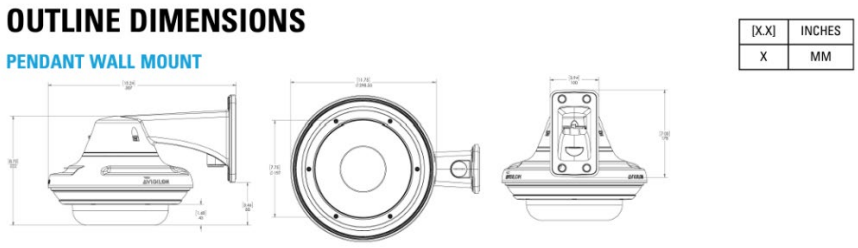
3. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.

4. Cabling Needs:
    a. CAT6 Cable from camera JB to the specific IT Rooms below.
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
5. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
6. Connect to associated security switch

ii. Equipment:
1. Camera 12.0C-H6A-FE-360-DO1-IR

iii. Function:
1. Integrate camera into Peregrine control system
2. Integrate camera into county enterprise camera system Avigilon ACC
3. Physical microphone switch enabled
4. Selection of doors or camera on Peregrine system will display live camera on designated control displays in Detention Control. Specific camera associations and changes beyond standard function programming to be determined by the client later.

k. Camera Type 9 Multi Sensor Camera (10’ Mount Height):
i. Rough-in, EMT, Cabling, Installation:
1. Rough in of detention control camera utilizing ½” conduit from mechanical, electrical, accessible celling spaces JB, to rear of camera. Camera mounted 10’ from floor. Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.



2. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
3. Cabling Needs:
    a. CAT6 Cable from camera to the specific IT Rooms below.

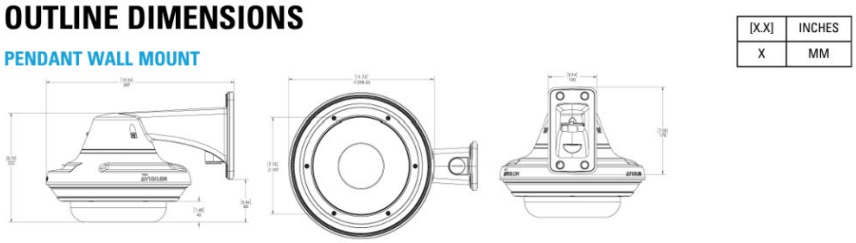
i. Devices in Area E Run IT room 11
ii. Devices in Area A&B Run to IT room 109B

4. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
5. Connect to associated security switch

ii. Equipment:
1. Camera 24C-H5A-3MH
2. Lense Cover H5AMH-DO-COVR1SMOKE
3. IR Ring H4AMH-AD-IRIL1
4. Camera Pendant Adapter H5AMH-AD-PEND1
5. Pendant Wall Mount WLMT-1001
6. Corner Mount CRNMT-1001
7. POE Injector POE60U-1BTE

iii. Function:
1. Integrate camera into Peregrine control system
2. Integrate camera into county enterprise camera system Avigilon ACC
3. Selection of doors or camera on Peregrine system will display live camera on designated control displays in Detention Control. Specific camera associations and changes beyond standard function programming to be determined by the client later.

l. Camera Type 10 Multi Sensor Camera (12’ Mount Height):
i. Rough-in, EMT, Cabling, Installation:
1. Rough in of detention control camera utilizing ½” conduit from mechanical, electrical, accessible celling spaces JB, to rear of camera. Camera mounted 12’ from floor. Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.



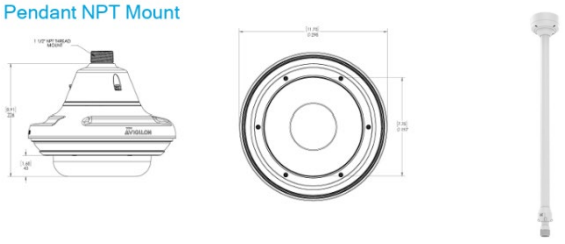
2. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.

3. Cabling Needs:
    a. CAT6 Cable from camera to the specific IT Rooms below.
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
4. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
5. Connect to associated security switch

ii. Equipment:
1. Camera 24C-H5A-3MH
2. Lense Cover H5AMH-DO-COVR1SMOKE
3. IR Ring H4AMH-AD-IRIL1
4. Camera Pendant Adapter H5AMH-AD-PEND1
5. Pendant Wall Mount WLMT-1001
6. Corner Mount CRNMT-1001
7. POE Injector POE60U-1BTE

iii. Function:
1. Integrate camera into Peregrine control system
2. Integrate camera into county enterprise camera system Avigilon ACC
3. Selection of doors or camera on Peregrine system will display live camera on designated control displays in Detention Control. Specific camera associations and changes beyond standard function programming to be determined by the client later.

m. Camera Type 10a Multi Sensor Camera Ceiling Pendant Mount
i. Rough-in, EMT, Cabling, Installation:
1. Rough in of detention control camera utilizing ½" conduit from mechanical, electrical, accessible celling spaces JB, to camera 4" square deep junction box JB (Camera JB) Installed on ceiling for ceiling pendant camera mount. Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.



2. .
3. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor

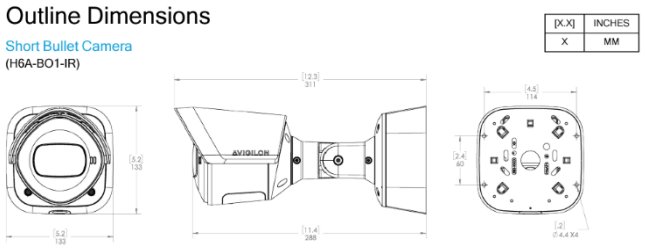
to coordinate roughing of Precast wall device locations with precast contractor.

4. Cabling Needs:
    a. (2 Cables) CAT6 Cable from camera JB to the specific IT Rooms below. (Leave cable long at device for pendant mount)
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
5. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
6. Connect to associated security switch

ii. Equipment:
1. Camera 32C-H5A-4MH
2. Lense Cover H5AMH-DO-COVR1SMOKE
3. IR Ring H4AMH-AD-IRIL1
4. Camera Pendant Adapter H5AMH-AD-PEND1
5. Pendant Ceiling Mount NPTA-1001
6. Axis Pendant AXIS T91B50
7. 1.5” Coupling
8. Audio Kit LE-345
9. Audio Cable CM-AC-AVIO1
10. POE Injector POE60U-1BTE

iii. Function:
1. Integrate camera into Peregrine control system
2. Integrate camera and audio kit into county enterprise camera system Avigilon ACC.
3. Selection of doors or camera on Peregrine system will display live camera on designated control displays in Detention Control. Specific camera associations and changes beyond standard function programming to be determined by the client later.

n. Camera Type 11 Bullet Camera Audio:
i. Rough-in, EMT, Cabling, Installation:
1. Rough in of detention control camera utilizing ½” conduit from mechanical, electrical, accessible celling spaces JB, to rear of camera. Camera mounted 10’ from floor. Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.

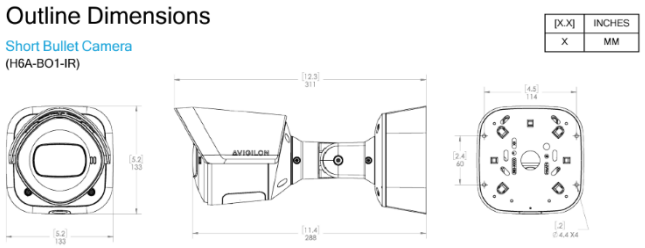
2. 

3. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
4. Cabling Needs:
    a. CAT6 Cable from camera to the specific IT Rooms below.
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
5. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
6. Connect to associated security switch

ii. Equipment:
1. Camera 8.0C-H6A-BO1-IR

iii. Function:
1. Integrate camera into Peregrine control system
2. Integrate camera into county enterprise camera system Avigilon ACC
3. Physical microphone switch enabled
4. Selection of doors or camera on Peregrine system will display live camera on designated control displays in Detention Control. Specific camera associations and changes beyond standard function programming to be determined by the client later.

o. Camera Type 12 Bullet Camera Audio:
i. Rough-in, EMT, Cabling, Installation:
1. Rough in of detention control camera utilizing ½” conduit from mechanical, electrical, accessible celling spaces JB, to rear of camera. Camera mounted 12’ from floor. Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.

2. 

3. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
4. Cabling Needs:
    a. CAT6 Cable from camera to the specific IT Rooms below.
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
5. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
6. Connect to associated security switch

ii. Equipment:
1. Camera 8.0C-H6A-BO1-IR

iii. Function:
1. Integrate camera into Peregrine control system
2. Integrate camera into county enterprise camera system Avigilon ACC
3. Physical microphone switch enabled
4. Selection of doors or camera on Peregrine system will display live camera on designated control displays in Detention Control. Specific camera associations and changes beyond standard function programming to be determined by the client later.

p. Camera Type 13 Multi Sensor Camera Exterior (Rooftop):
i. Rough-in, EMT, Cabling, Installation:
1. Rough in of detention control camera utilizing ½” conduit from mechanical, electrical, accessible celling spaces JB, 4” square deep junction box JB (Camera JB) mounted flush in wall if new or surface exterior rated JB if existing wall, within 6-12” top of wall. Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.

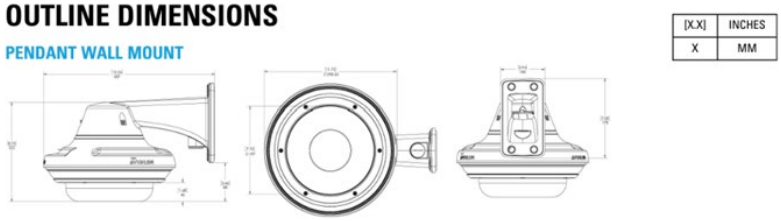
2. 

3. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
4. Cabling Needs:
    a. (2 Cables) CAT6 Cable from camera JB to the specific IT Rooms below. (Leave cable long at device for pendant mount)
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
5. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
6. Connect to associated security switch

ii. Equipment:
1. Camera 15C-H5A-3MH
2. Lense Cover H5AMH-DO-COVR1SMOKE
3. IR Ring H4AMH-AD-IRIL1
4. Camera Pendant Adapter H5AMH-AD-PEND1
5. Pendant Mount NPTA-1001
6. Parapet Mount AXIS T91D62
7. POE Injector POE60U-1BTE
8. Coupling 1.5" Coupling

iii. Function:
1. Integrate camera into Peregrine control system
2. Integrate camera into county enterprise camera system Avigilon ACC
3. Selection of doors or camera on Peregrine system will display live camera on designated control displays in Detention Control. Specific camera associations and changes beyond standard function programming to be determined by the client later.

q. Camera Type 14 Multi Sensor Camera Exterior Pole:
i. Rough-in, EMT, Cabling, Installation:

1. Rough in of detention control camera utilizing 2” underground conduit to pole junction box per electrical site plan. Mounting height of camera location on poles to be coordinated with security contractor and owner. Configuration of how the above EMT needs are met can be at discretion of circumstance or efficiency.
2. 

3. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
4. Cabling Needs:
    a. Fiber Cable from pole JB to the specific IT Rooms below.
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
5. NOTICE: Security Contractor responsible for specifying necessary fiber connections and network equipment needs to accommodate remote pole cameras.
6. 120vac to pole
7. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
8. Connect to associated security switch

ii. Equipment:
1. Camera 32C-H5A-4MH
2. Lense Cover H5AMH-DO-COVR1SMOKE
3. IR Ring H4AMH-AD-IRIL1
4. Camera Pendant Adapter H5AMH-AD-PEND1
5. Pendant Wall Mount WLMT-1001
6. Pole Mount PLMT-1001
7. POE Injector POE60U-1BTE
8. *Necessary fiber cable, grounding, and network equipment to accommodate function remote camera.

iii. Function:
1. Integrate camera into Peregrine control system
2. Integrate camera into county enterprise camera system Avigilon ACC via fiber connections at pole to IT room.

3. Selection of doors or camera on Peregrine system will display live camera on designated control displays in Detention Control. Specific camera associations and changes beyond standard function programming to be determined by the client later.

r. Camera Headend and Servers
   i. Rough-in, EMT, Cabling, Installation:
      1. Installed in Security Contractor provided data rack(s) located in IT Rooms
      2. Cables from field devices to be run to the center of the IT room(s) ceiling, then from the celling to the floor to accommodate equipment being installed in date racks.
      3. Connect to associated security switch
   ii. Equipment
      1. (3) Avigilon NVR6-PRM-PLUS-FORM-H-280TB-NA
      2. Required ACC Unity 8 Camera Licensing, Camera Fail Over Licensing, and all other licenses required to make a jail camera operation functional.
      3. Required Serial Servers and Licensing
   iii. Function:
      1. Licensed and programmed manufactures baseline software to accommodate standard detention functionality and other custom programming requested by client, within software's capability.
      2. Data storage and schedule back-ups
      3. All associated cameras on project working though the Peregrine JSMI system interface for camera call and visual safety.

13. INFRASTRUCTURE

a. Security Router
   i. Rough-in, EMT, Cabling, Installation:
      1. Installed in Security Contractor provided data rack(s) located in room IT 11
      2. WAN: Fiber connection to client production network to SPF 10g fiber port.
      3. LAN: Fiber connection to security network to SPF 10g fiber port.
   ii. Equipment
      1. Security Router FG-120G-BDL-950-12
      2. Required SFP Transceivers
   iii. Function:
      1. Licensed and programmed for 1 years Fortinet security services with a network addressing scheme to follow clients existing

security networks architecture. Further security programming and requests to limit all access to security network except that which is authorized by client and reasonably accomplish by software.
2. Schedule back-ups
3. All associated jail system equipment will be behind router firewall.
4. Fortinet Certified Associate on staff during this project and for the term of the warranty/support options proposed.

b. Security Switches
   i. Rough-in, EMT, Cabling, Installation:
      1. Installed in Security Contractor provided data rack(s) located in IT Rooms
      2. All switches connect through 10g SFP connection ending at security router 10g SFP LAN.
   ii. Equipment
      1. Required Security Switches USW-Pro-48-POE
         a. Max 80% power capacity utilization per switch.
      2. Required SFP Transceivers
      3. Required Port Patch Panels
   iii. Function:
      1. Connected to client existing security switch cloud management account.
      2. Schedule back-ups
      3. All associated jail systems run on these switches
      4. Patch panel labeled to corresponding field device abbreviated names.

c. Security Racks
   i. Rough-in, EMT, Cabling, Installation:
      1. Installed in Security Contractor provided data rack(s) located in IT Rooms
      2. Installed on Castors
      3. Leave 2’ spacing behind unit(s)
   ii. Equipment
      1. (6) Racks AR3140
      2. (12) Power Distribution Unit AP7532
      3. (12) Uninterrupted Power Supplies SU3000RTXLCD2U
      4. Required Rack Shelves
      5. Required Cable Management Looms
      6. Required Cable Management Arms
   iii. Function:

1. Leave 20u's available and concurrently spaced for client production network needs in one rack in each IT room.
2. All associated jail systems installed in these racks

d. Duress Buttons
   i. Rough-in, EMT, Cabling, Installation:
      1. Rough in of duress buttons utilizing ½" conduit from mechanical, electrical, accessible celling spaces JB, to associated 4" junction box with single gang mud ring. Installed behind/under cabinet or desk so button can be hidden under countertop or desk top. Coordinate with owner of final location. Configuration of how above EMT needs are met can be at discretion of circumstance or efficiency.
      2. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
      3. Cabling Needs:
         a. (5) 18/2 from duress button JB to the specific IT Rooms below.
            i. Devices in Area E Run IT room 11
            ii. Devices in Area A&B Run to IT room 109B
      4. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
      5. Connect to associated PLC controllers
   ii. Equipment:
      1. (5) Duress Buttons 269R
   iii. Function:
      1. Integrate door into Peregrine control system
      2. Upon pressing of duress button, the system will alert Detention Control, upon selection of alert, Peregrine will utilize associated cameras in area around area. Specific camera associations and changes beyond standard function programming to be determined by the client later.

e. Water Utility Infrastructure
   i. Rough-in, EMT, Cabling, Installation:
      1. Install 4" square electrical JB near all locations of utility shut off valves or control box for RIB. Flex from RIB to controlled valves.

2. Locations of utility shut off locations may not be on drawings total of 8 unique runs above ceiling with. (Two valves per pod, utility and fire riser) Coordinate fire and plumbing contractor for specifics of controlled devices.
3. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.
4. Cabling Needs:
    a. CAT6 Cable from Utility Control JB to the specific IT Rooms below.
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
5. 120vac maybe required for utility valve operation
6. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
7. Connect utility valve to RIB, from RIB to utility valve
8. Connect to associated PLC terminals

ii. Equipment
1. (8) RIB 24vdc coil with load side TBD

iii. Function:
1. Integrate valve into Peregrine control system
2. Upon operator pressing of potable water valve control button system will shut off water into area.
3. Upon operator pressing of fire riser valve control button system will shut off water into area. Fire system will monitor position of valve for alarming if shut off.

f. Electrical
i. Rough-in, EMT, Cabling, Installation:
1. Pipe ¾” EMT into primary LightLEEDer control relay electrical panel from mechanical, electrical, accessible celling spaces panel.
2. Separate ¾” pipe between all LightLEEDer control relay panels for communications
3. Locations of control relay electrical panels may not all be on drawings.
4. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor

to coordinate roughing of Precast wall device locations with precast contractor.

5. Cabling Needs:
    a. CAT6 Cable from main lighting control panel to the specific IT Rooms below.
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
    b. 18/2 Shielded Serial communication cable between each lighting control panel(s) from main panel
6. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
7. Install LightLEEDer module and gateway in primary control relay panel.
8. Connect all control relay panels
9. Connect to associated Security Switch

ii. Equipment
1. Necessary LightLEEDer Serial Interface
2. Necessary LightLEEDer Gateway Module to Communicate via Modbus TCP.
3.

iii. Function:
1. Integrate electrical panel into Peregrine control system
2. Upon operator pressing of electrical control button system will shut off electrical application in area such as TV's, Entertainment, lighting, or Exhaust fans as determined by owner.

g. Fire
i. Rough-in, EMT, Cabling, Installation:
1. Install 4" square electrical JB near all locations of fire alarm control panel for connection to fire alarm input and output modules.
2. Locations of fire device locations may not be on drawings total of 4 unique devices installed in IT Room 109B Coordinate fire contractor for specifics of controlled devices.
3. NOITCE: No exposed conduit within reach in dayrooms or areas constantly accessible to inmates such as cells. Electrical contractor to coordinate roughing of Precast wall device locations with precast contractor.

4. Cabling Needs:
    a. (4) 18/2 from fire module JB to the specific IT Rooms below.
        i. Devices in Area E Run IT room 11
        ii. Devices in Area A&B Run to IT room 109B
5. Above ceiling cabling to be run neat, clean, 90-degree corners, protected from common ceiling pathways and ceiling access locations. Utilize common cabling support infrastructure such as trays and J-hooks to keep cabling off ground and run to destination.
6. Connect to associated fire alarm input or output module.
7. Connect to associated PLC terminals

ii. Equipment
1. (4) RIB 24vdc coil with load side TBD

iii. Function:
1. Integrate required fire controls into Peregrine control system
2. Upon operator pressing of fire associated control function system will change states on the PLC to meet the controlled outcome fire department and code requirements.

14. GATE ENTRY & GATE EXIT

a. Gate Entry & Exit
i. Rough-in, EMT, Cabling, Installation:
1. NOTICE: Security Contractor responsible for specifying necessary fiber connections, cabling, remote power supplies, and network equipment needs to accommodate gate cameras, reader, intercom and secure gate control.
2. Install 2” underground conduit to as specified in electrical site plan for power and control of the gates.
3. Install dual height gate pedestal and underground conduit to gate controller JB.
4. Cabling Needs:
    a. Intercom Cabling TBD by Security Contractor
    b. Camera Cabling TBD by Security Contractor
    c. Controlled Access TBD by Security Contractor
    d. Fiber Cable from gate JB to the specific IT Rooms below.

ii. Equipment
1. (2) Camera 5.0C-H5M-DO1-IR
2. (2) Harding Detention Grade Intercom
3. (2) Card reader (Standard). Card Reader to be capable of reading county current card formats & credentials.

4. (1) Dual Height Gate Pedestal
5. Necessary power requirements
6. Necessary network and communication requirements.

iii. Function:

1. Upon pressing the intercom button, the system will alert Detention Control upon selection of alert, Peregrine will utilize and associated cameras in area around intercom station. Specific camera associations and changes beyond standard function programming to be determined by the client later. Detention Control has capabilities to allow entry into area.
2. Integrate gate into county enterprise access control system Avigilon ACM
3. Integrate gate into Peregrine control system
4. Upon valid card read, system will allow entry and mask any alerts or door activity to Peregrine control system.
5. Upon Peregrine system valid access, system will allow entry and mask any alerts or door activity to access control system
6. Upon invalid entry or attempted entry access control system will alert Peregrine control operators.

END OF SECITON

SECTION 323100 – FENCES AND GATES

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 other Division 0 and 1 Specification Sections apply to the Work of this Section.

1.2 SUMMARY

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

1. Provide all labor, materials, and equipment required to construct the chain link fencing, and the gate(s) system as indicated on the drawings or specified herein. Said work shall include any incidentals required to provide a finished job.

1.3 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 32 Section “Chain Link Cantilever Slide Gates.”

1.4 SUBMITTALS

A. Shop Drawings: Submit shop drawings or catalog cuts for approval, prior to manufacturing, describing and detailing typical line posts, terminal posts, gate, fabric, materials, hardware assemblies, and all proposed fence/gate alignment sections.

B. Certificates of Conformance or Compliance: Submit certificates from the manufacturer attesting that all materials meet requirements specified herein.

1.5 DELIVERY, STORAGE AND PROTECTION

A. Deliver materials to the site in an undamaged condition.

B. Carefully store materials off the ground to provide proper protection against oxidation caused by ground contact.

1. 6 FIELD VERIFICATION

A. Dimensions on all Drawings are approximate only. Contractor shall field verify all dimensions.

1.7 QUALITY ASSURANCE

A. The Bidder/Contractor must be experienced in fencing installations.

B. Thoroughly inspect the site(s) related work, and the Owner supplied material (where applicable). Notify the Owner before bidding, of any conditions adversely affecting the performance of fencing installation.

C. Provide warranty stating that the fencing is secure and stable, tight, corrosion-free, in proper alignment, complete in detail and finish, and free of hazardous conditions. Any defects that develop within one year from the date of physical completion shall be replaced at the expense of the Contractor.

D. Standard Specifications: All work shall conform to all applicable requirements of the following Specifications, whether specifically referred to or not, except as specifically modified herein:

1. ASTM Committee F-14 Standards of Fences (latest edition).

2. Perform all shop and field welding in accordance with the pertinent recommendations of the American Welding Society.

3. Pipe ASTM A-53.

E. Single-Source Responsibility: Obtain chain link fences and gates as complete units, including necessary erection accessories, fittings, and fastenings from a single source or manufacturer.

PART 2 PRODUCTS

2.1 GENERAL

A. All piping for fence and gates shall be Schedule 40, hot-dipped galvanized steel, or approved equal, for size, finish, material composition, strength, appearance, performance and ease of maintainability.

B. Galvanizing shall be in accordance with ASTM F 668-88. All fence fittings shall comply with ASTM F626-89a.

2.2 CHAIN LINK FENCE FABRIC

A. Chain link fence fabric shall be constructed of woven 9-gauge core size for all site perimeter fencing .

B. All fabric shall be W & M steel wire as specified on plans and details, in a continuous 2-inch mesh. Mesh shall be as specified on plans and details, with knuckled top and bottom selvage.

C. Fabric shall not be hot-dipped galvanized after weaving, per ASTM A-392. Weight of the coating shall be 1.2 oz. per square foot of actual surface. Coating shall be smooth, of uniform thickness, and free of dross, uncoated spots and adhered particles of foreign material.

D. Height of fabric shall be as shown on drawings. Lower edge of fabric shall be no greater than 1-1/2" above concrete mow strip or finished grade as specified on plans and details.

2.3 PERIMETER CHAIN LINK FENCING

A. All system components shall be galvanized steel.

B. Sizes shall be as specified in the following table for perimeter fencing.

TYPE		8' HT.
Terminal/ Corner Posts	"48" D"	
Line Posts	2-3/8" O.D.	schedule 40
Top Rails	1-5/8" O.D.	schedule 40
Intermediate Rails	1-5/8" O.D.	schedule 40
Bottom Rails	1-5/8" O.D.	schedule 40
Post Footing Size for Terminal Corner Posts	15" W 36" D	
Post Footing Size for Line Posts	15" W 36" D	
Fabric, Mesh Size	2"	
Fabric Finished (2)	9-gauge	

(2) All chain link fabric shall be galvanized before weaving.

2.4 GATES AND POSTS

A. Gateposts, frames and hardware shall be hot-dipped galvanized, as noted, for framework.

B. All fittings shall be galvanized as specified in Section 2.01.

C. Gate frames shall be galvanized after welding or painted with “Galvicon” or other zinc enriched paint, or approved equal.

D. Gate fabric shall match fencing fabric.

E. Gates shall maintain a gap no greater than 2” between gateposts and frames or ground.

F. Gate posts shall be 4” O.D. minimum, schedule 40 steel pipes (or larger, depending upon the size of the gate opening).

G. Gate frames shall be 1-7/8” O.D. steel pipe with joints notched and welded to form a rigid frame. Welds shall be coated with cold galvanized coating. Frames shall be filled with same fabric as fence and fastened in the frame by means of tension bars and tension bands at 1’ O.C.

H. Diagonal Bracing shall be 3/8” O.D. adjustable truss rod to ensure frame rigidity without sag or twist.

I. Hinges shall be pressed steel to suit gate size, non-lift-off type, offset to permit 180-degree gate opening. Provide 2 hinges for each leaf. Drill, tap and set screw or weld to frame or post to prevent rotation. Hinges shall be Bulldog Industrial Hinge, or approved equal.

J. Single Gate Latch: Provide heavy-duty gate fork latch of correct size malleable iron to permit operation from either side of gate, with padlock eye as integral part of latch.

2.5 FITTINGS

A. Fittings shall be hot-dipped galvanized pressed steel in accordance with ASTM F 626-89a.

B. All fittings shall be industrial quality.

2.6 ACCESSORIES

A. Post tops shall be pressed steel and designed as a weather tight closure cap for tubular posts.

B. Tension bars shall be on one piece lengths equal to full height of fabric with a minimum cross section of 3/16" x ¾". Provide a tension bar for each gate, end post, corner, and pull posts.

C. Tension Bar Bands (vinyl or powder coated), shall be pressed steel per ASTM F626-89a, spaced not over 12" O.C. to secure tension bars to end, corner, pull and gate posts.

D. Tension Wire: Contractor shall provide a No. 7 W & M gauge galvanized high carbon coiled tension wire (when bottom rail is not specified) stretched along the bottom of fabric and fastened to the fabric at intervals of not more than two feet using steel hog rings. Tension wire shall be attached with brace band, and nut and bolt. Tension wire shall be terminated around the bolt to itself with a minimum of three complete wraps.

E. Wire Ties shall be as follows: 6-gauge aluminum wire ties and 9-gauge hog rings on backstops back panels with standard 6-gauge fabric below 10' elsewhere, 6-gauge aluminum wire ties on all other backstop panels, wing fences and perimeter fencing (with standard 6-gauge fabric below 10 feet or 9-gauge fabric in all other places), or as otherwise specified on plans.

F. Concertina Wire. Provide galvanized steel long blade, 600mm coil diameter, 0.6 mm blade thickness double coil system concertina wire.

2.7 CONCRETE FOOTINGS

A. Refer to section 2.03 above for dimensions of all concrete post footings.

B. Concrete and mix design for post footings shall conform to the specifications for exterior concrete.

C. Concrete footings shall be neatly and evenly crowned slightly above finished grades and all concrete shall be cleaned from all posts.

PART 3 EXECUTION

3. 1 SITE PREPARATION

A. On-site conference: Do not work until a site meeting with the Owner is held.

B. Provide all temporary barricades, enclosures, and protection of adjacent property and existing work. These are to be in place before operations are started. Coordinate this work with other work and trades. Complete clearing and site preparation work is required prior to excavation.

3.2 FENCE CONSTRUCTION

A. Posts

1. Auger holes for post footings in firm, undisturbed or compacted soil. Holes for new line post footings shall be sized as shown on plans and details. Holes for terminal posts and gateposts shall be sized as shown on plans and details.

2. Over excavate hole depths to 6” deeper than post bottoms.

3. Place concrete around posts in a continuous placement, tamp for consolidation, checking each post for vertical and top alignment. Support posts plumb until concrete has cured. Set and secure keepers, stops, sleeves, and other accessories into concrete as required.

4. Tops of post footings shall be flush with finished grade, troweled and sloped outward to drain. Top of footing shall appear true and circular in shape with post at center of circle.

5. Posts shall be 10 feet O.C. maximum.

B. Rails

1. Top rail shall be securely fastened to terminal posts and pass through tops of line post fittings, forming a continuous rail for the full length of fence. Top rail shall be furnished in lengths approximately 21 feet long with standard hot dip galvanized steel expansion couplings not less than 6” in length. Lengths less than 10 feet shall not be used adjacent to terminal posts.

2. Intermediate and bottom (when specified) rails shall conform to the same specification as top rail and be joined at line posts with double-end socket clamps or brace bands and rail end, with one inverted to maintain smooth line.

C. Brace Assemblies

1. All corner, terminal, and gate posts shall be furnished with complete brace assembly, including brace of same material and finish as top rail, and adjustable tightener for 3/8” adjustable truss rod.

2. Corner and terminal posts shall have two brace assemblies, one in each direction.

3. The diagonal 3/8” adjustable truss rod shall be attached to the first ensuing line post.

4. Install braces so that posts are plumb and true when diagonal rod is under proper tension.

5. No truss rod is required if the intermediate rail is continuous.

D. Fabric

1. Pull fabric taut and tie to posts and rails.

2. Install fabric on interior or playing side of fences and anchor to framework so that the fabric remains in tension after pulling force is released.

3. Lower edge of fabric shall be set level with finished grade (1-1/2” above grade, typ.), except as specified on plans and details.

4. Provide galvanized steel long blade, 600mm coil diameter, 0.6 mm blade thickness double coil system concertina wire.

E. Wire Ties

1. Tie fabric to line posts, rails, and braces with 9-gauge aluminum wire ties, space at 12” O.C. (typ.).

F. Tension Bars

1. Fabric shall be attached to the terminal posts by means of single piece tension bars. Thread through fabric and secure to posts with metal bands spaced not over 12” O.C. (typ.).

G. Welding

1. All field welds shall be fully filled, ground flush and smooth, and cold galvanized by brushing on “Galvicon”, or approved paint for vinyl fencing. Use silver paint (two coats required).

3. 3 GATES

A. Install gates as shown on the Details and Drawings. Openings between frame or gate members shall not exceed 2”.

B. Gaps between bottom rail & finish grade shall not exceed 1-1/2”.

C. Install gates plumb, level, and secure for full opening without interference. Adjust hardware for smooth operation and lubricate where necessary. After Landscape Architect’s approval of operation, drill, tap, and setscrew or spot-weld all hinges and latch hardware to prevent rotation.

D. Set gateposts same as terminal posts.

3.4 CLEANUP

A. Job site shall be cleared of all excess material (concrete, wire, rail, pipe, etc.).

END OF SECTION

SECTION 32 31 01 – CHAIN LINK CANTILEVER SLIDE GATES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The Work of this Section applies to the Drawings, Specifications, and provisions of the Contract.

1.02 SUMMARY

A. This Section includes chain link cantilever slide gates with enclosed aluminum track and hardware.

1.03 RELATED SECTIONS

A. Sections that are related to this Section include, but are not limited to, the following:

1. Division 32 Section “Paving and Surfacing.”

2. Division 3 Section “Cast-in-Place Concrete.”

3. Division 4 Section “Unit Masonry.”

1.04 SUBMITTALS

A. Changes in specifications may not be made after the bid date.

B. Shop Drawings: Layout of fences and gates with dimensions, details, and finishes of components, accessories, and post foundations.

C. Product Data: Manufacturer’s catalog cuts indicating material compliance and specified options.

1.05 SPECIAL WARRANTY

A. Provide manufacturer's standard limited warranty covering cantilever slide gate and truck assembly against failure resulting from normal use for period of five (5) years from date of purchase. Failure is defined as any defect in manufacturing that prevents the gate from operating in a normal manner.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Products from qualified manufacturers having a minimum of five (5) years experience manufacturing internal roller cantilever slide gate will be acceptable by the Architect as equal, if approved in writing, ten days prior to bidding, and if they meet all of the following specifications for design, size gauge of metal parts and fabrication.

B. Obtain chain link fences and gates, including accessories, fittings and fastenings, from a single source.

C. Gates shall meet ASTM F1184-05 Type 2 Class criteria.

2.02 CHAIN LINK CANTILEVER SLIDE GATES

A. Gate frames: Fabricate chain link cantilever gates in accordance with ASTM F 1184, Type II, Class 2, using 2 inch (50mm) square aluminum members, ASTM B 221, alloy and temper 6063-T6, weighing 0.94 lb/ft . Weld members together forming rigid one-piece frame integral with top track (no substitution). Provide two (2) truck assemblies for each gate leaf, except as indicated for gates larger than 30'. Frame sizes over 27' in length shall be shipped in two (2) parts and field spliced with special attachments provided by the manufacturer.

Gate Leaf Sizes	Cantilever Support (Overhang)
6 ft to 10 ft	6'-6"
11 ft to 14 ft	7'-6"
15 ft to 22 ft	10'-0"

For gate leaf size 23' to 30', weld an additional 2" square lateral support rail adjacent to top horizontal rail. Bottom rail shall consist of 2" x 4" aluminum member weighing 1.71 lb/ft.

Gate Leaf Sizes	Cantilever Support (Overhang)
23 ft to 30 ft	12'-0"

For gate leaf sizes 31' to 40', weld two (2) top racks/rails together forming a dual enclosed track. Provide two (2) truck assemblies for each track for each gate leaf, total

four (4) truck assemblies. Bottom rail shall consist of 2" x 4" aluminum member weighing 1.71 lb/ ft.

Gate Leaf Sizes	Cantilever Support (Overhang)
31 ft to 35 ft	13'-6"
36 ft to 40 ft	16'-0"

For gate leaf sizes 41' to 50', fabricate 24" wide rigid box frame truss. Truss shall consist of dual side frames, constructed similar to standard single leaf gates, separated by square cross members and diagonal truss rod bridging. Dual side frames shall each contain top track/rail to provide support for truss from both sides. Provide four (4) trucks for each track, total eight (8) for each gate leaf. Weld steel plate between top of support posts to maintain truck assemblies in alignment with tracks.

Gate Leaf Sizes	Cantilever Support (Overhang)
41 ft to 50 ft	Custom engineered by manufacturer

B. Gate Frame Finish: galvanized

C. Bracing: Provide diagonal adjustable length truss rods of 3/8" galvanized steel, in each panel of gate frames.

D. Top track/rail: Enclosed combination of one-piece track and rail, aluminum extrusion with weight of 3.72 lb/ft. Track to withstand reaction load of 2,000lbs.

E. Truck assembly: Swivel type, zinc die cast, with four (4) sealed lubricant ballbearing rollers, two (2) inches in diameter by 9/16" in width, and two (2) side rolling wheels to ensure truck alignment in track (no substitution). Mount trucks on post brackets using 7/8" diameter ball bolts with 1/2" shank. Truck assembly to withstand same reaction load as track, 2,000lbs.

F. Provide gate hangers, latches, brackets, guide assemblies, and stops: Malleable iron or steel, galvanized after fabrication. Provide positive latch with provisions for padlocking. (These fittings do not receive PVC coating).

G. Bottom guide wheel assemblies: Each assembly shall consist of two, 3" diameter rubber wheels, straddling bottom horizontal gate rail, allowing adjustment to maintain gate frame plumb and in proper alignment. Attach one assembly to each guide post. (These fittings do not receive PVC coating).

H. Gates posts:

1. For gates under 31'-0": galvanized steel 4" OD schedule 40 pipe, ASTM F 1083, weighing 9.1 lb/ft. Provide one (1) latch post and two (2) support posts for single slide gates and four (4) support posts for double slide gates.

2. For gates 31’-0” or larger: two (2) pairs of support posts for each leaf (dual) 4” OD schedule 40 pipe, ASTM F 1083, weighing 9.1 lb/ft each. Posts connected by welding 6” x 3/8” plate between posts as shown on drawings. Also one 4” latch post.

I. Provide rolo latch where two (2) gates slide together.

J. Provide electric motor operator. Operator shall be connected to the control booth for opening and closing of the gate.

K. Concertina Wire: Provide galvanized steel long blade, 600mm coil diameter, 0.6 mm blade thickness double coil system concertina wire.

2.03 SETTING MATERIALS

A. Concrete: Minimum 28 day compressive strength of 4,000 psi.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify areas to receive fencing are competed to final grades and elevations.

B. Verify areas to assure sufficient space to receive gate in open position (gate and overhang).

C. Ensure property lines and legal boundaries of work are clearly established.

3.02 CHAIN LINK CANTILEVER SLIDE GATE FRAMING INSTALLATION

A. Install gate posts in accordance with manufacturer’s instructions.

B. Concrete set gate posts: Drill holes in firm, undisturbed or compacted soil. Holes shall have diameter four (4) times greater than outside dimension of post, and depths approximately 6” deeper than post bottom. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. Set pot bottom 36” below surface when in firm, undisturbed soil. Place concrete around posts in a continuous pour, tamp for consolidation. Trowel finish around post and slope to direct water away from posts. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.

3.03 GATE INSTALLATION

A. Install gates plumb, lever, and secure for full opening without interference.

B. Attach hardware by means which will prevent unauthorized removal.

C. Adjust hardware for smooth operation.

3.04 CLEANUP

A. Clean up debris and unused material, and remove from the site.

END OF SECTION 32 31 01

SECTION 328400 - LANDSCAPE IRRIGATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
   1. Pipe and fittings, valves, sprinkler heads, accessories, and connections to water source.
   2. Control system.
B. System Description
   1. Electric solenoid controlled automatic underground irrigation system.
C. Related Sections
   1. Division 16 Sections for electrical power materials and installations.

1.2 DEFINITIONS

A. Pipe sizes used in this Section are nominal pipe size (NPS) in inches. Tube sizes are Standard size in inches.
B. Pressure Piping Main Line: Piping downstream from supply piping to and including control valves. Piping is under irrigation system pressure. Piping in this category includes backflow preventers.
C. Circuit Piping Lateral Lines: Piping downstream from control valves to irrigation system sprinklers. Piping is under pressure (less than pressure piping) during flow.
D. Control Valve: Automatic (electrically operated) valve for control water flow to irrigation system zone.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Location of Sprinklers and Devices: Design location is approximate. Make minor adjustments necessary to avoid plantings and obstructions such as signs and light standards.
B. Minimum Water Coverage: Not less than:
   1. Turf Areas: 100 percent.
   2. Other Planting Areas: 100 percent.
C. All flow velocities, within the entire irrigation system, shall not exceed 5 feet per second.

1.4 SUBMITTALS

A. Product data including pressure rating, rated capacity, settings, and electrical data of selected models for the following:
   1. Backflow preventers, including test equipment.
   2. Valves, including general-duty, underground, automatic control, and quick-coupler types, isolation and valve boxes.
   3. Sprinklers.
   4. Irrigation Controller, including controller wiring diagrams.
   5. Wiring.
   6. Irrigation system record drawings.
   7. Pipe fittings.

B. Wiring diagrams for electrical controllers, valves, and devices. Valve numbers shall reflect station numbers within the controller and shall be noted on the as-builts.

C. Maintenance data for inclusion in "Operating and Maintenance Manual" specified in Division 1 Section "Contract Closeout" for the following:

1. Seasonal activities of start-up, shut-down and winterization, including blow-out operation of sprinkler system with compressed air.
2. Backflow preventers, including instructions for testing.
3. Automatic control valves.
4. Sprinklers.
5. Controllers.
6. Irrigation system record drawings.

1.5 QUALITY ASSURANCE

A. Comply with requirements of utility supplying water for prevention of backflow and backsiphonage. Comply with appropriated water rights.

B. Installer Qualifications: **(To be provided at time of bid opening):** Engage an experienced Installer with a minimum of five years experience and who has completed irrigation systems similar in material, design, and extent to that indicated for Projects that have resulted in construction with a record of successful in-service performance.

1. Professional Membership: Installer shall be a member in good standing of the Irrigation Association.
2. Experience: Company specializing in performing the work of this section with minimum five (5) years of documented experience and experience in the installation of a minimum of three (3) projects of similar nature and scope in addition to requirements in Division 01 Section "Quality Requirements.". The installer shall have at least one supervisor responsible for the project who is a Certified Irrigation Contractor as recognized by the Irrigation Association. The installer may be asked to provide references for verification of experience and quality of service.
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time English speaking supervisor on the Project site when irrigation work is in progress.
4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Irrigation Association:
   a. Certified Irrigation Technician.
   b. Certified Landscape Irrigation Auditor.
   c. Certified Irrigation Contractor.
   d. Certified Irrigation Water Manager.

C. Listing/Approval Stamp, Label, or Other Marking: On equipment, specialties, and accessories made to specified standards.

D. Listing and Labeling: Equipment, specialties, and accessories that are listed and labeled.
1. The Terms "Listed" and "Labeled": As defined in "National Electrical Code," Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

E. Product Options: Irrigation system piping, specialties, and accessories are based on specific types, manufacturers, and models indicated. Components with equal performance characteristics produced by other manufacturers may be considered, provided deviations in dimensions, operation, and other characteristics do not change design concept or intended performance as judged by the Landscape Architect. The burden of proof of product equality is on the Contractor. Any substitutions must be approved by the Architect in writing prior to installation per section 1.10.

1.6 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Verify that irrigation system piping may be installed in compliance with original design and referenced standards. Verify that pump and domestic supply perform as specified.

1.7 SEQUENCING AND SCHEDULING

A. Maintain uninterrupted water service to building during normal working hours. Arrange for temporary water shutoff with Owner.
B. Maintain Uninterrupted existing irrigation system during construction. Arrange for temporary water shutoff with owner. Provide alternate water source for irrigation if water is to be shut off for more than three (3) days.
C. Coordinate irrigation systems work with landscape work specified in “Plants” Section ".

1.8 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below. Package them with protective covering for storage and label clearly describing contents.
   1. Quick Couplers: Furnish quantity of units equal to 2 percent of amount of each size installed.
   2. Sprinklers: Furnish quantity of units equal to 5 percent of amount of each type installed.
   3. Valve Keys: Furnish quantity of tee-handle units equal to 2 percent of amount of each type key-operated, control valve installed.
   4. Quick-Coupler Hose Swivels: Furnish one for each quick coupler installed.
   5. Quick-Coupler Operating Keys: Furnish one for each quick coupler installed.

1.9 IRRIGATION RECORD DRAWINGS

A. Record accurately, on one set of black and white prints of the site plan **(to be on site at all times during installation),** all installed work including both pressure and non-pressure lines and pipe sizes.
B. Upon completion of each increment of work, transfer all such information and dimensions to the print. The dimensions shall be recorded in a legible and workmanlike manner. Maintain as-built drawings on site at all times. Make all notes on drawing in pencil (no ball point pen). When the work has been completed, transfer all information from the field record print to a set of reproducible drawings.
C. Dimension from two permanent points of reference (buildings, monuments, sidewalks, curbs, pavements, etc.). Locations shown on as-built drawings shall be kept day to day as the project is being installed. All dimension text noted on drawings shall be 1/8 inch in size (minimum).
D. Show locations and depths of the following items:
   1. Point of connection, including Flow Sensor Assembly
   2. Routing of sprinkler pressure lines
   3. Gate valves
   4. Sprinkler control valves
   5. Quick coupling valves
   6. Routing of control wires, including Flow Sensor Assembly wires
   7. Sprinkler heads
   8. Other related equipment

1.10 SUBSTITUTIONS

A. Coordinate substitutions per Division One.
B. Substitutions to the specified equipment will be permitted with the express written approval of the Landscape Architect. Substitutions will be approved only when the substituted item is equivalent or better in quality and performance than the item originally specified. The final determination for "equivalents" rests with the Landscape Architect. Their decision shall be final and binding.

1.11 WARRANTY

A. Warranty system against defects of installation and material for a period of 1 year after final completion of the irrigation system. Guarantee shall also cover repair or damage to any part of the premises resulting from leaks or other defects in material, equipment and workmanship to the satisfaction of the Architect. Repairs, if required, shall be done promptly upon notification by the Owner, and, at no cost to the Owner.
B. As part of the warranty, the Contractor shall be responsible for deactivating and winterizing the system prior to the onset of the freezing season and for reactivating the system at the onset of the spring growing season; each event must be accomplished once during the warranty period. In the event the system is completed in a season when it will not be in use, the Contractor shall winterize the system upon completion of testing (and approval by the Landscape Architect) and reactivate the system in the spring. The Contractor shall SUBMIT a letter to the Landscape Architect certifying that the system was winterized and drained and indicate the date such action was accomplished. The Contractor shall be responsible for any damage resulting from failure to comply. Contractor shall instruct and demonstrate winterization and startup techniques for Owner.

PART 2 - PRODUCTS

2.1 SUMMARY

A. All materials used throughout the system shall be new, unused, and in perfect condition. Refer to the irrigation materials legend, notes, detail drawings and these specifications for specific equipment to be used. Equipment or materials installed or furnished without prior approval of the Architect may be rejected and the Contractor required to remove such materials from the site at his own expense.
B. Substitutions: Under provisions of Division 1 and 328400, paragraph 1.10.

2.2 BRASS PIPE AND ACCESSORIES

A. Pipe: ASTM B43, Schedule 40; domestic manufacture
B. Fittings: Medium brass, screwed, 125-pound class.

2.3 PLASTIC PIPE AND ACCESSORIES

A. Pipe
   1. Pipe walls shall be uniform, smooth, glossy, and free of interior or exterior extrusion marks; pre-belled or straight to receive solvent-weld couplings; 20 foot standard lengths.
   2. Pipe shall be marked with manufacturer's name, class of pipe, NSF seal, and date/shift of manufacturing run.
   3. PVC Pipe: ASTM D1785, D2241
B. Fittings: PVC - ASTM D2464, D2466.

C. Irrigation System Plastic Pipe
1. Mainline: 3-inch pipe and larger: PVC class 200 with SDR21 rubber gasket fittings. 2 ½ inch pipe and smaller: PVC schedule 40 pipe with SDR21 solvent weld fittings.
2. Laterals: 3-inch pipe and larger: PVC class 200 with SDR21 rubber gasket fittings. 2 ½ inch pipe and smaller: PVC schedule 40 pipe with SDR21 solvent weld fittings.
3. Sleeving: ASTM D 1785, schedule 40, polyvinyl chloride (PVC) plastic pipe; ASTM D 2466, Schedule 40, PVC plastic, socket-type fittings; and solvent-cemented joints.
4. Refer to Part 3 Article "Piping Applications" for identification of systems where pipe and tube materials specified below are used.
5. Polyvinyl Chloride (PVC) Plastic Pipe: ASTM D 1785; PVC 1120, SDR 21, 200 psig (1380 kPa) minimum pressure rating, with plain ends. Schedule 40 upstream from controls, as noted on the drawings; schedule 40 downstream.

D. Pipe and Tube Fittings
1. Refer to Part 3 Article "Piping Applications" for identification of systems where pipe and tube fitting materials specified below are used.
2. Polyvinyl Chloride (PVC) Plastic Pipe Fittings: ASTM D 2464, Schedule 80, threaded.
3. Polyvinyl Chloride (PVC) Plastic Pipe Fittings: ASTM D 2467, Schedule 40, socket-type.
4. “Leemco” Push-on joint Ductile Fittings or approved equal: for all pipes 2 ½” and larger.
5. Dielectric Fittings: Assembly or fitting with insulating material isolating joined dissimilar metals to prevent galvanic action and stop corrosion. These devices are a combination of copper alloy and ferrous metal; threaded- and solder-end types, matching piping system materials.
a. Dielectric Unions: Factory-fabricated, union assembly, designed for 250 psig (1725 kPa) minimum working pressure at 180 deg F (82 deg C). Include insulating material isolating dissimilar metals and ends with inside threads according to ASME B1.20.1.
b. Transition Fittings: Manufactured assembly or fitting, with pressure rating at least equal to that of system and with ends.

2.4 JOINING MATERIALS

A. Solvent Cement: ASTM F 656 primer and ASTM D 2564 solvent cement in color other than orange.

2.5 VALVES

A. General: Valves are for general-duty and underground applications. Refer to "Valve Applications" Article for locations of various valve types specified in this Article. Refer to "Control Valves" Article for control valves and accessories.

2.6 CONTROL VALVES

A. Description: Manufacturer's standard control valves for circuits, of type and size indicated on Drawing, and as follows:
1. Angle Valves: Bronze construction, non-rising stem, inside screw threaded ends and as noted on the Drawings.
2. Automatic Control Valves: Diaphragm-type, normally closed, with manual flow adjustment, and operated by 24-volt-a.c. solenoid.

3. Quick-Couplers: Factory-fabricated, 2-piece assembly. Include coupler water-seal valve; removable upper body with spring-loaded or weighted, rubber-covered cap; hose swivel with ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet; and operating key.
    a. Locking Top : Include vandal-resistant, locking feature with 2 matching keys.
4. Drain Valve: As noted on the Drawings.
5. Isolation Gate Valves: 150# gate valve, epoxy-coated, ductile iron, resilient wedge valve with non-rising stem and inside screw with threaded ends. Mechanical joint or push-on. "Waterous", "American Flow Control" or "Nibco" gate valves or approved equal prior to bidding. Size to match line size. Install in valve box, size adequate for maintenance access. Minimum 15" x 21".
6. "Air Release Valve: 2" air release valve from "Crispin", "Ames", or "Waterman", install in valve box.
7. Master Valve/ Flow Sensor Assembly: Netafim Hydrometer, size to match main line, or approved equal.
8. "Leemco" Ductile Iron Lateral Connection System or approved equal.

B. Control Valve Boxes and Cover: Thermo-plastic valve boxes with lockable, snap-top lids. Size as required for application or as noted on drawings, maximum one (1) valve per box. All boxes shall have purple lids labeled "DO NOT DRINK".
1. Drainage Backfill: Cleaned gravel or crushed stone, graded from 3 inches (75 mm) maximum to 3/4 inch (19 mm) minimum. Cover gravel with layer of filter fabric.

C. Service Boxes for Key-Operated Control Valves: Size and type as shown on Drawings.
1. Include valve key, 48 inches (915 mm) long with tee handle and key end to fit valve.

D Irrigation System Controls
1. Controller: As noted on the Drawings. All control wiring that is above ground shall be installed in conduit. Electrical wiring shall be installed according to local code. Provide surge protectors install controllers.
2. Controller Housing: Weatherproof, watertight, with lockable access door.
3. Valves: Electric Solenoid type and size of control valves as noted on the Drawings, including required fittings and accessories.
4. Wire: Color coded, copper conductor direct burial, UF-UL listed as noted on the drawings.

2.7 SPRINKLERS

A. Description: Manufacturer's standard sprinklers designed to provide uniform coverage over entire area of spray shown on Drawings at available water pressure, as follows:
1. Housings: Plastic, except where material is specified.
2. Pop-Up, Spray: Fixed pattern, with screw-type flow adjustment and stainless-steel retraction spring.
3. Pop-Up, Rotary Spray: Gear drive, full-circle and adjustable part-circle type.
4. All sprinkler heads shall have purple non-potable water caps.

2.8 AUTOMATIC CONTROL SYSTEM

A. Description: Low-voltage controller system, made for control of irrigation system automatic control valves. Controller operates on 120 volts a.c. building power system, provides 24 volts a.c. power to control valves, and includes stations for at least the number of control valves indicated. Size and type as shown on Drawing.

B. Control Enclosures: Weatherproof enclosure with locking cover and 2 matching keys. Enclosure construction complies with NFPA 70 and NEMA 250, Type 4, and includes provision for grounding. All control wiring that is above ground shall be installed in conduit. Electrical wiring shall be installed according to local code. Provide surge protectors in all controllers.
   1. AG 240 V Surge Arrester: As noted on the drawing. Install in approved J-box next to controller. Install per manufacturer recommendations.
   2. Stainless Steel Wall Mounted Enclosure by Strong Box Item #B-16SSW or approved equal.

C. Transformer: Internal-type, and suitable for converting 120 volts a.c. building power to 24 volts a.c. power.

D. Controller Stations for Automatic Control Valves: Each station is variable from approximately 1 to 60 minutes. Include switch for manual or automatic operation of each station.

E. Timing Device: Adjustable, 24-hour, 14-day clock to operate any time of day. Include provision for the following settings:
   1. Setting to skip operation any day in timer period.
   2. Setting for operation every other day.
   3. Settings for operation 2 or more times daily.
   4. Include manual or semi-automatic operation without disturbing preset automatic operation.
   5. Provide NI-CAD battery and trickle charger to automatically power the timing device during power outages.

F. Wiring: UL 493, solid copper conductor, insulated cable, suitable for direct burial.
   1. Splicing Materials: Pressure-sensitive, waterproof, thermoplastic wire connectors and other materials required to make specified connections. Locate all splice within valve boxes.
   2. Decoder Wire to be size # 14 not to exceed 10,000 Linear feet before sizing up to #12 wire.

G. Communication Cable.
   1. All cable required for the 2-wire paths and from Controller to flow sensor shall be REA Pe-39, 19 gauge, conductor-solid annealed uncoated copper conforming to ASTM-B3; insulated with expanded polyolefin surrounded by solid polymer to ensure low loss long transmission capability. Communication cable shall be of a type and size manufactured for use with Baseline hardware and approved by Baseline for installation of this type.
   2. Cable for the 2-wire paths shall be installed with no underground splices. All cable shall be laid in trenches (“pulling-in” of cable for installation without trenching will not be allowed unless pre-approved by the Landscape Architect) and shall be carefully back-filled to avoid any damages to the cable insulation or cable conductors themselves. In rocky areas, the trench shall have a 6” layer of clean sand on the bottom before the cable is laid into the trench and back-filled. If rocky back-fill is being used, the cable shall have an additional 6” layer of sand on top of it before back-filling is started. The cable shall have a minimum of 18” of cover.
   3. All 2-wire shall be installed in a PVC schedule 40 conduit and a sleeve (where passed under paving, walls or any other paved areas) of proper size required for the number of cables to be placed in it. The 2-wire path is permitted to be laid in the same trench with the 117 VAC cable as much as possible by laying each in opposite sides of the trench.

2.9 VALVE BOXES

A. Carson Industries or approved equal green body with locking lid. Standard rectangular box, model L series 1220-12 with T-cover, for all electrical control valves, 1419-12B. 10" round box for all mainline ball valves, gate valves, and hose bibs. All boxes shall have purple lids labeled "Do not Drink".

PART 3 - EXECUTION

3.1 EXAMINATION

A. Investigate and determine available water supply water pressure and flow characteristics.
B. Insure that new pump station is providing necessary performance. Notify Landscape Architect of any deviations from design performance.

3.2 PREPARATION

A. Set stakes to identify proposed sprinkler locations. Obtain Irrigation Designer's approval before excavation.

3.3 PAVING WORK

A. Install piping in sleeves where crossing sidewalks, roadways, parking lots, playgrounds and railroads.
   1. Install piping sleeves by boring or jacking under existing paving, where possible.
   2. If it is necessary to cut pavement sections, pavement shall be replaced in cut areas per I.S.P.W.C. standards and requirements.

3.4 PIPING APPLICATIONS

A. Refer to Part 2 of this Section for detailed specifications for pipe and fittings products listed below. Use pipe, tube, fittings, and joining methods according to the following applications. Piping in pits and aboveground may be joined with flanges instead of joints indicated.
B. Use pipe, tube, fittings, and joining methods according to the following applications.
C. Pressure Piping Underground: Use the following:
   1. 2 ½ Inches (DN 80) and Smaller: ASTM D 2467, Schedule 40, PVC plastic, socket-type pipe fittings; and solvent-cemented joints.
   2. 3-Inches (DN 100) and Larger: ASTM D 2241, SDR 21 rubber gasketed Class 200, polyvinyl chloride (PVC) plastic pipe; ASTM A 536 push on ductile iron fittings.
D. Circuit Piping: Use the following:
   1. All Sizes: ASTM D 2241, ASTM D 2466, Schedule 40, polyvinyl chloride (PVC) plastic, socket-type fittings; and solvent-cemented joints.
E. Sleeves: ASTM D 2466, Schedule 40, polyvinyl chloride (PVC) PVC plastic, socket-type fittings; and solvent-cemented joints. Sleeve diameter shall be two sizes larger than pipe installed in sleeve with minimum sleeve size being 4". Extend sleeves 12" minimum beyond walk or pavement edge.

3.5 JOINT CONSTRUCTION

A. Threaded Joints: Thread pipes with tapered pipe threads according to ASME B1.20.1, apply tape or joint compound, and apply wrench to valve ends into which pipes are being threaded.

B. Polyvinyl Chloride (PVC) Piping Solvent-Cemented Joints: Construct joints according to ASTM D 2672 and ASTM D 2855.
   1. Handling of Solvent Cements, Primers, and Cleaners: Comply with procedures in ASTM F 402 for safe handling when joining plastic pipe and fittings with solvent cements.
C. Dissimilar Materials Piping Joints: Construct joints using adapters that are compatible with both piping materials, outside diameters, and system working pressure. Refer to "Piping Systems - Common Requirements" Article for joining dissimilar metal piping.
D. Provide “Leemco” joint restraints at all gasket fittings where a change of direction occurs, or approved equal. Install all joint restraints per manufacturer’s recommendations.

3.6 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General Locations and Arrangements: Drawings indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, and in other design considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings.
B. Install components having pressure rating equal to or greater than system operating pressure.
C. Install piping free of sags and bends. Deflections angles shall not exceed manufacturer’s recommendations.
D. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
E. Install fittings for changes in direction and branch connections.
F. Piping Connections: Except as otherwise indicated make piping connections as specified below.
   1. Install unions, in piping 2 inches (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment having 2-inch (DN 50) or smaller threaded pipe connection.
   2. Install flanges, in piping 2-1/2 inches (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.
   3. Install dielectric fittings to connect piping of dissimilar metals.

3.7 PIPING INSTALLATION

A. Install underground polyvinyl chloride (PVC) plastic pipe according to ASTM D 2774.
B. Lay piping on solid subbase, uniformly sloped without humps or depressions.
   1. Install polyvinyl chloride (PVC) plastic pipe in dry weather when temperature is above 40 deg F (4 deg C). Allow joints to cure at least 24 hours at temperature above 40 deg F (4 deg C) before testing, unless otherwise recommended by manufacturer.
C. Minimum Cover: Provide following minimum cover over top of buried piping:
   1. Pressure Piping: 18 inches.
   2. Circuit Piping: 12 inches.
   3. Sleeves: 24 inches.
D. Boring
   1. Locations: Boring shall be used to route pipe, wiring or both under concrete structures such as walks or curbs where trenching is impractical. Sleeves shall be installed in all bored holes.
   2. Method: Boring shall be accomplished with a drill, auger, water jet, or any other instrument approved by the Owner’s Representative capable of producing a precise hole. Boring shall not disturb overlaying structures or cause settlement and damage to those structures. Repair or replace any pavement damaged during boring procedures.

E. Install piping under sidewalks and paving in sleeves.

F. Back-filling

1. Inspection: The trenching shall not be backfilled until inspection and pressure testing has been completed and the pipe installation, including the grade, alignment and jointing has been found to be in compliance with the requirements of the plans and specifications.
2. Around and Over Pipe:
   a. Select backfill material consisting of sand, fine gravel or select earth, free of large lumps or rocks larger than 1/2 inch shall be used in backfilling around and over the installed pipe.
   b. The select material shall be obtained from the excavation material removed from the trench and shall be processed by screening, sifting, or selective sorting, so as to produce the type of backfill herein specified. The Contractor may at his option and own expense provide an acceptable imported material.
   c. Backfill material shall be carefully deposited around and over the pipe in layers not more than 6 inches thick, loose measurement, wetted to optimum moisture content and uniformly compacted to at least 95 percent of the maximum density obtainable at optimum moisture content as determined by AASHTO T99 Method A or D (latest revision), until the pipe has a cover depth of at least 12 inches.
3. Remainder of Trench Backfill:
   a. The remaining depth of the trench shall be backfilled to existing finish grade, with excavation material removed from the trench, which shall be wetted or dried to near optimum moisture content.
   b. Contractor shall be required to repair any settling problems which occur in the trench locations for the duration of the warranty period.

G. Pipe fittings

1. All piping 3” diameter or greater shall use “Leemco” ductile iron push on type fittings. Provide “Leemco” joint restraints at all gasket fittings where change of direction occurs. See drawings for details.
2. All piping less than 3” diameter shall use Schedule 40 socket type fittings.

3.8 VALVE APPLICATIONS

A. **Hunter ICV-G-R** with adjustable Dial pressure regulating module, size per plans.

3.9 VALVE INSTALLATION

A. Valves: Install underground valves in valve boxes as shown on Drawings.

B. Control Valves: Install in valve control valve boxes, arranged for easy adjustment and removal. Install union on downstream side. Maximum (1) valve per valve box.

C. Place 6 inches minimum of gravel below control valves for drainage. Maintain 4 inches minimum between bottom of valves and top of gravel. Place filter fabric barrier between gravel and valves. Valve box shall be free of dirt and debris.

3.10 SPRINKLER INSTALLATION

A. Sprinklers: Flush circuit piping with full head of water and install sprinklers after hydrostatic test is completed.

1. Install lawn sprinklers at manufacturer's recommended heights.
2. Install shrubbery sprinklers at heights indicated.

3. Locate part-circle sprinklers to maintain a minimum distance of 12 inches from walls and 2 inches (50 mm) from other boundaries, unless otherwise indicated.
4. Sprinkler Head Risers: Rotor pop-up sprinkler shall have an adjustable riser assembly (triple swing joint Rain Bird SA Series or approved equal). Stationary spray pop-up heads or shrubs spray heads shall have an adjustable riser assembly (triple swing joint) or low-density polyethylene flex pipe as shown on Drawings details. Triple swing joint fittings shall be of Schedule 80 PVC. Flex pipe shall be 12 inch long minimum and 18 inch maximum linear low-density polyethylene pipe with spiral barb fittings and 90 degree ell as shown on details on Drawing.
5. Quick coupling valves shall be installed with an adjustable riser assembly (triple swing joint) and a Leemco quick coupler stabilizer, size as necessary.

3.11 AUTOMATIC CONTROL SYSTEM INSTALLATION

A. Install controllers and controller pedestal according to manufacturer's written instructions and as indicated.
B. Install control wiring in same trench with piping. Where wiring leaves from piping trenches, install wiring in conduits.
C. Install control wiring in accordance with Specifications. Provide 10 inches expansion coil At each valve to which controls are connected, and at 100 foot intervals. Bury wire beside mainline pipe. Where wire leaves pipe, enclose in conduit. Use waterproof wire connectors. Use white or gray color for common wires and black or red colors for all other wires. No control wires shall be placed in thrust blocks. Locate wires on opposite side of thrust blocks.

3.12 TRENCHING

A. Trench Size:
1. Minimum Depth: as necessary to provide 18” of cover for mainline, sleeves, and wires.
2. Minimum Depth: as necessary to provide 12” of cover for all lateral lines.
3. Minimum Width: 4-inch pipe and larger – 12 inches.
4. Minimum Width: 3-inch pipe and smaller – 9 inches.
B. Trench to accommodate grade changes and slope to drains.
C. Maintain trenches free of debris, material, or obstructions that may damage pipe.

3.13 CONNECTIONS

A. Connect piping to sprinklers, devices, valves, control valves, specialties, and accessories.
B. Connect water supplies to irrigation systems. Include reduced pressure back-flow preventers on potable water supplies.
C. Electrical Connections: Connect to power source, controllers, and automatic control valves.

3.14 FIELD QUALITY CONTROL

A. Testing: Perform test of piping and valves before back-filling trenches. Piping may be tested in sections to expedite work. Owner’s representative must be present for testing.
1. Make all necessary provisions for thoroughly bleeding the line of air and debris.
2. Before testing, fill the line with water for a period of at least 24 hours.
3. **After valves have been installed, test all live water lines, (main line and lateral lines) for leaks at a pressure of <u>100 psi for a period of one hour</u>, with all couplings exposed and with all pipe sections center loaded.**
4. Furnish all necessary testing equipment and personnel.
5. Correct all leaks and retest until acceptance by the Landscape Architect.

B. Field inspection and testing will be performed under provisions of Division 1.

C. Installer's Field Service
   1. Prepare and start systems under provisions of Division 1.
   2. Provide one complete spring start-up and a fall shutdown, including winterization to blow out entire system with compressed air.
D. Adjust work under provisions of Division 1.
C. Change and/or adjust head types for full water coverage as directed.
D. Adjust nozzle spray pattern as required to avoid water spray on building walls, roads or sidewalks.
E. Have all backflow preventers tested by appropriate agency.

3.15 CLEANING AND ADJUSTING

A. Flush dirt and debris from piping before installing sprinklers and other devices.
B. Adjust automatic control valves to provide flow rate of rated operating pressure required for each sprinkler circuit.
C. Carefully adjust lawn sprinklers so they will be flush with, or not more than 2-inch (13 mm) above, finish grade after completion of landscape work. Adjust so that sprinklers do not spray on buildings or walls.
D. Adjust settings of controllers and automatic control valves to insure proper watering of all landscaping.

3.16 COMMISSIONING

A. Starting Procedures: Follow manufacturer's written procedures. If no procedures are prescribed by manufacturers, proceed as follows:
   1. Verify that specialty valves and their accessories have been installed correctly and operate correctly.
   2. Verify that specified tests of piping are complete.
   3. Check that sprinklers and devices are correct type.
   4. Check that damaged sprinklers and devices have been replaced with new materials.
   5. Check that potable water supplies have correct type back-flow preventers.
   6. Energize circuits to electrical equipment and devices.
   7. Adjust operating controls.
B. Operational Testing: Perform operational testing after hydrostatic testing is completed, backfill is in place, and sprinklers are adjusted to final position.

3.17 DEMONSTRATION

A Provide irrigation system demonstration under provisions of Division 1.
B. Demonstrate to Owner: that system meets coverage requirements and that automatic control functions properly.
C. Demonstrate to Owner's maintenance personnel operation of equipment, sprinklers, specialties, and accessories. Review operating and maintenance information including start up and winterization procedures.
D. Provide 7 days written notice in advance of demonstration.

END OF SECTION 328400

SECTION 329200 - TURF AND GRASSES

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. Drill seeding
   2. Hydroseeding.
   3. Sodding.
   4. Erosion-control material(s).

B. Related Sections:

   1. Division 31 Section "Site Clearing" for topsoil stripping and stockpiling.
   2. Division 31 Section "Earth Moving" for excavation, filling and backfilling, and rough grading.
   3. Division 32 Section "Planting Irrigation " for turf irrigation.
   4. Division 32 Section "Plants" for border edgings.

C. References:
   1. FS O-F-241 - Fertilizers, Mixed, Commercial.
   2. ASPA (American Sod Producers Association) - Guideline Specifications to Sodding.

1.3 DEFINITIONS

A. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.

B. Finish Grade: Elevation of finished surface of planting soil.

C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

F. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

G. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.

H. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.

I. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

J. Topsoil: Per specifications section 328500.

K. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, Brome Grass, Black Henbane, Buffalobur, Common Crupina, Dalmatian Toadflax, Diffuse Knapweed, Dyer’s Woad, Eurasian Watermilfoil, Field Bindweed, Hoary Cress, joined Goatgrass, Leafy Spurge, Matgrass, Meadow Hawkweed, Meadow Knapweed, Milium, Musk Thistle, Orange Hawkweed, Perennial Pepperweed, Perennial Sowthistle, Poison Hemlock, Puncturevine, Purple Loosestrife, Russian Knapweed, Scotch Broom, Scotch Thistle, Silverleaf Nightshade, Skeletonleaf Bursage, Spotted Knapweed, Syrian Beancaper, Toothed Spurge, Yellow Starthistle, Yellow Toadflax, Russian Knapweed, Jointed Goatgrass, Skeletonleaf Bursage, Hoary cress, Musk thistle, Yellow Starthistle, Hayek, Rush Skeletonweed, Poison Hemlock, Toothed Spurge, Leafy Spurge, Orange hawkweed, Dumort, Black henbane, Dyer's Woad, Perennial pepperweed, Yellow Toadflax, Milium, Eurasian Watermilfoil, Matgrass, Tansy Ragwort

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to this Project.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1. Certification of each seed mixture for turfgrass sod. Include identification of source and name and telephone number of supplier.

C. Submit sod certification for grass species and location of sod source.

D. Qualification Data: For qualified landscape Installer.

E. Product Certificates: For soil amendments and fertilizers, from manufacturer.

F. Material Test Reports: For existing native surface topsoil and imported or manufactured topsoil.

G. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of turf and meadows during a calendar year. Include cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer and herbicide. Submit before expiration of required initial maintenance periods.

H. Seed Tabs: One tag for each seed mix used with date(s) of application.

I. Fertilizer Labels: One label for each mix with date(s) of applications.

J. Hydro-mulch Labels: One label with date(s) of application.

K. Hydro-mulch Tackifier Labels: One label with date(s) of application.

L. Soil Amendment samples.

1.5 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Company specializing in manufacturing products specified in this section, with not less than three (3) years of documented experience.

B. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of the soil.
   1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
   2. The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from Architect. A minimum of two representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
   3. Report suitability of tested soil for turf growth.
      a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
      b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

D. Pre-installation Conference: Conduct conference at Project site prior to any turf installation. Contractor shall schedule conference with the landscape architect.

E. Obtain materials from same source throughout.

F. Contractor shall be responsible to provide proof of material delivery and installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable. The label shall show the variety of seed, the percentage of germination, purity and weed content.

B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.

C. Bulk Materials:
   1. Do not dump or store bulk materials near drainage facilities, structures, utilities, walkways and pavements, or on existing turf areas or plants.
   2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
   3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

1.7 PROJECT CONDITIONS

A. Planting Restrictions: Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.

B. Planting Season: Seeding shall be accomplished in the fall prior to September 15th. If this is not accomplished, seeding shall be in the following spring after April 15.

C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.8 SEQUENCING AND SCHEDULING

A. Coordinate work under provisions of Division 1.

B. Coordinate with installation of underground sprinkler system.

1.9 EXTENDED WARRANTY

A. Provide one-year warranty under provisions of Division 1. Warranty includes coverage for one continuous growing season; replace lawn (seed or sod) that is dead, unhealthy or in an unsightly condition.

1.10 MAINTENANCE SERVICE

A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:

1. Seeded Turf: 60 days from date of Substantial Completion of entire project.
   a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.
   b. Seeded turf areas will not be accepted as substantial completion until a healthy, full, uniform stand of grass with no bare spots has been obtained.

2. Sodded Turf: 60 days from date of Substantial Completion of entire project.

B. Initial Dryland Grass Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable meadow is established, but for not less than 60 days from date of Substantial Completion.

C. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.
   1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch. Anchor as required to prevent displacement.
   2. Apply herbicides to control weed growth in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

D. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawn uniformly moist to a depth of 4 inches.
   1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
   2. Water lawn at a minimum rate of 1½ inch per week.

E. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 30 percent of grass height. Remove no more than 30 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Remove excess clippings after mowing. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the grass height at 2.5inches

F. Lawn Fertilization: Apply fertilizer at intervals specified.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species: State-certified seed of grass species as follows:

C. Seed Species: Seed of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:
   1. Sun and Partial Shade: NoNet Spreading-type, Rhizomatous Turf Type Tall Fescue from Jacklin Seeds, or approved equal. Contractor shall submit seed mix for review and approval prior to installation.
   2. Seed shall be provided from and mixed by a certified dealer. Seed mixture shall be labeled with manufacturer's guaranteed analysis, germination rate and purity rate.
   3. Apply at manufacturer's recommended application rate.

2.2 DRYLAND SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species: State-certified seed of grass species as follows:

C. Seed Species: Seed of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:

D. Grass Seed: Install at 12 lbs / acre. Fresh, clean, pure live, and dry new seed, of mixed species as follows:
   1. 0.12 Western Yarrow
   2. 0.24 Firecracker Penstemon
   3. 2.52 Blue Flax
   4. 2.52 California Poppy
   5. 1.80 Sheep Fescue
   6. 2.40 Idaho Fescue
   7. 1.20 Sandburg Bluegrass
   8. 1.20 Rocky Mountain Penstemon

E. Seed Carrier: Inert material, sharp clean sand or perlite, mixed with seed at a ratio of not less than two parts seed carrier to one-part seed.
   1. Retain subparagraph below for shaded grass. Revise species and mixture proportions if required.

2.3 TURF GRASS SOD

A. Turfgrass Sod: Certified, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.

B. Turfgrass Species: Sod of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:
   1. Sun and Partial Shade: NoNet Spreading-type, Rhizomatous Turf Type Tall Fescue from Jacklin Seeds, or approved equal. Contractor shall submit seed mix for review and approval prior to installation."

2.4 SOIL AMENDMENTS

A. Compost: (Apply at 3 cu. yds. per 1000 sq. ft.) Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing

through 3/4-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.
2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

2.5 FERTILIZERS

A. Commercial Slow Release Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
2. Initial Application (two weeks after seeding, assumes fall planting) at 5 lbs/1000 sq. ft:
    a. 16 percent Nitrogen.
    b. 16 percent Phosphorus.
    c. 16 percent Potassium.
    d. Micronutrients
    e. 60 percent slow release nitrogen.
3. Spring Fertilization: (April 1) at 7 lbs/1000 sq. ft.
    a. 30 percent Nitrogen.
    b. 6 percent Phosphorus.
    c. 12 percent Potassium
    d. 50 percent slow release nitrogen.
4. Summer Application: (June 1) at 7 lbs/1000 sq. ft.
    a. 30 percent Nitrogen.
    b. 6 percent Phosphorus.
    c. 12 percent Potassium
    d. 50 percent slow release nitrogen.
5. Fall Application: (August 15) at 7 lbs/1000 sq. ft.
    a. 18 percent Nitrogen.
    b. 3 percent Phosphorus.
    c. 18 percent Potassium
    d. 50 percent slow release nitrogen.

2.6 PLANTING SOILS

A. Planting Soil: ASTM D 5268 topsoil, with pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth. Mix ASTM D 5268 topsoil with the following soil amendments and fertilizers in the following quantities to produce planting soil:

1. Weight of Compost per 1000 sq. ft.: 3 cu. yds.
2. Weight of Elemental Sulfur (90% S) per 1000 Sq. Ft.: 2 lbs.
3. Weight of Commercial Fertilizer per 1000 Sq. Ft.: 5 lbs.
4. Weight of Muriate of potash (00-00-60) per 1000 Sq. Ft.: 6.5 lbs.
5. Weight of Monoammonium phosphate (11-52-00) per 1000 Sq. Ft.: 1.2 lbs

B. Planting Soil: Imported topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from bogs or marshes.

1. Additional Properties of Imported Topsoil or Manufactured Topsoil: Screened and free of stones 1/2 inch or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants including quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and bromegrass; not infested with nematodes, grubs, other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration. Continuous, air-filled, pore-space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis.

2.7 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

C. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

2.8 PESTICIDES

A. General: Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

D. Weed Abatement: “Round-up” (contact herbicide) by Monsanto, or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint

thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.

2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
5. Verify that prepared topsoil is ready to receive the work of this Section.
6. Beginning of installation means acceptance of existing site conditions.
7. All planting areas shall be weed free at the time of seed or sod installation.
8. Soil Tests: Per Landscape Grading specification section 328500. Prior to planting, amendments shall be added to correct for problems as noted by the soils report.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with new planting soil.

3.2 WEED ABATEMENT

A. All areas to be planted or hydroseeded shall have weed abatement operations performed on them prior to planting or hydroseeding.

B. Contractor shall spray all exposed weeds with “Round-up” (contact herbicide) or approved equal.

C. Do not water for at least seven (7) days. Remove exposed weeds from the site.

D. Contractor shall operate the automatic irrigation system for a period of fourteen (14) days. At conclusion of this watering period, discontinue watering for three to five (3-5) days.

E. Apply second application of “Round-up” to all exposed weeds. Apply in strict conformance with manufacturer’s specifications and instructions. Do not water for at least seven (7) days. Remove weeds from the site.

F. If any evidence of weed germination exists after two (2) applications, Contractor shall be directed to perform a third application.

G. At the time of planting and hydroseeding, all planting areas shall be weed free.

3.3 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
   1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
   2. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.4 TURF AREA PREPARATION

A. Limit turf subgrade preparation to areas to be planted.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
   1. Spread planting soil to a depth of 9 inches in turf areas and 18 inches at shrub bed areas but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
      a. Spread planting soil over loosened subgrade.
      b. Reduce elevation of planting soil to allow for soil thickness of sod.

C. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:
   1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
   2. Loosen surface soil to a depth of at least 6 inches. Provide weed abatement procedure. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 6 inches of soil. Till soil to a homogeneous mixture of fine texture.
      a. Apply soil amendments directly to surface soil before loosening.
   3. Remove stones larger than 1 inch in any dimension and sticks, roots, trash, and other extraneous matter.
   4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

F. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

G. Do not sow immediately following rain, or when ground is too dry. Temperature shall be between 55 F and 95 F for a 24 hour period. Wind shall be less than 5 mph.

H. Turf Seed shall be sown at a rate per seed supplier recommendations.

I. Seed shall be hydroseeded or drill seeded at the contractors option. Areas with a 4:1 or greater slope shall be hydroseeded.

3.5 DRILL SEEDING

A. Sow seed with cultipacker (“Brillion” equipment or equal), seeding machine, or approved similar equipment to drill, cover and firm the seed bed in one operation. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other. Apply water with a fine spray immediately after each area has been seeded. Saturate the top 4 inches of soil.

   1. Do not use wet seed or seed that is moldy or otherwise damaged.

2. Do not seed against existing trees.
3. Keep soil surface continuously damp.

B. Protect seeded areas with slopes exceeding 1:4 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.

1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.

3.6 HYDROSEEDING

A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application. Slopes in excess of 4 horizontal to 1 vertical shall b hydroseeded.

1. Mix slurry with nonasphaltic tackifier.
2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.

3.7 SODDING

A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

1. Moisten prepared surface immediately prior to laying sod.

2. Lay sod immediately after delivery to site to prevent deterioration.
3. Lay sod across angle (perpendicular) of slopes exceeding 1:3.
4. Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.
5. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities.

C. Saturate sod with fine water spray immediately after planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

3.8 TURF MAINTENANCE

A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.

C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Contractor shall be responsible to maintain, fertilize, and mow all phase one turf areas until 60 days after phase two final acceptance. Schedule initial and subsequent mowings to maintain the following grass height:
1. Mow specified turf areas to a height of 2 inches.

D. Turf Post fertilization: Apply fertilizer after initial mowing and when grass is dry.

1. Apply fertilizer in accordance with manufacturer's instructions.
2. Lightly water to aid the dissipation of fertilizer.
3. Sweep all hard surfaces of fertilizer overthrow.
4. Turf areas seeded months ahead of acceptance of the entire project will be fertilized on an eight to ten week schedule consistent with the seasonal period and application rates specified.

3.9 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Landscape Architect:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 98 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
3. All turf areas will be accepted at the same time, including all phased areas.

B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.10 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.11 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. All scars, ruts or other marks in the ground caused by this work shall be repaired and the ground left in a neat and orderly condition throughout the site. Contractor shall pick up all trash resulting from this work no less frequently than each Friday before leaving the site, once a week, and/or the last working day of each week. All trash shall be removed completely from the site. The Contractor shall leave the site area broom-clean and shall wash down all paved areas within the Contract area, leaving the premises in a clean condition acceptable to the Owner and Construction Manager.

C. Erect temporary fencing or barricades and warning signs to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

D. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 329200

THIS PAGE INTENTIONALLY LEFT BLANK

STRATA

September 6, 2024
File: TF24135E

Bob Beer
Twin Falls County
630 Addison Avenue West
Twin Falls, ID 83301
Phone: 208-358-1150

RE: **Geotechnical Engineering Evaluation**
Twin Falls County Jail Modernization & Addition
2515 Wright Avenue
Twin Falls, Idaho 83301

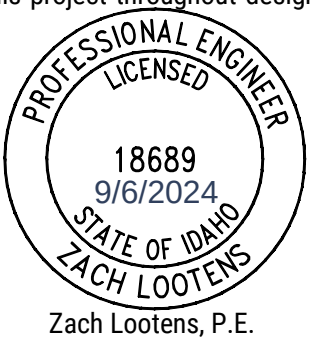
Dear Mr. Beer,

STRATA is pleased to present our authorized Geotechnical Engineering Evaluation (GEE) Report for the planned Twin Falls County Jail addition in Twin Falls, Idaho. The purpose of our GEE was to assess the subsurface conditions at the project site and provide geotechnical engineering recommendations for planning, design, and construction of the proposed facility. The attached report summarizes our field exploration and laboratory testing and presents our geotechnical engineering opinions and recommendations.

Our services were accomplished referencing conversations with you and our subconsultant agreement executed April 18, 2022. Portions of this report cannot be relied upon individually without the supporting text of remaining sections, appendices, and/or plates. When providing this report to designers, estimators, contractors, etc., the report including all appendices, plates and attachments must be provided in its entirety.

We appreciate the opportunity to work with Twin Falls County and your design team and look forward to our continued involvement with this project throughout design and construction. Please contact us if you have any questions or comments.

Sincerely,
STRATA



Carbella Medina
Staff Engineer

Zach Lootens, P.E.
Project Engineer

Dan P. Gado, P.E.
Senior Engineer

CM/ZL/DG/kv

STRATA

Geotechnical Engineering Evaluation

Twin Falls County Jail Modernization & Addition
Twin Falls, Idaho

September 6, 2024

Prepared for:
Bob Beer
Twin Falls County
360 Addison Avenue West
Twin Falls, ID 83301

208.733.8200 | 2332 Eldridge Ave., Twin Falls, Idaho 83301 stratageotech.com

TABLE OF CONTENTS

REPORT TABLES

REPORT PLATES & APPENDICES

PLATE 1: EXPLORATION LOCATION PLAN
APPENDIX A: EXPLORATORY TEST PIT LOGS
APPENDIX B: LABORATORY RESULTS
APPENDIX C: CUT-OFF BARRIER AND MSE WALL DETAIL

Geotechnical Engineering Evaluation Report
Twin Falls County Jail Modernization & Addition
2515 Wright Avenue
Twin Falls, Idaho 83301

INTRODUCTION

STRATA is pleased to present our Geotechnical Engineering Evaluation Report for the proposed Twin Falls County Jail addition at 2515 Wright Avenue in Twin Falls, Idaho. The purpose of our evaluation was to evaluate the subsurface soil, rock and groundwater conditions and to provide geotechnical engineering opinions and recommendations to assist project planning, design, and construction. We accomplished our geotechnical services referencing our subconsultant agreement dated April 18, 2022.

PROJECT UNDERSTANDING

Existing Site Conditions

The area of the site is situated northeast of the Wright Avenue cul-de-sac, at the existing juvenile center, with a single-story building and paved parking lot. The ground slopes down from west to east at the site, with up to 10 feet of elevation change. The Perrine Coulee flows from south to north on the east perimeter of the site.

Proposed Development

We understand the proposed construction will include a remodeling/modernization of the existing building, a one-story addition (Part A) of approximately 5,128 square feet to the east of the existing building, and an attached two-story addition (Part B) of approximately 44,342 square feet to the north. New pavement for service trucks and inmate busses is proposed to extend from the existing parking lot. New stormwater infiltration facilities are proposed to accept runoff from the building and asphalt pavements areas. The proposed structures are outlined on Plate 1.

Based on information provided, Part A building will be constructed of CMU masonry and will have wall loading ranging from 2.8 to 3.5 kips/ft with isolated column loading from 25 to 35 kips. Part B structure will be constructed of precast concrete double tee and CMU masonry and have 20 kips/ft wall loading and up to 250-kip column loads. Both buildings will have conventional slab-on-grade construction. Up to 5 feet of fill is expected for the Part A structure and a mechanically stabilized earth (MSE) retaining wall will provide grade separation between the edge of pavement and the Perrine Coulee. The MSE wall will have a free height up to 5 feet and a length of approximately 200 feet. A grading plan for the Part B structure has not been finalized at this time but we anticipated to have less than 3 feet of cuts or fills.

Flood elevations for the Perrine Coulee are approximately 3791 feet for the 100-year flood and 3792 feet for the 500-year flood.

FIELD EXPLORATION

Subsurface Exploration

STRATA observed the excavation of six test pits throughout the project site on July 19, 2024. The test pits extended between 10 to 15 feet below the ground surface (BGS). All depths are in reference to the existing ground surface elevation at the test pit locations. Latitude and longitude were established using a handheld Global Positioning System (GPS) device accurate to within 10 feet, using the WGS 84 datum. The test pit locations are illustrated on Plate 1, *Exploration Location Plan*.

Test Pit Excavation

The test pits for our exploration were completed by Twin Falls County using a 420E excavator, with a target excavation depth of 15 feet below the existing ground surface; however, most of the test pits were terminated at practical refusal on basalt or caliche before reaching the target depth. We obtained soil samples in each stratum encountered in the test pits. At the conclusion of our subsurface exploration, the test pits were backfilled with the excavation spoils and compacted by tamping with the bucket.

Infiltration Testing

Infiltration testing was performed in test pits 24-STR-TP4 and -TP6 at approximately 4 feet in the native loess silt. The infiltration test was performed in general accordance with the procedure for the In-Situ Large-Scale Pilot Infiltration Test (PIT) Method, per Ada County Highway District Stormwater Design Manual – Appendix C. The test pits had a cross-sectional area of approximately 8 square feet. The test was saturated a minimum of 1 hour with a 10 to 12-inch head. The falling head infiltration rate was then measured over a 2-hour period following saturation at 15-minute intervals.

SUBSURFACE CONDITIONS

The subsurface conditions across the site can generally be described as windblown loess overlying basalt. A general description of each unit's stratigraphic location and properties is provided below:

Loess – Native (wind-blown loess) stiff to hard Silt (ML) was observed in all test pits from the surface to approximately 13-foot deep at this site. The loess generally exhibited no cementation with strong hydrochloric (HCl) reaction, indicating the presence of calcium carbonate. A pinhole structure was observed in all of the explorations – generally within the non-cemented to moderately cemented layers.

Cemented Loess – Strongly cemented Sandy Silt (ML) loess (also known as caliche) was encountered in 24-STR-TP1 and -TP2 at a depth of approximately 13 to 14 feet BGS. The strongly cemented layer was hard and exhibited strong HCl reaction.

Basalt Rock – Basalt rock was encountered in test pits -TP3 to -TP6 at variable depths ranging from 10 feet to up to 14 feet BGS. The basalt was dark gray in color.

Groundwater

Groundwater was encountered in test pit 24-STR-TP3 at a depth of approximately 12 feet BGS at the time of exploration. It should be noted that groundwater levels can fluctuate seasonally and in response to water levels in the Perrine Coulee, precipitation events, and irrigation. Perched groundwater may exist at the loess-basalt interface, or above cemented soils, following periods of extended precipitation.

LABORATORY TESTING

Soil samples collected from the explorations were returned to our laboratory for further classification and testing. Laboratory testing was accomplished in general accordance with ASTM International (ASTM) and other procedures. ("General accordance" means that certain local and common descriptive practices and methodologies have been followed.) Our laboratory testing program included:

- Moisture Content (ASTM D2216)
- Atterberg Limits (ASTM D4318)
- Percent Passing the No. 200 Sieve (ASTM D1140)
- Consolidation or Collapse Consolidation (ASTM D2435 or D4546)

Laboratory test results are included on the exploration logs in Appendix A and summarized in Appendix B.

GEOTECHNICAL OPINIONS AND RECOMMENDATIONS

The following geotechnical engineering recommendations were developed to support design and construction of the proposed structure. Our recommendations and opinions are based on the results of our field evaluation, laboratory testing, our experience with similar soil conditions, and our understanding of the proposed construction.

Geotechnical Constraints

Collapsible Silt/Sand (Loess)

Loess is a windblown soil deposit, which often exhibits a high void ratio (often distinguished by pinhole sized voids in the soil structure) and variable cemented structure due to leached minerals (such as calcium carbonate) that form along shallow soil wetting fronts in Idaho's arid climate. The cemented soil structure will support moderate imposed loads until the soil is inundated/saturated, then the minerals dissolve and the soil collapses. Based on laboratory testing performed on a sample obtained from the project site, the weakly cemented (silt) loess layer

collapsed approximately 3.3 percent under a load of 2,000 psf. Unacceptable large settlements may occur post-construction if relatively thick layers of collapsible silt below structures are allowed to become saturated.

Due to the proximity of flood waters from the Perrine Coulee to structures for this project, we recommend placing a cut-off trench between the structures and the Perrine Coulee, and infiltration ponds/seepage beds to mitigate the potential for saturation of native loess below structures. Recommendations for the cut-off trench are provided in the *MSE Wall Recommendations.*

To mitigate the potential for settlement beneath the structures, we are recommending over excavation and backfill soil improvements. Our design assumes a potential wetting front up to 5 feet in depth below the surface from irrigation and stormwater infiltration. If saturation of native loess below a depth of 5 feet or below the depth of soil improvements were to occur due to unforeseen water infiltration (possible pipe leaks or defect in the cut off trench) then additional collapse settlement can occur which could cause distress to the overlying improvements. The ownership team understands and accepts this risk of possible future settlement.

Earthwork

Excavation Characteristics

Based on our exploration, the soil at the project site may be excavated with conventional earthwork equipment. Slower rates of excavation should be expected in strongly cemented silt/sand (caliche). Where basalt rock is encountered, excavation methods may need to include heavy equipment with ripper teeth, pneumatic hammers, or drill and blast methods to remove rock. In general, ripping and chipping the basalt is not typically performed by contractors in this area to significant depths due to its hardness. Excavations may cave and slough and are to be sloped in accordance with Occupational Health and Safety Act (OSHA) guidelines. The on-site, non-cemented to weakly cemented loess will correspond to Class B soil. Excavations in Class B soils should be temporarily sloped no steeper than 1H:1V (horizontal to vertical) for excavations deeper than 4 feet. Excavations in Stable Rock can be temporarily sloped up to vertical based on field evaluation by a Competent Person as defined by OSHA. Surcharges must not be allowed within a horizontal distance equal to one-half the excavation depth. Construction vibrations can cause excavations to slough or cave. Ultimately, the contractor is solely responsible for site safety and excavation configurations. We recommend earthwork contractors evaluate each excavation configuration specific to OSHA guidelines and that they seek appropriate professional guidance to ensure excavation safety and stability.

Site Stripping

Prior to any earthwork, we recommend stripping the upper topsoil/organics below the footprint of all structures. Based on our explorations, we estimate a stripping depth ranging from 6 to 12 inches. If organic material and

topsoil is not removed beneath structures, there is a risk that decay of organics could lead to settlement and that could negatively impact its performance. To help maintain uniform support conditions, it will be necessary to remove all organic-laden topsoil and replace topsoil inorganic structural fill. Stripping shall extend laterally at least 5 feet outside of the planned structure footprints. Soil containing vegetation and organics shall be disposed of off-site or may be stockpiled for reuse as landscaping. Topsoil is not suitable for use as structural fill.

Proof Compaction

Proof compaction (or proof rolling) is typically used on subgrade, in lieu of density testing, to create a stable platform to place structural fill. Where specified in this report, proof compaction shall consist of moisture conditioning followed by compacting with a minimum of 5 passes of a 5-ton static drum weight vibratory roller, or other heavier equipment. STRATA should observe the proof compaction to see if any pumping or weaving of the subgrade is observed. If pumping or weaving occurs, the subgrade in question should be undercut in accordance with *Section 202, Part 3.7 Excavation of Unsuitable Material* of the ISPWC and replaced with Granular Structural Fill, as defined in the following section. Where proof compaction with large compaction equipment is not possible (footing trenches), the exposed subgrade should be moisture conditioned and proof compacted with a vibratory hoe pack. A steel probe and/or pocket penetrometer shall be used to identify potential areas with unsuitable subgrade, where removal and replacement is required.

Subgrade Preparation

Soil improvements will be required to limit potential settlement to tolerable levels. We recommend improving soil below the foundations and the MSE wall (and reinforced soil zone) using the removal of loess and replacement with structural fill. Table 1 summarizes the required depths of removal and replacement material for this project.

Table 1. Soil Improvements

Structure	Depth of Soil Improvements (ft)	Replacement Material
MSE Wall and Reinforced Soil Zone	3	General or Granular Structural Fill
Part A Footings	3	General or Granular Structural Fill
Part B Footings	5	Granular Structural Fill

The depth of soil improvements in Table 1 are in reference to the bottom of footing elevation or bottom of MSE reinforced zone. Onsite loess may be re-used as General Structural Fill and replaced to the bottom of Part A footings and the MSE wall. All over-excavations should extend 1 foot laterally beyond the improvement area for every 2 feet of excavation depth.

In floor slab on grade and pavement areas, the subgrade should be proof-rolled and any soft or loose areas removed and replaced with Granular Structural Fill. STRATA should be retained to perform field inspections during removal and replacement operations.

Structural Fill

The on-site loess is moisture susceptible and can be difficult to use during inclement weather, but may be used as General Structural Fill, provided it is moisture conditioned and compacted in accordance with the *Compaction* section of this report. In general, the structural fill requirements described in Table 2 correlate to material specifications in the *Idaho Standards for Public Works Construction* (ISPWC).

The following soils are considered unsatisfactory for use in structural applications:

- Soil classified as CL, CH, MH, OH, OL or PT.
- Soil with a moisture content greater than 3% of optimum moisture.
- Any soil containing more than 3% organics by weight or other deleterious substances (wood, metal, plastic, waste, etc.).

Table 2. Structural Fill Specifications

Structural Fill Material • Allowable Use	Material Specifications
General Structural Fill • General site grading	• Soil classified as GW, GP, GP-GM, GM, GC, SW, SP, SP-SM, SM, SC, or ML according to the USCS. • Maximum particle size must be less than 6 inches. • Soil consisting of inert earth materials with less than 3% organics or other deleterious substances (wood, metal, plastic, waste, etc.).
Granular Structural Fill • Soft spot subgrade replacement • Soil improvements • Pavement subbase	• Soil classified as GW, GP, GP-GM, SP or SP-SM according to the USCS, with no particles greater than 6 inches in size. *Or* • Soil meeting requirements stated in the latest edition of the *ISPWC, Section 801 – Uncrushed Aggregates (6 inches).*
Aggregate Base Course • Slab or foundation support • Gravel base course	• Soil meeting requirements stated in the latest edition of the *ISPWC, Section 802 – Crushed Aggregate Base Type I.*
Utility Trench Bedding • Utility trench construction	• Soil meeting requirements stated in the latest edition of the *ISPWC, Section 305 – Pipe Bedding.*
Drainage Aggregate • MSE face drain	• AASHTO #57 Stone

Compaction

All structural fill should be compacted to a minimum of 95 percent below buildings and walls and 90 percent below pavement of the maximum dry density of the soil as determined by ASTM D1557 (Modified Proctor). Structural fill must be moisture-conditioned to near optimum moisture content, placed in maximum 8-inch-thick loose lifts for fine grain cohesive soils, and 12 inches thick loose lifts for granular soils, then compacted using appropriate compaction equipment. If smaller or lighter compaction equipment is used, the lift thickness should be reduced to meet the compaction requirements.

Testing of structural fill shall consist of a minimum of one modified proctor, particle size distribution, and Atterberg limit (as needed) per 5,000 cubic yards. Density testing shall be accomplished with a nuclear density meter at a minimum frequency of one test per lift per 2500 square feet in the building area, one test per lift for spot footings, one test per 50 linear feet for strip footings, and one test per lift per 5000 square feet in pavement areas.

Wet Weather/Wet Soil Construction

We recommend earthwork be performed during dry weather conditions. Fine-grained, silty soils are susceptible to pumping and/or rutting when the soil is above optimum moisture content and is subjected to heavy loads, such as rubber-tired equipment or vehicles. Earthwork should not be performed immediately after precipitation events until the soil has dried sufficiently to support construction traffic without disturbing the subgrade. The contractor shall take precautions to protect the subgrade from becoming saturated and/or disturbed. Use of tracked mount equipment can limit the disturbance of moisture sensitive soil. We recommend the contractor limit construction traffic on the prepared subgrade and reduce exposure of the subgrade to precipitation and water. Specifically, the contractor should:

- Slope subgrades to direct surface water away from construction areas.
- Remove subgrade soil that has become soft and/or pumping and replace it with properly compacted structural fill, as described in the Structural Fill subsection above.
- Not place structural fill during or immediately following a significant precipitation event.
- Not place structural fill on frozen or saturated subgrades.

Use of on-site silty soil as structural fill may be impractical during periods of inclement weather. Therefore, we recommend construction contingencies include removal and replacement of wet soil with Granular Structural Fill.

Seismic Design Criteria

Based on our subsurface test pit, geologic data, the project location, and ASCE 7 (ASCE, 2016), we recommend Seismic Site Class D be utilized for the seismic design of the project, provided the soil improvements outlined in the Subgrade Preparation Section are accomplished beneath the shallow foundations. Seismic response criteria are presented in Table 3.

Table 3. Seismic Response Criteria

Period (seconds)	Mapped Acceleration Coefficients (g)	Site Factor for Site Class D	Modified Acceleration Coefficient for Site Class D (g)
Peak	PGA = 0.086	F_{PGA} = 1.6	PGA_M = 0.137
0.2 (Short)	S_S = 0.194	F_a = 1.6	S_{DS} = 0.207
1.0	S_1 = 0.082	F_v = 1.5	S_{D1} = 0.132

1. Values for location Latitude 42.5437°N and Longitude 114.4328°W

Conditions required for liquefaction to occur include relatively loose, fine granular soil, shallow groundwater, and strong earthquake ground motions. Due to the absence of these conditions at this site and the low seismic hazard, it is our opinion that the liquefaction and lateral spreading are unlikely to occur.

Foundation Design Recommendations

Shallow foundations may be utilized for this project, provided that the required subgrade improvements in the *Subgrade Preparation* section are performed. We recommend a 24-inch frost depth for this site.

Shallow Foundations

Shallow foundations must be structurally designed to conform to the latest edition of the International Building Code (IBC). Provided the soil improvements outlined in the *Subgrade Preparation Section* are accomplished, an allowable bearing capacity of 3,000 psf may be used for footings for building Part A and an allowable bearing capacity of 4,000 psf may be used for footings supported on Granular Structural fill for building Part B.

A friction coefficient of 0.35 can be used for concrete placed on General Structural Fill and 0.55 for concrete placed on Granular Structural Fill or Aggregate Base Course. The bearing capacity may be increased 30 percent to account for transitory live loads such as seismic and wind.

The allowable bearing capacity provided assumes that structures can tolerate up to 1-inch of total settlement and differential settlement less than 0.002L where L is the span distance. We recommend STRATA be retained to observe the foundation installation; including subgrade preparation and structural fill placement and compaction, prior to placing concrete forms or concrete. Observing the subgrade soil improvement process and foundation bearing surfaces allows us to confirm our allowable bearing pressure recommendations and settlement estimates and is an important part of the geotechnical engineering design process.

Concrete Slab-on-Grade Floors

Concrete slab-on-grade floors can be supported directly on the prepared subgrade, as described in the Subgrade Preparation section above. The thickness of the Aggregate Base shall be at least 6 inches below slabs. Floor slabs may be designed for the anticipated use and equipment or storage loading conditions considering a preliminary unit modulus of subgrade reaction “k” value of 175 psi/in (12-inch plate equivalent).

Interior floor slabs may be susceptible to moisture migration caused by capillary action and vapor pressure. If floor coverings such as tile, vinyl, or other “impervious coatings” are planned, a vapor retarder should be used. Where utilized, vapor retarders must consist of a 15-mil, puncture-resistant sheeting, consistent with American Concrete Institute (ACI) Section 302.2R-06 specifications. An example of a common vapor retarder is Stego Wrap™.

The specific location of vapor retarders has been widely discussed in the architectural, structural, construction and geotechnical engineering communities, and differing opinions exist. However, the ACI recommends placement of a vapor retarder directly below the concrete slab. Ultimately, the location of the vapor retarder (if a vapor retarder is specified) should be carefully considered by the owner and architect. Studies have shown that decreased

concrete water-cement ratios, higher strength concrete, and good construction finishing practices significantly decrease any negative impacts associated with placement of the vapor retarder immediately below the concrete slab.

Form stakes or other sub-slab penetrations must not be allowed to puncture the vapor retarder. Manufacturer recommendations for proper sealing of slab-to-wall connections, plumbing, or other penetrations must be followed. Water vapor migration through the concrete floor slab is still possible. Floor covering must be selected accordingly and manufacturer's recommendations followed.

Exterior slabs are susceptible to frost action, which can generate substantial frost heave at certain times of the year. The potential for frost heave may not be acceptable in areas adjacent to the structures that will be exposed to weather. One approach to provide partial frost protection requires removing 60-65 percent of material within the frost depth and replacing it with non-frost susceptible aggregate. Partial frost protection typically allows for up to 1 inch of frost heave. If this method is employed, we recommend placing Granular Structural Fill or Aggregate Base Course below the slabs so that the combined slab and aggregate thickness is 15 inches or greater. Alternatively, if partial frost protection is unacceptable, over-excavation and Granular Structural Fill/Aggregate Subbase Course replacement must be accomplished to the anticipated frost depth (24 inches).

MSE Wall Recommendations

We understand the proposed MSE wall will have Eco Block facing with geotextile reinforcement. We have performed stability analysis on the wall to calculate the minimum tensile strength and length of the reinforcements. Drainage recommendations are also included in this section. The retaining wall was designed assuming a 250 psf traffic surcharge load with wall dimensions provided by Civil Science.

Backfill

The MSE reinforced zone should be backfilled with Aggregate Base Course, with exception of the face drain discussed further in the *Drainage* subsection. Heavy compaction equipment or other construction loads must not to be allowed within 3 feet of the wall face. Hand-operated or lightweight compaction equipment such as vibrating plate compactors and loose lift thicknesses reduced to a maximum of 6 inches must be utilized within 3 feet of the structure.

Reinforcement

We recommend using a woven geotextile with a minimum long term tensile strength of 2000 lbs./ft. The minimum reinforcement length should be 6 feet and placed between blocks at a vertical spacing of 2 feet.

Lateral Earth Pressures

Assuming General Structural Fill as described in this report will be placed behind the retaining walls, we recommend using the following parameters for estimating lateral forces.

- Active earth pressure (wall free to move away from backfill): 37 pounds per square foot per foot of depth (psf/ft).
- At-rest earth pressure: 62 psf/ft.
- Passive earth pressure: 300 psf/ft.
- Coefficient of sliding friction: 0.55.

The values indicated above do not include safety factors. Appropriate safety factors should be included when designing retaining walls to resist lateral earth forces.

Cut-off Barrier

We recommend placing a cut-off barrier along the eastern perimeter of the site as illustrated on Plate 1. The cut-off barrier will extend up to the 100-year floodplain Elevation 3791 feet and down 5 feet below existing grade. Details for the cut-off barrier are presented in Apprendix C. The barrier will be placed behind the reinforced zone of the MSE wall and transition to a 24-inch-wide trench to the north and south of the wall. The cut-off trench sections should be backfilled with native excavated soils re-compacted as General Structural Fill. We recommend using a 30-mil thick PVC or HDPE membrane.

Drainage

Both internal and external drainage measures are recommended for the MSE wall. A surface swale should be constructed at the edge of pavement to mitigate stormwater from sheet flowing over the wall face. The surface swale should have a minimum depth of 4 inches and connect with the stormwater retention ponds/seepage beds. We recommend placing 12 inches of Drainage Aggregate behind the wall face from the top of the wall down to the finished grade below wall to allow water to seep through the block facing.

Pavement Design

We have provided a flexible pavement section for parking lots and drive aisles. The native silt subgrade soil is frost susceptible and pavement sections were designed to provide a minimum 60 percent frost protection. Pavement subgrades should be approved by grading to the finished subgrade elevation and proof compacting the subgrade.

Flexible Pavement

We performed flexible pavement section analyses for the pavement section utilizing the ITD Gravel Equivalency (GE) design method. Based on our understanding of the anticipated traffic, the recommended flexible hot-mix asphalt (HMA) pavement section for the development is presented in Table 4 and will provide a 20-year design for a traffic index of 6.5 or approximately 65,000 ESALS.

Table 4. Flexible Pavement Design Recommendations

HMA (inches)	Aggregate Base (inches)	Granular Subbase[1] (inches)
3	4	8

1. Aggregate Base can be substituted for Granular Subbase to place in fewer lifts.

We recommend Superpave HMA Class SP-2 or SP-3 with PG 64-28 and 1/2-inch nominal aggregate. We also recommend crack maintenance and seal coating be accomplished on all pavement surfaces every 3 to 5 years to reduce the potential for surface water infiltration into the underlying pavement subgrade. Surface and subgrade drainage are extremely important to the performance of the pavement section. Therefore, we recommend the subgrade, base, and asphalt surfaces slope at no less than 2 percent to an appropriate stormwater disposal system or other appropriate location that does not impact adjacent buildings or properties. The pavement's lifespan is dependent on achieving adequate drainage throughout the section, especially at the subgrade elevation. Ponding water at the pavement subgrade surface can induce heaving during the freeze-thaw process.

Utility Trench Backfill

Trenches for utilities should conform to the specifications of the Idaho Standards for Public Works Construction (ISPWC) Section 305 and 306 (ISPWC 2017). Trench backfills below the building foundation should be imported trench backfill, per Section 306.2.3, and compacted to Type A-1 compaction. Loose soil must be removed from the base of trenches prior to placing utility trench bedding. In addition, if water is encountered, it must be removed from the base of the trench before placing bedding.

Site Drainage

We recommend that finished grades be sloped at a minimum of 2 percent away from the proposed structures for a minimum distance of 10-ft and directed to an acceptable collection area/facility. We recommend a minimum buffer of 30 feet from the building perimeter to the infiltration facilities. Infiltration test results are presented in Table 5. We recommend a safety factor of 2 for the field infiltration rate.

Table 5. Infiltration Testing

Location (Depth)	Stratum	Measured Infiltration (in/hr)	Recommended Safety Factor	Design Infiltration (in/hr)
24-STR-TP4 (4')	Silt (ML)	1	2	0.5
24-STR-TP6 (4')	Silt (ML)	1	2	0.5

GEOTECHNICAL DESIGN CONTINUITY

Geotechnical design continuity will be an important aspect of this project's successful completion. In our opinion, geotechnical continuity can occur in the planning, design, and construction project aspects. Specifically, we recommend STRATA maintain the geotechnical design continuity in the following aspects:

Plan and Specification Review

Once project drawings have been produced, STRATA should be notified in order to review the site plan layout and grading plans for the Twin Falls County Jail Modernization and Addition. We recommend STRATA be retained to review final design, construction plans, and specifications to verify our geotechnical recommendations are incorporated into project bidding and construction documents, as well as to provide additional recommendations based on the final design concepts. These efforts can help provide document continuity across the engineering disciplines and reduce the potential for errors as the project concepts evolve.

Geotechnical Design Confirmation

We recommend STRATA be retained to provide geotechnical engineering oversight during site grading, foundation installation, soil improvements, cut-off drain installation, wall construction, and excavation to observe the potential variability in the soil conditions and provide consultation regarding potential impacts on foundation construction.

Construction Observation and Testing

We recommend STRATA be retained to observe foundation soil improvement, excavation, grading, and concrete placement operations for floor slab preparation and shallow foundations. Having STRATA provide inspection and oversight during this process will reduce the potential for any unforeseen construction errors, which may ultimately impact the project. STRATA can also provide construction material testing and special inspections for concrete, masonry, reinforcement, steel/welding, and asphalt. If we are not retained to perform the recommended services, we cannot be responsible for related construction errors or omissions.

EVALUATION LIMITATIONS

This geotechnical engineering evaluation report was prepared to assist in the design, planning, and construction of the proposed Twin Falls County Jail addition at 2515 Wright Avenue in Twin Falls, Idaho. Our services and this report are not applicable to other sites. Our services consist of professional opinions and recommendations made in accordance with generally accepted geotechnical engineering principles and practices as they exist in southern Idaho at the time of this report. This report has been prepared under the premise that STRATA will review the geotechnical aspects of the plans and specifications and will provide geotechnical observation and design verification during construction.

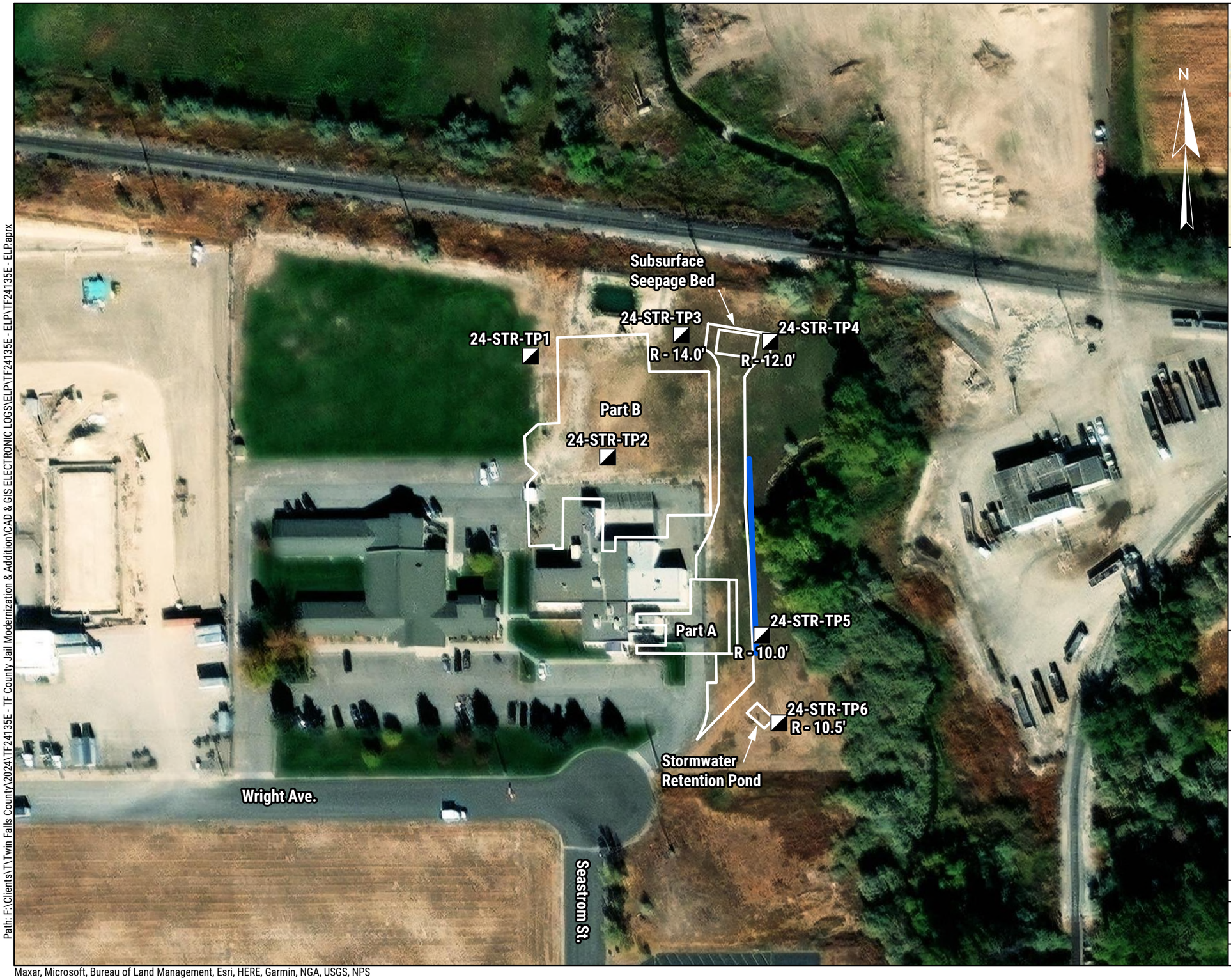
Soil and geologic materials, including groundwater, are variable in nature and conditions can change between exploration locations. These changes can impact construction timing and costs. STRATA's exploration identified the conditions at the time of our site reconnaissance and subsurface evaluation and in the discrete locations explored. This acknowledgment is in lieu of all warranties either express or implied.

This report has been prepared specifically for Twin Falls County and their design team. STRATA cannot be held responsible for unauthorized duplication or reliance upon this report or its contents without written authorization.

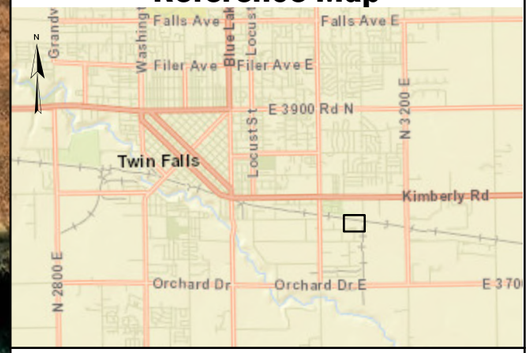
REFERENCES

ASCE. (2016). Minimum Design Loads for Buildings and Other Structures. ASCE/SEI Standard 7-16.

ISPWC. (2020). "IDAHO STANDARDS for PUBLIC WORKS CONSTRUCTION, 2020 Edition". Local Highway Technical Assistance Council (LHTAC), Boise, Idaho



Reference Map



Legend

24-STR-TP1	Approximate location of test pit observed by STRATA on July 19, 2024
R	Depth to Rock in feet
	Retaining Wall

0 50 100 200 Feet

Scale: 1" = 100'

STRATA

EXPLORATION LOCATION PLAN

Twin Falls County Jail
Modernization & Addition
Twin Falls, Idaho

Client: Twin Falls County	
Client File No.: N/A	File No.: TF24135E
Drawn By: G. Morlan	Checked By: C. Medina
Date: 8/1/2024	Plate 1

Path: F:\Clients\T\Twin Falls County\2024\TF24135E - TF County Jail Modernization & Addition\CAD & GIS ELECTRONIC LOGS\ELP\TF24135E - ELP\TF24135E - ELP.aprx

Appendix A
Exploratory Test Pit Logs

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL NAMES
COURSE GRAINED SOIL MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% COARSE FRACTION RETAINED #4 SIEVE	CLEAN GRAVELS WITH LITTLE OR NO FINES		GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES
				GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH >12% FINES		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	SANDS >50% COARSE FRACTION PASSES #4 SIEVE	CLEAN SANDS WITH LITTLE OR NO FINES		SW	WELL-GRADED SANDS, GRAVELY SANDS
				SP	POORLY-GRADED SANDS, GRAVELY SANDS
		SANDS WITH >12% FINES		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND CLAY MIXTURES
FINE GRAINED SOIL MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50	INORGANIC		ML	INORGANIC SILTS, SANDY OR CLAYEY SILTS
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, SANDY OR SILTY CLAYS
		ORGANIC		OL	ORGANIC SILTS AND CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT 50 OR MORE	INORGANIC		MH	INORGANIC SILTS, MICACEOUS SILTS, PLASTIC SILTS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		ORGANIC		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, MUCK AND OTHER HIGHLY ORGANIC SOIL

SHORTHAND NOTATION

SPT - STANDARD PENETRATION TEST
PL - PLASTIC LIMIT
LL - LIQUID LIMIT
PI - PLASTICITY INDEX
MC - MOISTURE CONTENT
DD - DRY DENSITY
WD - WET DENSITY
UC - UNCONFINED COMPRESSION
OC - ORGANIC CONTENT
BGS - BELOW GROUND SURFACE
N.E. - NOT ENCOUNTERED

MATERIAL DESCRIPTION CONTACT

——— DISTINCT SOIL LAYER CONTACT WITHIN SOIL PROFILE

- - - - - - APPROXIMATE SOIL LAYER CONTACT WITHIN SOIL PROFILE

NOTES

1. MIXED UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS ARE USED TO INDICATE DUAL SOIL CLASSIFICATIONS.
2. THE SPT N-VALUE, REPORTED IN BLOWS PER FOOT, IS THE SUM OF THE NUMBER OF BLOWS REQUIRED TO DRIVE THE STANDARD SPLIT SPOON SAMPLER A DISTANCE OF 12-INCHES AFTER AN INITIAL 6-INCHES OF PENETRATION. IF A TOTAL OF 50 BLOWS ARE INSUFFICIENT TO ADVANCE ANY OF THE THREE 6-INCH INTERVALS, THE PENETRATION DEPTH AFTER 50 BLOWS IS ALSO REPORTED.

BORING LOG SYMBOLS

GRAPH SYMBOL	DESCRIPTION
	STANDARD 2-INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER
	MODIFIED CALIFORNIA 3-INCH OUTSIDE DIAMETER SAMPLER
	ROCK CORE
	SHELBY TUBE 3-INCH OUTSIDE DIAMETER SAMPLER

ADDITIONAL MATERIAL SYMBOLS

GRAPH SYMBOL	LETTER SYMBOL	TYPICAL NAMES
	AC	ASPHALT CONCRETE
	CC	CEMENT CONCRETE
	TS	TOPSOIL
	FL	FILL

TEST PIT LOG SYMBOLS

GRAPH SYMBOL	DESCRIPTION
BG	BAGGIE SAMPLE
	BULK SAMPLE
RG	RING SAMPLE

GROUNDWATER SYMBOLS

GRAPH SYMBOL	DESCRIPTION
	GROUNDWATER LEVEL AT TIME OF DRILLING
	GROUNDWATER LEVEL AT END OF DRILLING
	GROUNDWATER LEVEL 24 HOURS AFTER DRILLING COMPLETION
04-10-18	DATE OF GROUNDWATER READING

EXPLORATION LOG KEY - SOIL

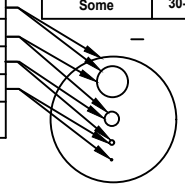
STRATA

GRAIN SIZE

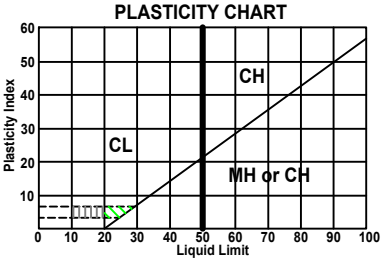
DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		>12"	>12"	Larger than basketball-size.
Cobbles		3" - 12"	3" - 12"	Fist-size to basketball-size.
Gravel	coarse	3/4" - 3"	3/4" - 3"	Thumb-sized to fist sized.
	fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized.
Sand	coarse	#10 - #4	0.079 - 0.19"	Rock salt-sized to pea-sized.
	medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock salt-sized.
	fine	#200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized.
Fines		Passing #200	<0.0029"	Flour-sized and smaller.

MODIFIERS

DESCRIPTION	%
Trace	<5
Few	5-10
Little	15-25
Some	30-45



PLASTICITY CHART



STRATIFICATION

DESCRIPTION	THICKNESS
Parting	1/16 - 1/4"
Lense	1/4 - 4"
Layer	4 - 12"

DESCRIPTION	THICKNESS
Occasional	One or less per foot of thickness.
Frequent	More than one per foot of thickness.

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to touch.
Moist	Slightly damp, some apparent moisture.
Wet	Saturated, visible free water, soil is below water table.

APPARENT RELATIVE DENSITY OF COARSE-GRAINED SOIL

APPARENT DENSITY	SPT blows/ft	CALIFORNIA SAMPLER blows/ft	D & M SAMPLER blows/ft	RELATIVE DENSITY (%)	FIELD TEST
Very Loose	0-4	<4	<5	0-15	Easily penetrated with 1/2" reinforcing rod pushed by hand.
Loose	5-10	5-12	5-15	15-35	Difficult to penetrate with 1/2" reinforcing rod pushed by hand.
Medium Dense	11-30	12-35	15-40	35-65	Easily penetrated a foot with 1/2" reinforcing rod driven with 5-lb hammer.
Dense	31-50	35-60	40-70	65-85	Difficult to penetrate a foot with 1/2" reinforcing rod driven with 5-lb hammer.
Very Dense	>50	>60	>70	85-100	Penetrated only a few inches with 1/2" reinforcing rod driven with 5-lb hammer.

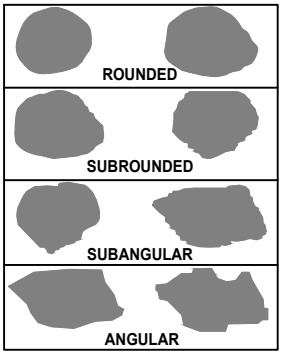
CONSISTENCY FINE-GRAINED SOIL

		TORVANE	POCKET PENETROMETER	
CONSISTENCY	SPT blows/ft	UNDRAINED SHEAR STRENGTH (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	FIELD TEST
Very Soft	<2	<0.125	<0.25	Easily penetrated several inches by thumb. Extrudes between thumb and finger when squeezed in hand.
Soft	2-3	0.125-0.25	0.25-0.5	Penetrated about 1/4 inch by thumb with moderate effort. Molded by strong finger pressure.
Firm	4-7	0.25-0.5	0.5-1.0	Penetrated about 1/4 inch by thumb with moderate effort. Molded by strong finger pressure.
Stiff	8-14	0.5-1.0	1.0-2.0	Indented about 1/2 inch by thumb only with great effort.
Very Stiff	15-30	1.0-2.0	2.0-4.0	Readily indented with difficulty by thumbnail.
Hard	>30	>2.0	>4.0	Indented with difficulty by thumbnail.

REACTION WITH HCl

None	No visible reaction.
Weak	Some reaction, with bubbles forming slowly.
Strong	Violent reaction, with bubbles forming immediately.

PARTICLE SHAPE



CEMENTATION

Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

STRUCTURE

Stratified	Alternating layers of varying material or color with layers at least 1/4" thick; note thickness.
Laminated	Alternating layers of varying material or color with layers at least 1/2" thick; note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small macular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soil, such as small lenses or sand scattered through a mass of clay; note thickness.
Homogeneous	Same color and thickness throughout.

EXPLORATION LOG KEY - SOIL

STRATA

Project: Twin Falls County Jail Addition (TF24135E)

Client: City of Twin Falls

Equipment: 420E

Date Excavated: 07-19-2024

Bucket Width: 24"

Depth to Groundwater: N.E.

Logged By: C. Medina

STRATA

Test Pit:

24-STR-TP1

Depth (ft)	Elevation	USCS Description	Symbol	Sample Type	DCP Blows	DCP Value	Pocket Pen (TSF)	Moisture Content (%)	Dry Density (pcf)	Percent Passing the No. 200 Sieve	Liquid Limit	Plasticity Index	Remarks Note: BGS = Below Ground Surface
0.0	3796.0	**Silt (ML)**, Tan to medium brown, moist, stiff to very stiff, HCl reaction: strong	ML	BG			2.0 2.0 1.5 2.0						Organics in upper 8 inches
2.5													
5.0													
7.5													
10.0													
12.5													
	3782.5	**Sandy Silt (ML)**, Tan, moist, hard, HCl reaction: strong, strong cementation, fine-grained sand (caliche)	ML										
15.0	3781.0	Terminated at 15.0 Feet.											

Latitude: 42.5443
Longitude: -114.43314

Project: Twin Falls County Jail Addition (TF24135E)

Client: City of Twin Falls | **Equipment:** 420E

Date Excavated: 07-19-2024 | **Bucket Width:** 24"

Depth to Groundwater: N.E. | **Logged By:** C. Medina

STRATA

Test Pit:

24-STR-TP2

Depth (ft)	Elevation	USCS Description	Symbol	Sample Type	DCP Blows	DCP Value	Pocket Pen (TSF)	Moisture Content (%)	Dry Density (pcf)	Percent Passing the No. 200 Sieve	Liquid Limit	Plasticity Index	Remarks Note: BGS = Below Ground Surface
0.0	3795.0	**Silt (ML)**, Brown, dry to moist, very stiff to hard, HCl reaction: strong, pinholes present					2.5						Organics in upper 16 inches to 4 feet (big root)
							4.5+						
2.5				■			3.5	8.2		88			
							2.0						
5.0			ML										
7.5													
10.0													Basalt fragments
12.5													
	3781.5												
	3781.0	**Sandy Silt (ML)**, Tan, dry to moist, hard, HCl reaction: strong, strong cementation, fine-grained sand (caliche)	ML										
		Terminated at 14.0 Feet.											

Latitude: 42.54401
Longitude: -114.43285

Project: Twin Falls County Jail Addition (TF24135E)

Client: City of Twin Falls

Equipment: 420E

Date Excavated: 07-19-2024

Bucket Width: 24"

Depth to Groundwater: 12'

Logged By: C. Medina

STRATA

Test Pit:

24-STR-TP3

Depth (ft)	Elevation	USCS Description	Symbol	Sample Type	DCP Blows	DCP Value	Pocket Pen (TSF)	Moisture Content (%)	Dry Density (pcf)	Percent Passing the No. 200 Sieve	Liquid Limit	Plasticity Index	Remarks Note: BGS = Below Ground Surface
0.0	3792.0	**Silt (ML)**, Brown, dry to wet, very stiff to hard, HCl reaction: strong, pinholes present					4.5+						Organics in upper 18 inches.
							3.5						
2.5								18.6		91			
							2.5						
							2.5						
5.0													
			ML	BG				27.3		98	25	3	
7.5													
10.0													
12.5	3778.0												Terminated at 14 feet BGS due to basalt.

Terminated at 14.0 Feet.

Latitude: 42.45506
Longitude: -114.4328

Project: Twin Falls County Jail Addition (TF24135E)

Client: City of Twin Falls

Equipment: 420E

Date Excavated: 07-19-2024

Bucket Width: 24"

Depth to Groundwater: N.E.

Logged By: C. Medina

STRATA

Test Pit:

24-STR-TP4

Depth (ft)	Elevation	USCS Description	Symbol	Sample Type	DCP Blows	DCP Value	Pocket Pen (TSF)	Moisture Content (%)	Dry Density (pcf)	Percent Passing the No. 200 Sieve	Liquid Limit	Plasticity Index	Remarks Note: BGS = Below Ground Surface
0.0	3790.0	**Silt (ML)**, Brown, dry to moist, stiff to very stiff, HCl reaction: strong, pinholes present	ML				3.0 2.5 1.0 1.0						Organics in upper 6 inches. Field Infiltration Rate = 1 in/hr
12.0	3778.0	Terminated at 12.0 Feet.											Terminated at 12 feet BGS due to basalt Latitude: 42.54433 Longitude: -114.43222

Project: Twin Falls County Jail Addition (TF24135E)

Client: City of Twin Falls

Equipment: 420E

Date Excavated: 07-19-2024

Bucket Width: 24"

Depth to Groundwater: N.E.

Logged By: C. Medina

STRATA

Test Pit:

24-STR-TP5

Depth (ft)	Elevation	USCS Description	Symbol	Sample Type	DCP Blows	DCP Value	Pocket Pen (TSF)	Moisture Content (%)	Dry Density (pcf)	Percent Passing the No. 200 Sieve	Liquid Limit	Plasticity Index	Remarks Note: BGS = Below Ground Surface
0.0	3793.0	**Silt (ML)**, Brown, dry to moist, very stiff to hard, HCl reaction: strong, pinholes present	ML				4.0 4.5+ 3.0 2.0						Organics in upper 12 inches.
2.5													
5.0													
7.5													
10.0	3783.0	Terminated at 10.0 Feet.											Terminated at 10 feet BGS due to basalt

Latitude: 42.5435
Longitude: -114.43227

TEST PIT - STRATA PROJECT.GDT - 8/15/24 12:35 - F:\CLIENTS\TI\TWIN FALLS COUNTY\2024\TF24135E - TF COUNTY JAIL MODERNIZATION & ADDITION\CAD & GIS ELECTRONIC LOGS\BORING-TEST PIT LOGS\TF24135E LOGS.GPJ

Project: Twin Falls County Jail Addition (TF24135E)

Client: City of Twin Falls

Equipment: 420E

Date Excavated: 07-19-2024

Bucket Width: 24"

Depth to Groundwater: N.E.

Logged By: C. Medina

STRATA

Test Pit:

24-STR-TP6

Depth (ft)	Elevation	USCS Description	Symbol	Sample Type	DCP Blows	DCP Value	Pocket Pen (TSF)	Moisture Content (%)	Dry Density (pcf)	Percent Passing the No. 200 Sieve	Liquid Limit	Plasticity Index	Remarks Note: BGS = Below Ground Surface
0.0	3793.0	**Silt (ML)**, Brown, dry to moist, very stiff to hard, HCl reaction: strong, pinholes present	ML	BG			3.0	8.9		96			Organics in upper 16 inches
							4.0						
2.5							4.5+						
							2.0						Field Infiltration Rate = 1 in/hr
5.0													
7.5													
10.0	3782.5												Terminated at 10.5 feet BGS due to basalt

Terminated at 10.5 Feet.

Latitude: 42.54325
Longitude: -114.43221

Appendix B
Laboratory Test Results

STRATA

Summary of Laboratory Test Results

Project: Twin Falls County Jail Modernization & Addition
Client: Twin Falls County

Project Number: TF24135E
Date: 7/31/2024

Boring	Depth, feet	Soil Classification (USCS)	In Situ Moisture, %	Passing No. 200,%	Atterberg Limits LL	PL	PI	Fines Class.
24-STR-TP2	2.75-3.25	Silt (ML)	8.2	88	-	-	-	ML
24-STR-TP3	2.5-3.0	Silt (ML)	18.6	91	-	-	-	ML
24-STR-TP3	6.5-7.5	Silt (ML)	27.3	98	25	22	3	ML
24-STR-TP6	0.0-1.0	Silt (ML)	8.9	96	28	23	5	ML

Reviewed By:

Zach Lootens
Project Engineer

ASTM D2435

Report Date: 07/30/2024

Boise
8653 W. Hackamore Dr
Boise, ID 83709
Phone: 208.376.8200

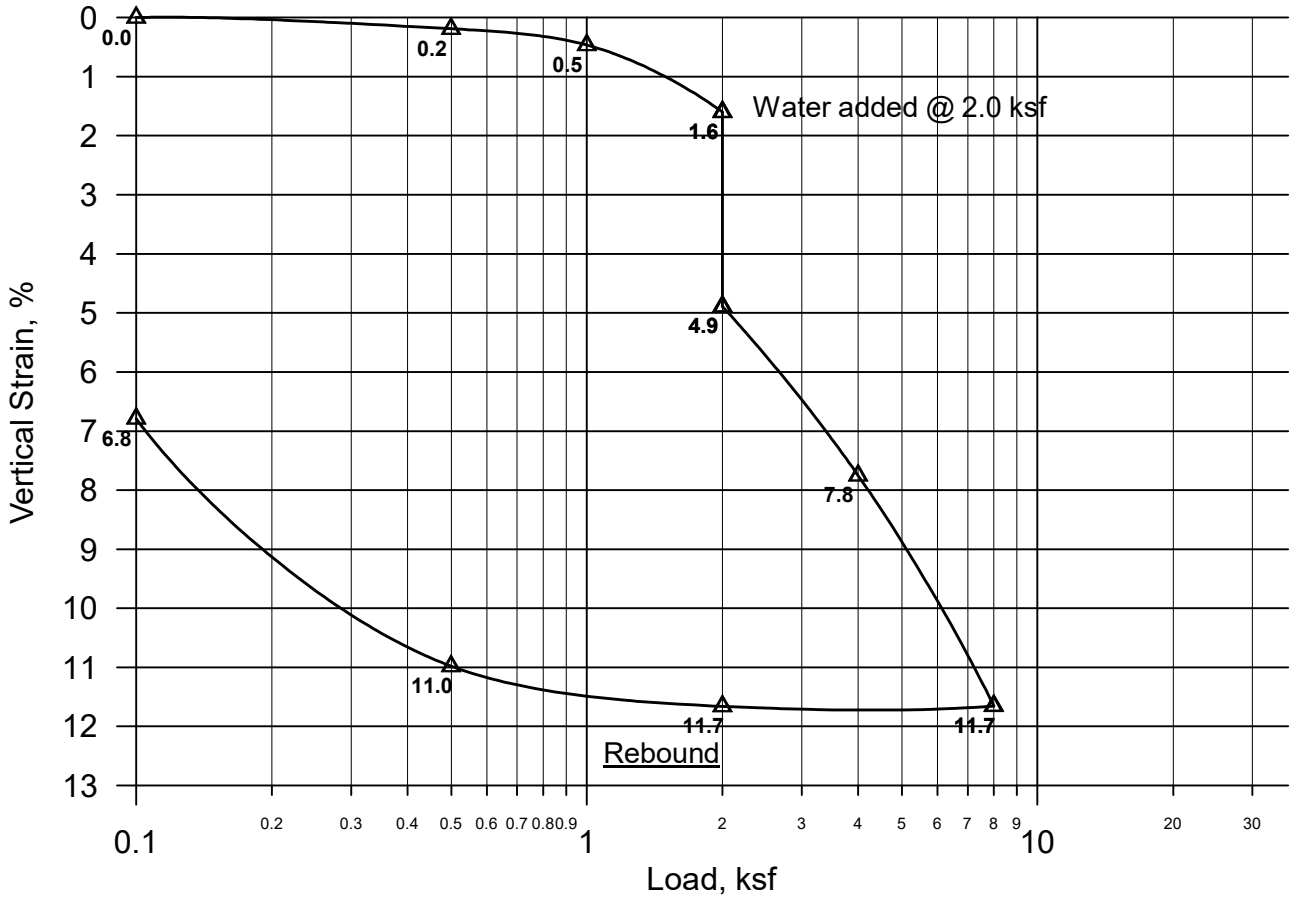
Client
Twin Falls County

Project
TF24135E
Twin Falls County Jail Modernization and Addition

SAMPLE INFORMATION

SAMPLE No.:	54145	**SAMPLE DATE:**	07/17/2024	**BORING No.:**	24-STR-TP3
SPECIMEN SIZE:	Shelby Tube	**TEST DATE:**	07/23/2024	**DEPTH (FT):**	2.5-3.0
USCS CLASSIFICATION:	[USCS Classification]	**SAMPLED BY:**	J. Marsh	**SAMPLE CONDITION:**	Good
		TESTED BY:	V. Barinaga		

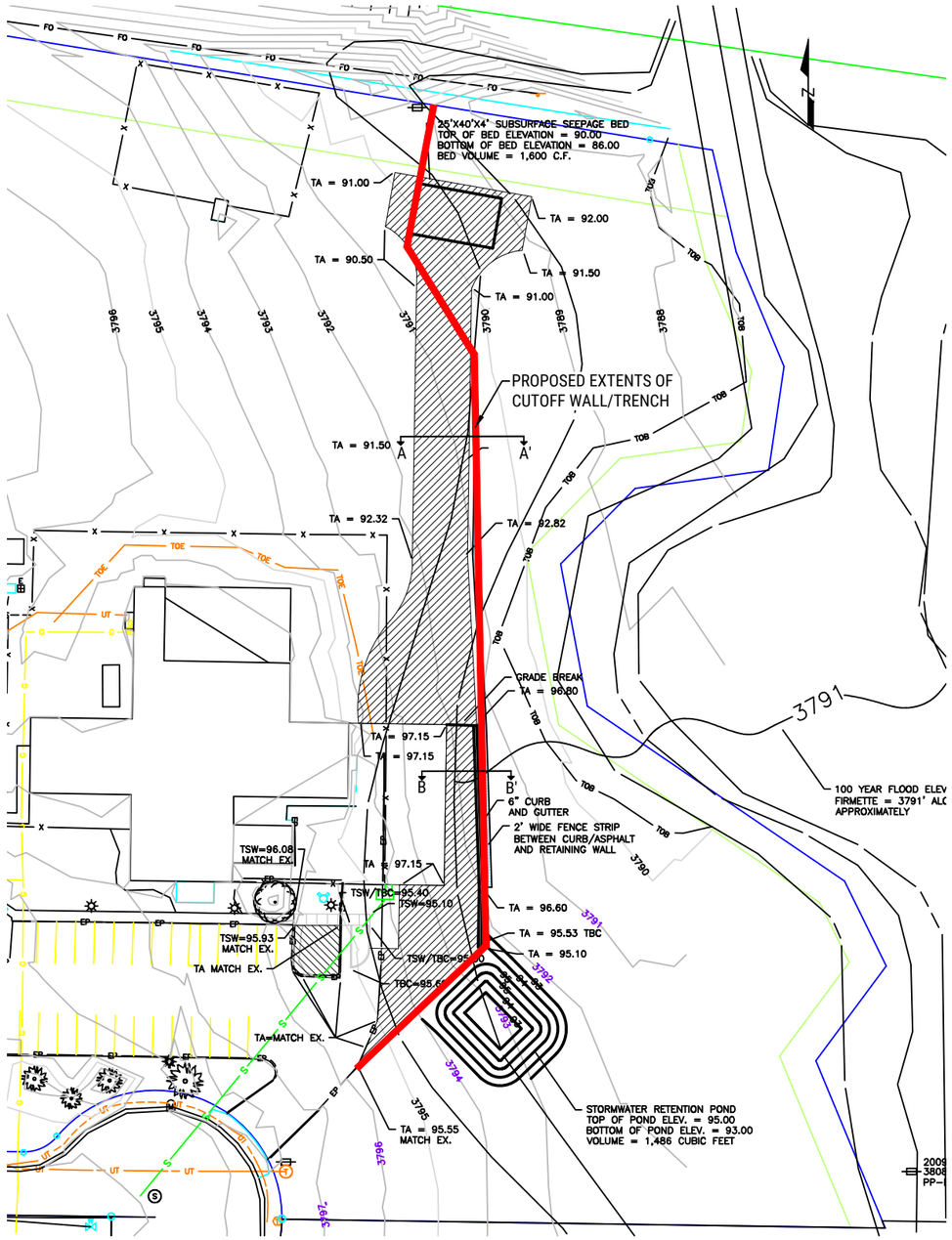
APPARATUS:	Humboldt Load Frame	**INITIAL MOISTURE CONTENT:**	18.6%
SAMPLE PREP:	Intact	**FINAL MOISTURE CONTENT:**	25.4%
TEST WATER:	Tap	**DRY UNIT WEIGHT:**	87.9 pcf



REMARKS:

Reviewed by Keith Wildman
Laboratory Services Coordinator

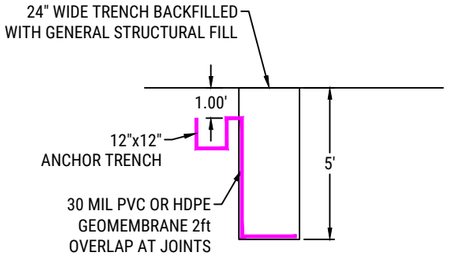
Appendix C
Cut-off Barrier and MSE Wall Detail



PLAN VIEW

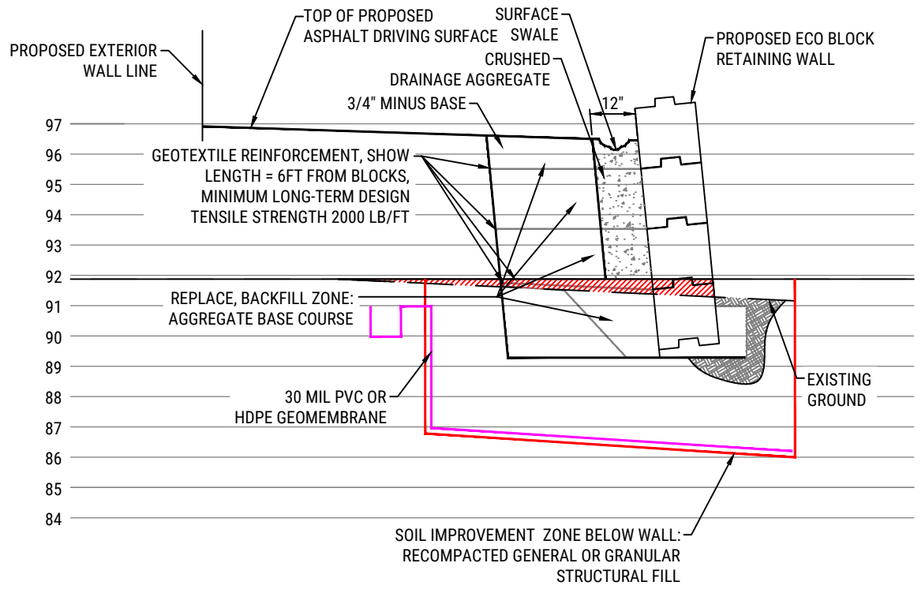
0' 70'

SCALE: 1" = 70'



CUTOFF TRENCH (A-A')

SCALE: 1" = 5'



RETAINING WALL CUTOFF DETAIL (B-B')

SCALE: 1" = 5'

CUT-OFF BARRIER AND MSE WALL DETAIL
TF COUNTY JAIL MODERNIZATION & ADDITION
TWIN FALLS, IDAHO

STRATA

Project No.: TF24135	Drawing By: G. MORLAN
Client: TWIN FALLS COUNTY	Checked By: Z. LOOTENS
Plate: APPENDIX C1	Date: 8/15/2024