SPECIFICATIONS

FOR:

KIMBERLY SCHOOL DISTRICT

AG SHOP ADDITION

KIMBERLY, IDAHO

Laughlin Ricks Architecture

architecture/planning

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PART 1 GENERAL

1.1 SECTION INCLUDES

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

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

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

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

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

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

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

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

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

1.2 CASH ALLOWANCES

A. None

1.3 SCHEDULE OF VALUES

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

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

1.4 APPLICATIONS FOR PAYMENT

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

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

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

1.5 CHANGE PROCEDURES

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

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

1.6 COORDINATION

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

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

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

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

1.7 FIELD ENGINEERING

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

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

1.8 CUTTING AND PATCHING

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

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

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

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

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

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

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

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

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

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

G. Refinish surfaces to match adjacent finishes.

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

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

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

1.9 SUBMITTAL PROCEDURES

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

B. The General Contractor shall review all submittals prior to submitting to Owner. The responsibility to properly review and coordinate the submittals is solely the Contractor's and

is the means by which the Contractor can confirm that the products, materials, systems, etc., by his Subcontractors will be constructed in accordance with the Contract Documents. Review of each submittal by the Architect and the Engineer shall not be construed as a complete or comprehensive check. The Architect/Engineer review shall not relieve the Contractor from responsibility for errors which may exist in the submittal.

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

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

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

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

1.10 CONSTRUCTION PROGRESS SCHEDULES

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

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

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

1.11 PROPOSED PRODUCTS LIST

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

1.12 PRODUCT DATA

A. Product Data for Review:

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

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

B. Product Data for Information:

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

C. Product Data for Project Close-out:

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

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

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

1.13 SHOP DRAWINGS

A. Shop Drawings for Review:

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

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

B. Shop Drawings for Information:

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

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

1.14 SAMPLES

A. Samples for Review:

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

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

B. Samples for Selection:

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

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

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

1.15 MANUFACTURER INSTALLATION INSTRUCTIONS

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

1.16 MANUFACTURER CERTIFICATES

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

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

1.17 QUALITY ASSURANCE - CONTROL OF INSTALLATION

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

B. Comply with manufacturers' instructions.

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

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

1.18 EXAMINATION

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

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

1.19 PREPARATION

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

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

1.20 TOLERANCES

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

B. Comply fully with manufacturers' tolerances.

1.21 REFERENCES

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

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

1.22 INSPECTION AND TESTING LABORATORY SERVICES

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

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

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

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

1.23 TEMPORARY ELECTRICITY

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

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

1.24 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

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

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

C. Permanent building lighting may be utilized during construction

1.25 TEMPORARY HEAT

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

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

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

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

1.26 TEMPORARY VENTILATION

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

1.27 TELEPHONE SERVICE

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

1.28 TEMPORARY WATER SERVICE

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

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

1. Local police and fire department
2. Doctor/emergency room.
3. Ambulance service.
4. Contractor’s office.
5. Architects office.
6. Engineers’ offices.

7. Owner's office.
8. Principal sub-contractor's offices.

1.29 TEMPORARY SANITARY FACILITIES

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

B. Contractor shall maintain in clean and sanitary condition.

1.30 WATER CONTROL

A. Contractor shall provide water to control dust.

1.31 INTERIOR ENCLOSURES

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

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

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

1.32 PROTECTION OF INSTALLED WORK

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

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

1.33 SECURITY

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

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

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

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

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

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

1.34 PROGRESS CLEANING AND WASTE REMOVAL

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

1.35 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

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

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

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

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

1.36 PRODUCTS

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

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

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

2. Arrange and pay for product delivery to site.

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

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

C. Contractor's Responsibilities.

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

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

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

4. Repair or replace items damaged after receipt.

1.37 TRANSPORTATION, HANDLING, STORAGE AND PROTECTION

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

1.38 PRODUCT OPTIONS

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

1.39 SUBSTITUTIONS

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

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

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

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

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

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

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

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

6. Project Schedule will not be altered.

1.40 STARTING SYSTEMS

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

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

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

1.41 DEMONSTRATION AND INSTRUCTIONS

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

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

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

1.42 TESTING, ADJUSTING, AND BALANCING

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

1.43 OPPERATIONS, TERMINATION AND REMOVAL:

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

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

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

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

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

1.44 CONTRACT CLOSEOUT PROCEDURES

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

B. In ordered to achieve Substantial Completion:

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

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

3. Provide the following:

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

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

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

1) Complete final cleanup requirements including finishing of flooring.

C. Architect's Review Procedures

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

within a reasonable time or will advise Contractor in writing of unfulfilled requirements.

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

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

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

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

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

1.45 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

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

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

D. Replace filters of operating equipment.

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

F. Glass: Clean all glass inside and outside.

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

flooring. Coordinate with Owner for product used and include instructions for flooring maintenance in Operations and Maintenance Manual.

1.46 ADJUSTING

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

1.47 PROJECT RECORD DOCUMENTS

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

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

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

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

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

1.48 OPERATION AND MAINTENANCE DATA

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

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

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

D. Contents: Include at least the following:

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

2. Copy of all guarantees and warranties issued.

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

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

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

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

1.49 WARRANTIES

A. Provide duplicate notarized copies.

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

C. Submit prior to final Application for Payment.

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

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

1.50 NOISE, LANGUAGE, TOBACCO AND FIREARMS

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

B. Loud or abusive language will not be tolerated by any person on the project site. In the event that any person generates such language and fails to conduct themselves in a proper

manner or practices loud and/or abusive language, they shall be informed by the Contractor of these provisions and if repeated, shall be dismissed from the site by the Contractor. Contractor shall have the responsibility to see that such behavior is not tolerated or allowed on site and be responsible for removal of those not in compliance with the above requirements.

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

2 PART 2 - PRODUCTS

Not Used.

3 PART 3 - EXECUTION

Not Used.

END OF SECTION

Section 013500 – PROJECT ALTERATION PROCEDURES

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

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

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

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

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

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

1.2 QUALITY ASSURANCE

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

1.3 SUBMITTALS

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

PART 2 - PRODUCTS

2.1 GENERAL

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

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

2.2 PRODUCTS FOR PATCHING WORK

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

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

PART 3 - EXECUTIONS

3.1 PREPARATION

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

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

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

3.2 INSTALLATION

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

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

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

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

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

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

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

3.3 REPAIR OF DAMAGED SURFACES

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

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

3.4 FINISHES

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

3.5 CLEANING

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

END OF SECTION

SECTION 017000 - SELECTIVE DEMOLITION

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. This Section includes but is not limited to:

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

1.2 DEFINITIONS

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

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

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

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

1.3 MATERIALS OWNERSHIP

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

END OF SECTION

SECTION 022300 – SITE CLEARING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Removal of surface debris and deleterious matter.

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

C. Removal of asphalt and concrete.

1.2 REGULATORY REQUIREMENTS

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

B. Coordinate clearing Work with utility companies.

PART 2 PRODUCTS

2.1 MATERIALS

None specified.

PART 3 EXECUTION

3.1 PROTECTION

A. Identify and protect utilities from damage.

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

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

3.2 CLEARING

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

B. Remove surface rock.

3.3 ROUGH GRADING

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

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

C. Notify utility company to remove and relocate utilities.

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

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

3.4 CLEAN UP

A. Remove debris and rock from site.

END OF SECTION

SECTION 023000 – EARTHWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

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

PART 2 PRODUCTS

1.2 SOIL MATERIALS

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

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

1.3 FILL MATERIALS

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

1. 100% passing through ¾ inch sieve.

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

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

1. Minimum Size: ¼ inch

2. Maximum Size: 5/8 inch

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

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

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

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

PART 3 – EXECUTION

1.4 EXAMINATION AND PREPARATION

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

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

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

D. Maintain and protect existing utilities to remain.

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

1.5 PROTECTION OF ADJACENT WORK

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

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

1.6 TOPSOIL EXCAVATING

A. Do not excavate wet topsoil.

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

1.7 SUBSOIL EXCAVATING

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

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

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

D. Correct unauthorized excavation at no cost to Owner.

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

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

1.8 Trenching

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

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

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

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

E. Backfill trenches required contours and elevations.

F. Place and compact fill materials as for backfilling.

1.9 BACKFILLING

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

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

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

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

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

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

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

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

1.10 PLACING BUILDING PAD

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

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

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

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

3.8 PLACING STOCKPILED TOP SOIL

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

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

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

D. Lightly compact and roll placed topsoil.

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

3.9 TESTS

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

3.10 TOLERANCES

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

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

3.11 SCHEDULE

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

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

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

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

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

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

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

END OF SECTION

SECTION 023000 – LANDSCAPE IRRIGATION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes pipe and fittings, valves, sprinkler heads, accessories, and controls.

System shall be design/build with approval by Owner and Architect.

1.2 SYSTEM DESCRIPTION

A. Electric solenoid controlled underground irrigation system, with pressure blow-out drain.

1.3 SUBMITTALS

A. Shop Drawings: Indicate piping layout to water source, location of sleeves under pavement, location and coverage of sprinkler heads, controller, plant and landscaping features, site structures, schedule of fittings to be used.

B. Product Data: Submit component and control system and wiring diagrams.

1.4 MAINTENANCE SERVICE

A. Furnish manufacturer's maintenance services on equipment and accessory items for one year from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 LANDSCAPE IRRIGATION

A. Manufacturers:

1. Hunter (commercial grade)
2. Rainbird (commercial grade)
3. Toro (commercial grade)
4. or other approved equal (commercial grade) system.

2.2 MATERIALS

A. Pipe: PVC schedule 40; solvent-weld sockets.

B. Fittings: Type and style of connection to match pipe.

C. Rotary Type Sprinkler Head: Fixed pop-up type with screens; fully adjustable for flow and pressure; size as required.

D. Spray Type Sprinkler Head: Pop-up head with adjustable heads, as required.

E. Emitter: Adjustable outlet, non-clogging.

F. Bubbler: Adjustable outlet.

G. Or approved.

2.3 VALVES

A. Gate valves: Bronze construction, non-rising stem, Inside screw with threaded ends.

B. Backflow Preventers: Brass body construction, double check valve type.

C. Valve Box and Cover: Fiberglas

2.4 CONTROLS

A. Controller: Rainbird ESP-LX or approved equal (commercial grade).

B. Electric solenoid valve

C. Wire: Single copper conductor, direct burial type.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify field conditions and location of existing utilities are acceptable.

B. Piping layout indicated is diagrammatic only. Route piping to avoid plants and structures.

3.2 INSTALLATION

A. Trench the minimum 18 inch depth.

B. Install pipe, valves, controls, and outlets.

C. Set sprinkler heads and box covers at finish grade elevations.

D. Landscape Irrigation System: Shall provide 100% overlap coverage.

E. Adjust control system to achieve time cycles required.

3.3 BACKFILLING

A. Prior to backfilling, test system for leakage at main piping to maintain 100 psi pressure for one hour. System is acceptable when no leakage or loss of pressure occurs during test period.

B. Backfill trench and compact to subgrade elevation with rock and debris-free site soil.

END OF SECTION

SECTION 029000 – LANDSCAPE PLANTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preparation of soil, placement of plant life and fertilizer.

B. Landscaping includes purchase, delivery and installation of trees, plants, and ground cover.

1.2 QUALITY CONTROL

A. Nursery: Company specializing in landscape planting with minimum 5 years experience in growing and cultivating the plant life specified in this Section.

B. Maintenance Services: Performed by installer

1.3 WARRANTY

A. Provide one year warranty on plant life, including one continuous growing season, with coverage of plants that die or do not thrive due to unhealthy conditions.

B. Replacements: Plants of same size and species as specified, planted in the next growing season with a new warranty beginning on date of replacement.

1.4 MAINTENANCE SERVICE

A. Maintain plant life for 1 year from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 TREES, PLANTS AND GROUND COVER

A. Trees, Plants and Ground Cover: Species and size identified in Plant Schedule as indicated on Drawings, grown in climatic conditions similar to those in locality of the Work.

2.2 SOIL AND SOIL MODIFICATION MATERIALS

A. Topsoil: Fertile agricultural soil typical for locality, capable of sustaining vigorous plant growth, free of subsoil, clay or impurities, plants, weeds and roots.

B. Fertilizer: As required for healthy plant growth.

2.3 ACCESSORIES

A. Wood Stakes: Softwood, sufficient size and length to ensure anchorage.

B. Herbicide: As required for local conditions.

C. Pesticide: As required for local conditions.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that existing and required underground utilities are in proper location.

B. Prepare subsoil to eliminate uneven areas. Maintain profiles and contours. Make changes in grade gradual. Blend slopes into level area.

3.2 PLANTING

A. Set plants in pits or beds partly filled with prepared topsoil mixture. Backfill soil mixture.

B. Saturate soil with water when the pit or bed is half full of top soil and again when full.

3.3 MAINTENANCE

A. Control growth of weeds. Apply herbicides and pesticides in accordance with manufacturer's instructions.

B. Prune and spray trees and plants as required for one complete year growth cycle for health and vigorous growth. Show as per proposal requirements, Article 1.2 B.

END OF SECTION

SECTION 033000 - CONCRETE

PART 1 GENERAL

1.1 SUMMARY

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

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

1.2 DEFINITIONS

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

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

1.3 SUBMITTALS

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

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

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

1.4 PREINSTALLATION MEETING

A. Preinstallation Conference: Conduct conference at Project site

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

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

1.3 QUALITY ASSURANCE

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

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

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

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

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

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

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

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

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

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

B. TESTING

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

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

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

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

PART 2 PRODUCTS

2.1 FORM MATERIALS

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

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

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

2.2 REINFORCING MATERIALS

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

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

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

2.3 CONCRETE MATERIALS

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

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

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

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

E. Fabricate concrete reinforcing in accordance with ACI 315.

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

a. Portland Cement ASTM C 150, Type II Preferred

b. Use cement that exhibits low shrinkage characteristics.

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

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

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

2. Provide aggregates that test low in alkalinity.

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

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

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

G. Water: Drinkable with low alkaline characteristics.

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

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

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

    a. "Air-Tite," Cormix.

    b. "Air-Mix" or "Perma-Air," Euclid Chemical Co.

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

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

    e. "Sealtight AEA," W.R. Meadows, Inc.

    f. "Sika AER," Sika Corp.

    g. or Approved.

2.4 RELATED MATERIALS

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

1. Polyethylene film per ACI 302.1R.

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

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

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

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

    b. "Flo-Top," Euclid Chemical Co.

    c. "Pourcrete," Master Builders, Inc.

    d. "Thoro Underlayment Self-Leveling," Thoro System Products.

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

D. Bonding Compound: Polyvinyl acetate or acrylic base.

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

   a. Acrylic or Styrene Butadiene:

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

      2) "SBR Latex," Euclid Chemical Co.

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

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

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

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

      7) or Approved.

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

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

2.5 PROPORTIONING AND DESIGNING CONCRETE MIXES

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

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

   2. No fly-ash will be allowed in the mix design.

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

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

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

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

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

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

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

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

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

2. Reinforced foundation systems: 4 inches maximum.

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

2.6 ADMIXTURES

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

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

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

2.7 CONCRETE MIXING

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

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

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

PART 3 EXECUTION

3.1 GENERAL

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

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

3.2 FORMS

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

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

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

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

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

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

3.3 PLACING REINFORCEMENT

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

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

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

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

3.4 JOINTS

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

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

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

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

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

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

3.5 INSTALLATION OF EMBEDDED ITEMS

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

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

3.6 PREPARATION OF FORM SURFACES

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

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

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

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

3.7 CONCRETE PLACEMENT

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

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

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

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

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

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

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

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

3. Maintain reinforcing in proper position during concrete placement.

4. Place expansion joint material.

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

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

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

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

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

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

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

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

I. Slab Tolerances:

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

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

3.8 FINISH OF FORMED SURFACES

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

B. Smooth Form Finish: For formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, damp proofing, veneer plaster, painting, or other similar

system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.

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

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

3.9 MONOLITHIC SLAB FINISHES

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

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

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

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

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

1. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance. Grind smooth surface defects which would telegraph through applied floor covering system.

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

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

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

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

3.10 MISCELLANEOUS CONCRETE ITEMS

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

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

3.11 CONCRETE CURING AND PROTECTION

A. General: Concrete Cure Finishing System

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

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

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

2) Mechanical:

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

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

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

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

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

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

1. Follow GreenIce Manufacturer installation procedure.

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

3.12 SHORES AND SUPPORTS

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

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

3.13 REMOVAL OF FORMS

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

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

3.14 REUSE OF FORMS

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

3.15 CONCRETE SURFACE REPAIRS

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

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

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

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

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

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

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

3.16 QUALITY CONTROL TESTING DURING CONSTRUCTION

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

B. Sampling and testing for quality control will occur during placement of concrete. Cooperate with the testing laboratory to provide cylinders for compressive tests, samples of the materials for slump tests, air content and temperature, and access to the work. Test results will be reported in writing to the Architect and the Contract Officer for distribution.

C. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

3.17 STANDARD FF/FL SPECIFICATION

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

END OF SECTION 033000

SECTION 042000 – MASONRY

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes but is not limited to:

1. Provide concrete masonry unit (CMU) work.

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

1.2 PERFORMANCE REQUIREMENTS

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

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

a. F'm =2000 psi.

1.3 SUBMITTALS

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

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

1. After review and approval, submit to Architect.

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

1. Indicate locations of penetrations, embedments, etc.

2. After review and approval, submit to Architect.

D. Samples for initial selection purposes of the following:

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

a. After review and approval, submit to Architect.

E. Samples for verification purposes of the following:

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

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

a. Submit to Architect

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

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

2. Each material and grade indicated for reinforcing bars.

3. Each type and size of joint reinforcement.

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

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

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

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

3. Masonry units.

1.4 QUALITY ASSURANCE

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

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

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

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

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

1. Locate mock-ups on site.

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

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

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

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

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

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

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

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

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

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry materials to project in undamaged condition.

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

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

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

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

1.6 PROJECT CONDITIONS

A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

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

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Remove immediately any grout, mortar, and soil that come in contact with such masonry.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

PART 2 PRODUCTS

2.1 MANUFACTURERS

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

1. Concrete Masonry Units and Ground Face Units:

a. Basalite (Design Standard).

b. Oldcastle Materials

c. Or Approved.

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

a. Davis Colors (Design Standard).

b. Lafarge Corporation.

c. Or Approved.

3. Mortar Pigments:

a. Davis Colors (Design Standard).

b. Lafarge Corporation.

c. Or Approved.

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

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

2.2 CONCRETE MASONRY UNITS

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

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

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

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

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

2. Weight Classification: Medium weight.

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

4. Provide Type I, moisture-controlled units.

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

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

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

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

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

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

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

6. Color: Standard Gray.

2.3 MORTAR AND GROUT MATERIALS

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

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

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

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

   a. Color: 1% “Wheat.”

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

1. Mortar color: 1% “Wheat.”

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

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

F. Aggregate for Grout: ASTM C 404.

G. Water: Clean and potable.

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

1. Colored Portland Cement-Lime Mix:

a. Color Mortar Blend; Glen-Gery Corporation.

b. Centurion Colorbond PL; Lafarge Corporation.

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

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

2. Mortar Pigments:

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

b. Centurion Pigments; Lafarge Corporation.

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

2.4 REINFORCING STEEL

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

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

B. Deformed Reinforcing Wire: ASTM A 496.

2.5 JOINT REINFORCEMENT

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

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

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

2.6 TIES AND ANCHORS

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

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

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

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

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

C. Adjustable Masonry-Veneer Anchors

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

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

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

a. Available Manufacturers:

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

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

3) Blok-Lok "BL 210."

2.7 FOAM-IN-PLACE INSULATION

A. Foamed-In-Place Thermal Insulation: Foamed-in-place plastic thermal insulation materials shall have UL 94 flammability classification and be tested for thermal characteristics per ASTM C177-76.

1. R Value per 1": 5.0 at 25 degrees Fahrenheit.

2. Flame Spread: Class 1. B. Materials: Manufacturer offering products that may be incorporated in the work include the following:

B. Approved Manufacturers

1. cfiFOAM, Inc. (CoreFoam) (Complying Example).

2. Polymaster R-501. Other Manufacturers:

3. Request approval.

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 N.

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 or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

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

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

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

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

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

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

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

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:

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

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

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

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

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

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

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

3.6 CAVITIES

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

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

3.7 HORIZONTAL JOINT REINFORCEMENT

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

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

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

3.8 ANCHORING MASONRY TO STRUCTURAL MEMBERS

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

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

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

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

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

3.9 ANCHORING MASONRY VENEERS

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

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

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

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

3.10 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where indicated and wherever openings of more than 1'-0” for brick size units and 2'-0” for block size units are indicated without structural steel or other supporting lintels. Provide precast or formed-in-place masonry lintels. Cure precast lintels before handling and installation. Temporarily support formed-in-place lintels.

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

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

3.11 FLASHING, WEEP HOLES, AND VENTS AND REGLETS.

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

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

C. Install flashing as follows:

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

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

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

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

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

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

2. Space weep holes 32 inches o.c.

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

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

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

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

3.12 INSTALLATION OF REINFORCED UNIT MASONRY

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

a. Provide cleanout holes at each vertical reinforcing bar.

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

3.13 FIELD QUALITY CONTROL

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

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

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

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

a. Cast 6-2x4 mortar samples (one set) per day of operation (three specimens tested at 7 days and the other three tested at 28 days).

3. Grout compressive strength will be sampled and tested per ASTM C 1019.

a. Cast 3-4x8 grout prisms (one set) per day of operation (1 specimen tested at 7 days and the other two specimens tested at 28 days).

C. Prism Test Method: For each type of wall construction indicated, masonry prisms will be tested per ASTM E 447, Method B, and as follows:

1. Prepare one set of prisms for testing at 7 days and one set for testing at 28 days.

D. Evaluation of Quality Control Tests: In absence of other indications of noncompliance with requirements, masonry will be considered satisfactory if results from construction quality control test comply with minimum requirements indicated.

3.14 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units and in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point- up all joints including corners, openings, and adjacent construction to provide a neat, uniform appearance, prepared for application of sealants.

C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

2. Test cleaning methods on sample wall panel; leave 1/2 panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.

3. Protect adjacent concrete precast units and non masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.

4. Saturate wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.

5. Clean concrete unit masonry to comply with by means of cleaning method indicated in masonry manufacturer's directions and applicable NCMA “TEK” bulletins and as approved by masonry special coating manufacturer.

6. Use extreme care and provide all measures necessary to prevent migration or application of cleaning materials onto other parts of the work such as metal window frames, flashings, etc. Complete correct or replace any damaged materials or assemblies.

3.15 MASONRY SEALER/WATER REPELLENT (NON-PAINTED SURFACES)

A. Apply masonry sealer in strict accordance with manufacturer's instructions over surfaces prepared, cleaned and in condition acceptable to sealer/water repellent manufacturer.

1. Verify that moisture in unit masonry is at or below recommended levels prior to applications of masonry sealer.

B. Installer and equipment used shall be as required and certified by water repellent manufacturer.

C. Apply water repellent/sealer by spray application or as otherwise approved, fully flooding surface with a minimum application rate of 1 gallon of material per 100 s.f. of masonry surface.

D. Protect all surfaces not to receive sealer by covering, masking, provision of drop cloths, etc. Fully correct all damage to satisfaction of Architect.

3.16 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to installer, which ensures unit masonry work being without damage and deterioration at time of Substantial Completion.

END OF SECTION 042000

SECTION 041000 – MASONRY MORTAR AND GROUT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Mortar and grout for Masonry

1.2 SUBMITTALS

A. Samples: Submit two samples of mortar illustrating mortar color and color range.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 530 and ACI 530.1.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Hot Weather Requirements: IMIAC – Recommended Practices and Guide Specifications for Hot Weather Masonry Construction.

PART 2 PRODUCTS

2.1 MATERIALS

A. Portland Cement: ASTM C150, Type I, gray color.

B. Mortar Aggregate: ASTM C144, standard masonry type.

C. Hydrated Lime: ASTM C207, Type S

D. Mortar Color: Mineral oxide pigment; color as selected.

E. Grout Aggregate: ASTM C404

F. Water: Clean and potable.

G. Bonding Agent: Epoxy type.

2.2 MORTAR MIXES

A. Mortar for Brick Veneer: ASTM C270, Type S using the Property Method.

2.3 MORTAR MIXING

A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C270.

B. Add mortar color and admixtures in accordance with manufacturer's instructions.

C. Do not use anti-freeze compounds to lower the freezing point of mortar.

2.4 GROUT MIXES

A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C476 Fine grout.

2.5 GROUT MIXING

A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C476 Fine grout.

B. Do not use anti-freeze compounds to lower the freezing point of grout.

2.6 MIX TESTS

A. Test mortar and grout in accordance with Section 01001.

B. Testing of Mortar Mix: In accordance with ASTM C780

C. Testing of Grout Mix: In accordance with ASTM C1019.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install mortar in accordance with ASTM C780. Install grout in accordance with ASTM C1019.

B. Work grout into masonry cores and cavities to eliminate voids. Do not displace reinforcement.

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 Zone 2B, Soil Profile Type 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 16 inches 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 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. Fuel Equipment Closet, Communications and Electrical Room Mounting Boards: PS 1 A-D plywood; ¾ inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.4 ACCESSORIES

A. Fasteners and Anchors: Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M for exterior, roof related and preservative-treated wood locations, unfinished steel elsewhere.

2.5 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 – Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.

2. Preservative-Treated Wood: Provide lumber and plywood mark or stamped by on ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:

1. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.

a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.

b. Do not use treated wood in direct contact with the ground.

2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (Low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 min.

a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.

b. Treat rough carpentry items as indicated.

c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:

1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0/25 lb/cu ft retention.

a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.

b. Treat lumber in contact with roofing, flashing, or waterproofing.

c. Treat lumber in contact with masonry or concrete.

1) Treat lumber in other locations as indicated.

2. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative to 0.25 lb/cu ft retention.

a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.

b. Treat plywood in contact with roofing, flashing or waterproofing.

c. Treat plywood in contact with masonry or concrete.

d. Treat plywood less than 18 inches above grade.

e. Treat plywood in other locations as indicated.

PART 3 EXECUTION

3.1 BLOCKING, NAILERS, AND SUPPORTS

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

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and

C. Between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

E. Where ceiling-mounted is indicated, provide clocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

F. Specifically, provide the following non-structural framing and blocking;

1. Handrails.

2. Grab bars.

3. Toilet room accessories.

3.2 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.3 INSTALLATION OF CONSTRUCTION PANELS

A. Roof Sheathing; Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.

1. At long edges provide flat 2x blocking between roof framing members as indicated in the drawings.

2. Nail panels to framing as indicated in the drawings; staples are not permitted.

B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using screws.

1. At long edges provide flat 2x blocking between stud framing members as indicated in the drawings.

2. Nail panels to framing as indicated in the drawings; staples are not permitted.

C. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.

1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.

2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.

3. Install adjacent boards without gaps.

3.4 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.
B. Allow Preservative to dry prior to erecting members.

3.5 TOLERANCES

A. Variation from Plane (Other than Floors): ¼ inch in 10 feet maximum, and ¼ inch in 30 feet maximum.

END OF SECTION

SECTION 062000 - FINISH CARPENTRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Finish carpentry items.

B. Wood standing and running trim.

C. Finish Plywood.

1.2 SUBMITTALS

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

B. Samples: Submit two samples of wood trim 6-inch long.

1.3 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.1 FINISH CARPENTRY ITEMS

A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI/AWMAC/WI Architectural Woodwork Standards for Custom Grade.
1. Provide ½ plywood, A1 one side only, faux beams and column wrap at SALES FLOOR 2 with clear transparent finish and as indicated on drawings.
2. Provide wood paneling, Shou Sugi Ban-Charred Siding & Shiplap, Larch Cobalt: As manufactured by Pioneer Millworks. Contact: AJ Henion, 1-800-951-wood. Refer to Interior Elevations.
3. Provide wood paneling, Shou Sugi Ban-Charred Siding & Shiplap, Larch Shallow Char: As manufactured by Pioneer Millworks. Contact: AJ Henion, 1-800-951-wood. Refer to Interior Elevations.
4. Interior wood trim and casing: White Oak No. 1, no knots. Clear Transparent finish

B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

2.2 SHEET MATERIALS

A. Particleboard: ANSI A208.1; composed of wood chips, sawdust, or flakes of medium density, made with waterproof resin binders; of grade to suit application; sanded faces.

B. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.

2.3 WOOD STANDING AND RUNNING TRIM

A. Interior “Hardwood” wood trim (stained): White Maple No. 1, no knots. Length between joints 12’-0”.

B. B. Interior “Painted” wood trim: Western Hemlock, Clear, No. 1, no knots. Length between joints 16’-0”.

2.4 FASTENINGS

A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

B. Fasteners: Of size and type to suit application; use corrosion resistant fasteners for exterior locations.

2.5 ACCESSORIES

A. Lumber for Shimming and Blocking: Softwood lumber of any appropriate species.

B. Primer: Alkyd primer sealer.

C. Wood Filler: Solvent base, tinted to match surface finish color.

2.6 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. Cap exposed plastic laminate finish edges with material of same finish and pattern.

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

D. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

2.7 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

D. Finish work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards, Section 5 – Finishing for Grade specified and as follows:

1. Transparent:

a. System – 12, Polyurethane, Water-based.

b. Stain: As indicated on drawings.

c. Sheen: As indicated on drawings.

2. Opaque:

a. System – 4, Latex Acrylic, Water-based.

b. Color: As indicated on drawings.

c. Sheen: As indicated on drawings.

E. Back prime woodwork items to be field finished, prior to installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.2 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

D. Install trim with appropriate mechanical fasteners.

E. Install panels with concealed fasteners.

3.3 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.4 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

C. TCNA W202E.

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

END OF SECTION

SECTION 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 068200
FIBERGLASS REINFORCED PLASTIC PANELS (FRP)

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Work of this Section applies to the Drawings, Specifications, and provisions of the Contract. The General Conditions, Supplementary General Conditions, Special Conditions, and Division 1 Specification Sections apply to the work of this Section.

1.2 SUMMARY

A. This Section includes but is not limited to:

1. Provide fiberglass reinforced plastic panel system (FRP) and accessories.

2. Provide miscellaneous materials, accessories, trim, adhesive and components for a complete system.

1.3 QUALITY ASSURANCE

A. Manufacturer: Provide fiberglass panel and accessory product as produced by a single manufacturer, including recommended primers, adhesives, sealants, trims, and moldings.

B. Installer: A firm specializing in fiberglass panel work with not less than three years of experience in installing panels similar to those required for this project.

C. Fire Hazard Classification: Provide materials bearing UL Label and Marking, indicating surface burning characteristics of less than or equal to 200, smoke developed under 450, as determined by ASTM-E-84.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer’s technical data and installation instructions for fiberglass panels and installation materials.

B. Samples: Submit sample of fiberglass panel, illustrating range of colors and textures.

C. Shop Drawings: Indicate and dimension the location of joints and fastener attachments.

D. Certification: Submit manufacturer’s certification that materials furnished comply with requirements specified.

E. Maintenance Instructions: Submit manufacturer’s printed instructions for maintenance of installed work.

1.5 DELIVERY AND STORAGE

A. General: Comply with instructions and recommendations of manufacturer and as herein specified.

B. Deliver materials to project site in original packages or containers clearly labeled to identify manufacturer, brand name, quality or grade, and fire hazard classification.

C. Panels should be stored flat on a solid, dry surface.

D. Handling:

1. When moving more than a single sheet, place sheets face-to-face and back-to-back.

2. Protect surface during cutting and working by application of temporary, strippable coating or by other means recommended by panel manufacturer.

3. Remove foreign matter from face of panel by use of a soft bristle brush, avoiding abrasive action.

1.6 PROJECT CONDITIONS

A. Installation shall not begin until building is enclosed, permanent heating and cooling equipment is in operation, and residual moisture from concrete work has dissipated.

B. During installation and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type f adhesive used.

C. Do not allow containers of adhesive to be opened until all potential sources of flame or spark have been shut down or extinguished and until warnings against their ignition during adhesive application have been posted.

D. Provide ventilation to disperse fumes during application of solvent-based adhesive.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturer subject to compliance with requirements, provide fiberglass panels produced by the following:

1. Fiberglass Reinforced Plastic Panel (FRP):
   a. Design Stardard: Kemlite Company “Fire-X Glasbord” with “Surfaseal” finish.
   b. Approved: No substitutions (any product proposed for substitution shall have the “Surfaseal” type finish, and if not, will be rejected).

2. Panel Thickness: 0.09-inches.

3. Size: 4’-0” by height dimension required to provide full height vertical joints with no intermediate horizontal joints. Hold vertical FRP trim pieces off floor 4" to avoid "bumps" in resilient base.

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

4. Color: Color as selected by Architect.

5. Division Bars, Corner Trim: Panel manufacturer’s standard single length aluminum pieces; longest length possible - to eliminate end joints.

B. Adhesive: Use a non-flammable, FRP adhesive as recommended by panel manufacturer.

1. Provide and use proper adhesive with the installed substrate.

PART 3 EXECUTION

3.1 PREPARATION

A. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.

3.2 INSTALLATION

A. Do all cutting with carbide tipped saw blades or drill bits or cut with snips.

B. Install panels with manufacturer’s recommended gap for panel field and corner joints.

C. Fastener holes in the panels must be predrilled 1/8” oversize.

D. Using a 1/4-inch notched trowel, apply adhesive to panel back for 100 percent coverage.

E. Using products acceptable to manufacturer, install the FRP system in accordance with manufacturer’s printed instructions.

F. Seal joints at floor base, corners, and ceilings to allow for water tight installation using manufacturer’s recommended sealant.

3.3 ADJUST AND CLEAN

A. Replace removed plates and fixtures; verify cut edges of wall panels are completely concealed.

B. Remove surplus materials, rubbish, and debris resulting from panel installation upon completion of work, and leave areas of installation in neat, clean condition.

END OF SECTION

SECTION 071000 – DAMPPROOFING AND VAPOR RETARDERS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide cold applied asphalt emulsion damp proofing to all perimeter foundation walls and top of footings.

B. Provide vapor retarder below interior concrete slabs.

1.2 SUBMITTALS

A. Product data for each type of product specified, including data substantiating that materials comply with requirements for each damp proofing material specified. Include recommended method of application, recommended primer, number of coats, coverage or thickness, and recommended protection course.

1. Certification by damp proofing manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOC's).

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Employ experienced workers specializing in bituminous damp proofing and vapor retarder systems.

B. Single-Source Responsibility: Obtain primary damp proofing and vapor retarder materials and primers from a single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

1.4 PROJECT CONDITIONS

A. Proceed with damp proofing work only after substrate construction and penetrating work have been completed. Do not proceed with work until all joints have been caulked and sealed, walls have been patched and sealed at penetrations for conduits and pipes, and unsatisfactory surface conditions have been corrected. Coordinate with backfilling operations.

B. Proceed with damp proofing work only when existing and forecast weather conditions will permit work to be performed in accordance with manufacturer's directions.

C. Provide adequate ventilation during application of solvent-based components in enclosed spaces. Maintain ventilation until vapor retarder adhesives have thoroughly cured.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Products that may be incorporated in the Work:

1. Cold-Applied, Asphalt Emulsion Damp proofing:

a. Meadows: W.R. Meadows, Inc. (complying example).

Other manufacturers:

a. ChemRex, Inc.; Sonneborn Building Products Div.

b. Euclid Chemical Co.

c. Karnak Chemical Corporation.

d. Koppers Industries, Inc.

e. Deco Products, Inc.

2. Vapor Retarder:

a. Stego Industries, LLC. “Stego Wrap”, 15 mil.

Other Manufacturers:

a. W.R. Meadows, Inc.
P.O. Box 543, Elgin, IL. 60121;
Phone (708) 683-4500 or 1-800-342-5976

b. Viper Vaporcheck II 15 mil.

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

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 074113 - METAL ROOF & WALL PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Section Includes: Architectural metal roof panels, metal wall panels, soffit, & trim accessories.

1.2 PERFORMANCE REQUIREMENTS

A. Wind uplift: Roof manufacturer shall certify adequate design and fasteners for wind loading as required for building area for roof substrata of building.

1.3 SUBMITTALS

A. Product Technical Data: For each type of product required, including manufacturer's preparation recommendations, storage and handling requirements, and recommended installation methods.

B. Shop Drawings: Showing methods of installation, plans, sections, elevations and details of roof and wall panels, specified loads, flashings, roof curbs, vents, sealants, interfaces with all materials not supplied by the metal panel system manufacturer, and identification of proposed component parts and their finishes. Do not proceed with fabrication prior to approval of shop drawings.

C. Samples: Selection and verification samples for finishes, colors and textures. Submit two complete sample sets of each type of panel, trim, clip and fastener required.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with the following: SMACNA Architectural Sheet Metal Manual.

B. Installer's Qualifications

1. Installer must be approved by the panel manufacturer in writing prior to work commencing.

2. Installer shall meet the following:

a. Successfully applies five metal roofs of comparable size and complexity which reflect a quality and weather tight installation.
b. Have been in business for a minimum period of 5 years.

C. Manufacturer's Qualifications

1. Manufacturer shall have a minimum of 10 years experience supplying metal roofing to the region where the work is to be done.
2. Manufacturer shall provide proof of liability insurance for their metal roof system and comply with current independent testing and certification as specified.

D. Regulatory Agency Requirements: Comply with International Building Code and local building code requirements if more than those specified herein.

1.5 STORAGE AND HANDLING

A. Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation and per manufacturer's instructions.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

1.6 WARRANTY

A. Warranty Period: Film integrity for 45 years and chalk and fade rating for 30 years from date of Substantial Completion.

B. Installer's Warranty: Warrant panels, flashings, sealants and accessories against defective materials and/or workmanship, to remain water tight and weatherproof with normal usage for five (5) years following project Substantial Completion.

PART 2 - PRODUCTS

2.1 METAL ROOF PANELS

A. Basis of Design Product: Subject to compliance with requirements provide: TS-324
   a. Color: Galvalume
   b. Gauge: 24
   c. Trim color: Carlsbad Canyon

2.2 METAL WALL PANELS

A. Basis of Design Product: Subject to compliance with requirements provide: A (Factory locate FO.S)
   a. Color: Carlsbad Canyon
   b. Gauge: 26
   c. Trim Color: Carlsbad Canyon

B. Other manufacturer's must request approval.

2.3 SOFFIT PANELS, CAP FLASHING, FASCIA, TRIM, FLAT STOCK AND FLASHING

A. Product Options:

1. Soffit Panel: 26 ga. RR.

2. Provide flashing, fascia, cap flashing, flat stock as required for a complete system.

3. Color: Carlsbad Canyon

2.3 ACCESSORIES

A. Fasteners: As recommended by manufacturer.

B. End Closures: As recommended by manufacturer.

1. Color: to match adjacent siding
2. Sealant

a. Gunnable grade sealant: Single component urethane calk.
b. Tape sealant: Butyl tape mastic

3. Flashings: Material, gage and finish to match panels. All flashing shapes shall be manufactured or approved by roof manufacturer.

2.4 SHOP FABRICATION

A. Unless otherwise shown on Drawings or specified herein, fabricate panels in continuous one-piece lengths and fabricate flashings and accessories in longest practical lengths.

B. Roofing panels shall be factory formed. Field formed panels are not acceptable.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Treat, or isolate with protective material, any contacting surfaces of dissimilar materials to prevent electrolytic corrosion.

B. Require workers who will be walking on roofing panels to wear clean, soft-soled work shoes that will not pick up stones or other abrasive material which could cause damage and discoloration.

C. Project Conditions

1. Inspect installed work by other trades and verify that such work is complete to a point where work may continue.

2. Verify that installation may be made in accordance with approved shop drawings and manufacturer's recommendations.

D. Verify roof openings, roof penetrations, cant strips and reglets in place.

3.2 INSTALLATIION

A. Panels

1. Follow roof panel manufacturer's instruction.

2. Install panel seams vertically.

3. Lap panels away from prevailing wind direction.

4. Do not stretch or compress panel side-lap interlocks.

5. Install without warp or deflection.

6. Extend roof panels to overlap gutter openings 2 inches, but do not restrict opportunity to clean gutters.

7. Remove strippable protective film, if used, immediately preceding panel installation.

8. Install furring, eave angles, subpurlins, and other miscellaneous roof panel support members and anchorage according to metal roof panel manufacturer's recommendations.

B. Allowable Erection Tolerance: Maximum alignment variation shall be 1/4 inch in 40’.

C. Flashing

1. Following manufacturer's instructions and approved shop drawings.

2. Overlap roof panels at least 6 inches.

3. Install flashings to allow for thermal movement.

4. Comply with performance requirements, manufacturer's written installation instructions, and the SMACNA "Architectural Sheet Metal Manual."

3.3 CUTTING AND FITTING

A. Neat, square and true. Torch cutting is prohibited where cut is exposed to final view.

B. Openings 6 inches and larger in any direction: Shop Fabricate and reinforce to maintain original load capacity.

C. Where necessary to saw cut panels, debur and treat with galvanic paint.

3.4 CLEAN UP AND CLOSE OUT

A. Touch-up damaged paint surfaces with air dry touch-up paint provided by manufacturer. Follow instructions carefully to minimize color irregularities. Small brush application only. Do not spray touch-up paint.

B. Cleaning and Repairing:

1. At completion of each day's work and at work completion, sweep panels, flashing and clean gutters. Do not allow fasteners, cuttings, fillings or scraps to accumulate.

2. Remove debris from project site upon completion or sooner, if directed.

END OF SECTION

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 079000 - JOINT SEALERS

1 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sealants and joint backing.

1.2 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

2 PART 2 PRODUCTS

2.1 SEALANTS

A. Exterior Window and Joint Sealant:

1. Vertical joints: Sonneborn NP-1 or Sashco “Big Stretch”.

2. Horizontal joints: Sonneborn SL-1 or Sashco “Big Stretch”.

3. Standard colors matching finished surfaces.

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

1. Standard colors matching finished surfaces.

C. interior Building Sealants (Painted surfaces)

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

a. Dap – 35-year warranty.

D. Approved Manufacturers:

1. Tremco, Cleveland, OH www.tremcosealants.com .

2.2 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant; D1667, closed cell polyethylene or polyurethane; oversized 30 to 50 percent larger than joint width, no gassing.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

3

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that substrate surfaces and joint openings are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

C. Remove loose materials and foreign matter which might impair adhesion of sealant.

D. Clean and prime joints in accordance with manufacturer's instructions.

E. Perform preparation in accordance with manufacturer's instructions and ASTM C1193. Provide architect with manufacturer’s instructions for joint preparation and installation instructions.

3.2 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions. Provide a copy for the Architect before application.

B. Perform installation in accordance with ASTM C1193.

C. Clean off excess sealants or smears adjacent to joints without damaging adjacent surface or finishes.

D. Clean joint to eliminate all detrimental substances.

E. Install joint filler and backing without gaps between ends. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

G. Tool joints concave.

END OF SECTION

SECTION 081000 - METAL DOORS, DOOR AND WINDOW FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Provide hollow metal doors, frames, windows, sidelights and borrowed lights as specified and shown on plans and schedules.

1.2 REFERENCES

A. Steel Door Institute (STI-100 standards)

B. ANSI standards (ANSI/SDI A250.8-2014)

C. ANSI/SDI A250.11-2012 Recommended Erection Instructions for Steel Frames.

1.3 QUALITY ASSURANCE

A. Manufacturer shall meet or exceed all standards as noted.

B. Fire Rated assemblies shall be manufactured in accordance with [Underwriters Laboratories] [Intertek Testing Services] [Factory Mutual] established procedures and shall bear the appropriate labels for each application.

C. No product shall be manufactured prior to receipt of approved hardware schedule and templates.

1.4 SUBMITTALS

A. Shop drawings shall show all openings in the door schedule and/or the drawings.

B. Provide details of door design, door construction details and methods of assembling sections, hardware locations, anchorage and fastening methods, door frame types and details, and finish requirements.

1.5 DELIVERY, MARKING AND STORAGE

A. All products shall be marked with architects opening number on all doors, frames, misc. parts and cartons.

B. All materials upon receipt shall be inspected for damage, and the shipper and supplier notified if damage is found.

C. All doors and frames shall be stored vertically under cover. The units shall be placed on at least 4” high wood sills or in a manner that will prevent rust or damage. The use of non-vented plastic or canvas shelters that can create a humidity chamber shall be avoided.

D. A ¼" space between the doors shall be provided to promote air circulation. If the wrapper on the door becomes wet, it must be removed immediately.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance, provide hollow metal door and window frames by one of the following manufacturers:

1. Ceco Door

2. Curries

3. Steelcraft

2.2 All steels used to manufacture doors, frames, anchors, and accessories shall meet at least one or more of the following requirements:

A. Cold-Rolled Steel shall conform to ASTM designations A1008, Standard Specifications for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability and A568, Standard Specification for steel, sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.

B. Hot rolled, pickled and oiled steel shall comply with ASTM designations A1011, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability and A568, Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.

C. Hot dipped zinc coated steel shall be of the alloyed type and comply with ASTM designations A924, Standard Specification for General Requirements for Steel Sheet, Metallic Coated by the Hot-Dip Process and A653, Standard Specification for Steel Sheet, ZincCoated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

D. Supports and Anchors shall be fabricated of 18-gauge minimum galvanized sheet steel.

E. Inserts, Bolts, and Fasteners shall be fabricated of manufacturer's standard units, except hot-dip galvanize items shall be built into exterior walls, complying with ASTM A 153, Class C or D.

2.3 FRAMES

A. Interior Frames

1. Provide metal frames of minimum 16 gauge cold-rolled steel for interior doors, transoms, sidelights, and other openings as indicated in the contract documents and schedules. Reinforce frames for hardware, closers, stops, etc. for hardware as specified.

2. Provide foam-in-place insulation or other insulation for sound-deadening as approved by Architect. Grout is not acceptable.

B. Exterior Frames

1. Provide metal frames of minimum 16 gauge cold-rolled steel for exterior doors, transoms, sidelights, and other openings as indicated in the contract documents and schedules. Reinforce frames for hardware, closers, stops, etc. for hardware as specified.

2. Provide foam-in-place insulation or other insulation for sound-deadening as approved by Architect. Grout is not acceptable.

2.4 DOORS

A. Interior Doors: ANSI/SDI-100, Grade III, heavy-duty, Model 1, Honeycomb Core, minimum 16-gauge cold-rolled sheet steel faces with welded seamless edges.

1. Complying Example: CECO REGENT

B. Exterior Doors: ANSI/SDI-100, Grade III, heavy-duty, Model 1, Insulated Core, minimum 16-gauge cold-rolled sheet steel faces with welded seamless edges.

C. Thermally insulated and ready for weather-stripping.

D. U-value of 0.24 (R value 7.25) or greater.

2.5 Finishing Prime finish: Doors and frames shall be thoroughly cleaned, and chemically treated to insure maximum paint adhesion. All surfaces of the door and frame exposed to view shall receive a factory applied coat of rust inhibiting primer, either air-dried or baked-on. The finish shall meet the requirements for acceptance stated in ANSI/SDI A250.10 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.

2.6 Design Clearances

A. The clearance between the door and frame head and jambs shall be as specified in ANSI/SDI-100.

PART 3 EXECUTION

3.1 INSTALLATION

A. Frames shall be installed plumb, level, rigid and in true alignment as recommended in ANSI/SDI A250.11, Recommended Erection Instructions for Steel Frames. All frame types shall be fastened to the adjacent structure so as to retain their position and stability.

B. Doors shall be installed and fastened to maintain alignment with frames to achieve maximum operational effectiveness and appearance. Doors shall be adjusted to maintain perimeter clearances as specified. Shimming shall be performed by the installer as needed to assure the proper clearances are achieved.

C. Installation of hardware items shall be in accordance with the hardware manufacturer's recommendations and templates. ANSI/SDI A250.

1. Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames shall be consulted for other pertinent information.

END OF SECTION 08100

SECTION 083613 - 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. Cast-In-Place Concrete: Prepared opening in concrete. Execution requirements for placement of anchors in concrete wall construction.

B. Unit Masonry Assemblies: Prepared opening in masonry. Execution requirements for placement of anchors in masonry wall construction.

C. Metal Fabrications: Steel frame and supports.

D. Joint Sealers: Perimeter sealant and backup materials.

E. Paints and Coatings: Field painting.

1.3 REFERENCES

A. ANSI/DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors.

B. ASTM A 123 – Zinc hot-dipped galvanized coatings on iron and steel products.

C. ASTM A 216 - Specifications for sectional overhead type doors.

D. ASTM A 229 - Steel wire, oil-tempered for mechanical springs.

E. ASTM A 653 - Steel sheet, zinc-coated galvanized by the hot-dipped process, commercial quality.

F. ASTM D 1929 - Ignition temperature test to determine flash and ignition temperature of foamed plastics.

G. ASTM E 84 - Tunnel test for flame spread and smoke developed index.

H. ASTM E 330 - Structural performance of exterior windows, curtain walls, and doors by uniform static air pressure difference.

I. ASTM E 413 - Classification for Rating Sound Insulation

J. ASTM E 1332 - Standard Classification for Rating Outdoor-Indoor Sound Attenuation.

K. ASTM E 283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

1.4 DESIGN / PERFORMANCE REQUIREMENTS

A. Wind Loads: Design and size components to withstand loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with applicable code.

B. Wiring Connections: Requirements for electrical characteristics.
1. 115 volts, single phase, 60 Hz.

C. 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 and operators System warranty for 10 years against cracking, splitting or deterioration of steel skin due to rust.

B. Warranty: Manufacturer’s limited door and operators System warranty for 8 years against cracking, splitting or deterioration due to rust-through.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Wayne Dalton; 2501 S. State Highway 121 Business, Suite 200, Lewisville, TX 75067. ASD. Phone: (800) 827-3667; Web Site: www.wayne-dalton.com. Email: info@wayne-dalton.com.

B. Substitutions: As approved by Architect.

C. Requests for substitutions will be considered in accordance with provisions of Section 010010.

D. Approved Manufacturers: Overhead Door Company

2.2 INSULATED SECTIONAL OVERHEAD DOORS

A. Insulated Steel Sectional Overhead Doors: Wayne Dalton ThermoMark 5150 insulated sectional overhead steel doors. Units shall have the following characteristics:

1. Door Sections: Shall be of steel/polyurethane/steel sandwich type construction with thermal break.
   a. Panel Thickness: 1-3/8 inches (34.92 mm).
   b. Exterior Surface:
      1) Flush with non-repeating wood grain texture.
      2) Raised panel with non-repeating wood grain texture.
   c. Exterior Steel: .015 inch (0.38 mm), hot-dipped galvanized.
   d. Thermal Values: R-value of 12.12; U-value of 0.0825.
   e. Air Infiltration: 0.23 cfm at 15 mph.
   f. Sound transmission class 20 when tested in accordance with ASTM E 413.
   g. Outdoor-indoor transmission class 20 when tested in accordance with ASTM E 1332.
   h. Insulation: CFC-free and HCFC-free polyurethane, fully encapsulated.
      1) Insulated sections tested in accordance with ASTM E 84 and achieve a Flame spread Index of 10 or less, and a Smoke Developed Index of 210 or less.
      2) Insulation material tested in accordance with ASTM D 1929 and achieve a minimum Flash Ignition temperature of 734 degrees F, and a minimum Self Ignition temperature of 950 degrees F.
      3) Insulated sections shall meet all requirements of the UBC 17-5 corner burn.
   i. Ends: Hot-dipped galvanized steel, full height with end caps.
      1) 18 gauge.
      2) 16 gauge.
   j. Spring Counterbalance: Sized to weight of the door, with a helically wound, oil tempered torsion spring mounted on a steel shaft; cable drum of die cast aluminum with high strength galvanized aircraft cable. Sized with a minimum 5 to 1 safety factor.
      1) High cycle spring: 100,000 cycles.
2. Finish and Color:
   a. Two coat baked-on polyester:
      1) Interior color, white.
      2) Exterior color, brown.
3. Windload Design: Provide to meet the Design/Performance requirements specified.
4. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.
5. Lock:
   a. Interior mounted slide lock with interlock switch for automatic operator.
6. Weatherstripping:
   a. Flexible 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) 2 inch (51 mm).
      2) 3 inch (76 mm).
   b. Type:

1) Standard lift.

a. Horizontal track shall be reinforced with continuous angle of adequate length and gauge to minimize deflection.

b. Vertical track shall be graduated to provide wedge type weathertight closing with continuous angle mounting for steel or wood jambs, and shall be fully adjustable to seal door at jambs.

8. Manual Operation: Chain hoist.

9. Electric Motor Operation: Provide UL listed electric operator, equal to Genie Commercial Operators, 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.

a. Heavy Duty

1) Model GH – hoist

2) Model GT - trolley

b. Operator Controls:

1) Push-button operated control stations with open, close, and stop buttons.

2)

3) Push-button and key operated control stations with open, close, and stop buttons.

4) .

c. Special Operation:

1) Radio control operation.

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 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.

G. Instruct Owner’s personnel in proper operating procedures and maintenance schedule.

3.4 ADJUSTING

A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion

B. Adjust hardware and operating assemblies for smooth and noiseless operation.

3.5 CLEANING

A. Clean doors, frames and glass using non-abrasive materials and methods recommended by manufacturer.

B. Remove labels and visible markings.

C. Touch-up, repair or replace damaged products before Substantial Completion.

3.6 PROTECTION

A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

B. Protect installed products until completion of project.

END OF SECTION

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware

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. ''Metal Doors and Frames''

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 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
2. NFPA 101 – Life Safety Code
3. NFPA 105 – Smoke and Draft Control Door Assemblies
4. 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. 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.

3. 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.

4. 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.

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.
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. 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) 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. Review required testing, inspecting, and certifying procedures.
   d. Review questions or concerns related to proper installation and adjustment of door hardware.

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.

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

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.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Ives 5BB series

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

2.04 FLUSH BOLTS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Rockwood
   b. Trimco

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.05 COORDINATORS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Trimco
   b. Rockwood

B. Requirements:

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers, surface vertical rod exit device strikes, or other stop mounted hardware. Factory-prepared coordinators for vertical rod devices as specified.

2.06 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:

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

2. Acceptable Manufacturers and Products:
   a. Sargent 11-Line
   b. Best 9K

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. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
   a. Vandlgard: Provide levers with vandal resistant technology for use at heavy traffic or abusive applications.
   b. Lever Design: RHODES

2.07 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. Sargent 19-43-GL-80 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 weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
6. Provide flush end caps for exit devices.
7. Provide exit devices with manufacturer's approved strikes.
8. 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.
9. 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.
10. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
11. 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.
12. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
13. 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.
14. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.08 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer and Product:
   a. VERIFY EXISITNG STSTEM WITH OWNER

2. Acceptable Manufacturers and Products:

B. Requirements:

1. Provide cylinders/cores to match Owner's existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.

2.09 KEYING

A. Scheduled System:

1. Existing factory registered system:
   a. Provide cylinders/cores keyed into Owner's existing factory registered keying system. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

1. Construction Keying:
   a. Replaceable Construction Cores.
      1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
         a) 3 construction control keys
         b) 12 construction change (day) keys.
      2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2. Permanent Keying:
   a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
      1) Master Keying system as directed by the Owner.
   b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
   c. Provide keys with the following features:
      1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
      2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
   d. Identification:
      1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
      2) Identification stamping provisions must be approved by the Architect and Owner.
      3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.

4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.

e. Quantity: Furnish in the following quantities.
1) Permanent Control Keys: 3.
2) Master Keys: 6.
3) Change (Day) Keys: 3 per cylinder/core that is keyed differently
4) Key Blanks: Quantity as determined in the keying meeting.

2.10 DOOR CLOSERS

A. Manufacturers and Products:

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

2. Acceptable Manufacturers and Products:
   a. BEST EHD9000
   b. 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.

2.11 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.

2.12 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

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

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

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

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Zero International

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.

2.14 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.

2.15 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. 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. Lock Cylinders:

1. Install construction cores to secure building and areas during construction period.
2. Replace construction cores with permanent cores as indicated in keying section.
3. Furnish permanent cores to Owner for installation.

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

O. 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.

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

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

R. 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. 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
IVE	H.B. Ives
LCN	LCN Commercial Division
SCH	Schlage Lock Company
VON	Von Duprin
ZER	Zero International Inc

118491 OPT0387642 Version 1

HW SET: 01

For use on Door #(s):
2 4

Each to have:

3	EA	HINGE	5BB1 4.5 X 4.5 NRP		630	IVE
1	EA	PANIC HARDWARE	98-L-06		626	VON
1	EA	SFIC PERMANENT CORE	1C7		626	BES
1	EA	SFIC MORTISE HOUSING	80-102		626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING	429AA-S		AA	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	655A-223		A	ZER

HW SET: 02

For use on Door #(s):
1

Each to have:

3	EA	HINGE	5BB1 4.5 X 4.5 NRP		630	IVE
1	EA	VANDL STOREROOM LOCK	ND96BD RHO		626	SCH
1	EA	SFIC PERMANENT CORE	1C7		626	BES
1	EA	SURFACE CLOSER	4040XP SCUSH		689	LCN
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING	429AA-S		AA	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	655A-223		A	ZER

HW SET: 03

For use on Door #(s):
6

Each to have:

3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	CLASSROOM LOCK	ND70BD RHO		626	SCH
1	EA	SFIC PERMANENT CORE	1C7		626	BES
1	EA	SURFACE CLOSER	4040XP CUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

HW SET: 04

For use on Door #(s):
3

Each to have:

6	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	AUTO FLUSH BOLT	FB31T		630	IVE
1	EA	CLASSROOM LOCK	ND70BD RHO		626	SCH
1	EA	SFIC PERMANENT CORE	1C7		626	BES
1	EA	COORDINATOR	COR X FL		628	IVE
2	EA	MOUNTING BRACKET	MB1/MB2		689	IVE
2	EA	SURFACE CLOSER	4040XP EDA		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
2	EA	WALL STOP	WS406/407CCV		630	IVE
2	EA	SILENCER	SR64		GRY	IVE

HW SET: R1

For use on Door #(s):
5

Each to have:

	EA	NOTE	ALL HARDWARE BY DOOR SUPPLIER/MANUFACTURER

END OF SECTION

SECTION 088100-GLASS GLAZING

PART 1 – GENERAL

1.1 SUMMARY

A. Includes but Not Limited To:

1. Quality of glazing used in doors and windows.

1.2 QUALITY ASSURANCE

A. Safety glazing standard: Safety glass is required throughout the entire project. Provide type of safety glass products which comply with ANSIZ97.1 and testing requirements of 16 CFR Part 1201 for Category II Materials

B. Certifications: Labels showing strength, grade, thickness, type, and quality are required on each piece of glass

C. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or on component pane of units by IGCC or ALI.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Manufacturers:

1. Manufacturer List for Glazing

a) PPG Solarban 70 (2).

B. Exterior Window Glazing: Heat – Treated Float Glass.
1. Solarban 70 (2) solarbronze + clear.
   a) Thickness: ¼ inch minimum, Low-E coated (surface no. 2) Fully tempered, transparent flat glass, glazing select quality.
   b) Thickness for Units: Overall unit shall be 1” with ½” air space

C. Interior Glass (glass not required to be provided for fire rated assemblies) shall be clear, fully tempered, uncoated, transparent flat glass, glazing select quality

1. ¼” thickness

D. Fabrication:
1. Except where glass exceeds 66 inches in width, cut clear glass so any wave will run horizontally when glazed.

2. Sealed, Insulating Glazing Units:

a) Double pane, sealed insulating glass units meeting requirements of ASTM E 774, Class A. Install at exterior windows and exterior aluminum-framed storefront.

b) Unit Thickness: 5/8 inch minimum, one inch maximum

c) Insulated obscure units shall consist of one pane pf specified obscure glass and one pane of standard glass

d) Type Seal:

1) Metal-to-glass bond and separated by ½ inch dehydrated air space

2) Use non-hardening sealants.

e) Approved Fabricators.

1) Members of Sealed Insulating Glass Manufacturer's Association

E. fire-rated glass shall be Fire Lite Plus

2.2 SEALED INSULATING GLASS MATERIALS

A. Insulated Glass Units – Exterior Store-Front windows system:

1. Units shall consist of one outboard lite of ¼" flat glass and inboard lite of ¼ "Low E glass, separated by a ½" aluminum spacer, filler with a moisture absorbing desiccant. Units shall have a primary seal of polyisobutylene and a secondary seal pf two-part silicone.

2. Performance shall comply to Class "A" or better of ASTM specification E774-84a for sealed insulated glass.

2.3 GLAZING COMPONENTS

A. Manufacturers: Use Dow795 sealant at window perimeter

2.4 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene 80 to 90 shore A Durometer hardness

B. Glazing Spline: Resilient neoprene extruded shape to suit glazing channel retaining slot; black color

PART 3 – EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that openings for glazing are correctly sized, within tolerance, and glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.2 INTALLATION – EXTERIOR DRY METHOD (PREFORMED GLAZING)

A. Cut glazing spline to length; install on glazing pane. Seal corners with butyl sealant.

B. Place set blocks at ¼ points.

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

D. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.

3.3 INSTALLATION – INTERIOR DRY METHOD (TAPE AND TAPE)

A. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.

B. Place setting blocks at ¼ points with edge block no more than 6 inches from corners.

C. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.

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

E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

F. Knife trim protruding tape.

3.4 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

END OF SECTION

SECTION 092900-GYPSUM BOARD ASSEMBLIES

PART 1 – GENERAL

1.1 SECTIN INCLUDES

A. Interior gypsum wallboard.

B. Tile Backer Board for application at wall tile and FRP.

C. Provide Gypsum board assemblies attached to suspended grid system.

D. Provide Cementitious Backer Board (CBB).

1.2 SUBMITTALS

A. Product Data for each type of product indicated.

1.3 FIRE TEST RESPONSE CHARACTERISTICS

A. For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.4 SOUND TRANSMISSION CHARACTERISTICS

A. For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

1.5 QUALITY ASSURANCE

A. Fire-resistance ratings: Where fire-resistance ratings are indicated, provide materials/assemblies complying with ASTM E 119 and as required by local authorities.

B. Comply with recommendations of Gypsum Association GA-216.

C. Comply with ASTM 1396, “Specification for Gypsum Board”.

1.6 FIELD CONDITIONS

A. Temperature shall be 50 deg F and 95 deg F maximum day and night during entire joint operation and until execution of certificate of Substantial Completion. Provide ventilation to eliminate excessive moisture. Avoid hot air drafts that will cause rapid drying.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Gypsum Board Products; Georgia-Pacific Corp., Gold Bond Building Products, United States Gypsum.

1. Or approved by Architect

2.2 PANEL PRODUCTS, GENERAL: provide sizes in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

A. Gypsum Wallboard: ASTM C36.

1. Type X: Fire-resistance-rated.

2. Thickness: 5/8” minimum.

3. Edges: Tapered

B. Tile Backer Board unit (TBB): Silicone Based Tile Backer Board installed behind ceramic wall tile and FRP as manufactured by “Denshield” by Georgia Pacific or approved.

1. Thickness: 5/8” minimum.

2.. Edges: Tapered

C. Cementitious Backer Board: “Hardi Backer” by James Hardie installed behind all shower wall tile.

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. Not to exceed 30’-0” o.c.

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 "Building 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 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

A. Type, Form, and Finish: Provide Fiberglass Fine surface texture, NRC 0.90, Flame Spread – Class A (UL).
   a. Products: Design Standard.
      i. ACT: 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 2012 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. 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.

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 FLOORING

A. Resilient Base (RB): ASTM F-1861 vinyl; top set coved
   1. Height: 4 inch.

2. Thickness: 0.125 inch thick.
3. Length: Roll.
5. Color as selected by Architect

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

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. At external corners, use premolded units.

3.4 CLEANING

A. Remove excess adhesive from surfaces without damage.

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

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: Chlorinated rubber-alkyd type, AASHTO M 248, FS-TT-P-115, Type III, 4" wide, color white

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.

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 101100 - VISUAL DISPLAY BOARDS

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. This Section includes but is not limited to:

1. Provide porcelain enamel marker boards (white boards).
2. Provide Grain Tackboard (CorkBoards).
3. Provide all materials and accessories for a complete installation.

1.03 RELATED SECTIONS

A. Sections that are related to this Section include, but are not limited to, the following:

1. Division 6 Section “Rough Carpentry.”

2. Division 6 Section “Finish Carpentry.”

3. Division 9 Section “Wall Coverings.”

4. Division 9 Section “Painting.”

1.04 SUBMITTALS

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

B. Product Data: Submit manufacturer's technical data and installation instructions for each material and component part, including data substantiating that materials comply with requirements.

1. After review and approval, submit to Architect.

C. Samples for Initial Selection: Manufacturer’s color charts showing the full range of colors and textures available for the following:

1. Markerboards: Actual section of porcelain enamel finish for each type of markerboard required.

2. After review and approval, submit to Architect.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who is an authorized representative of the markerboard manufacturer for both installation and maintenance of the type of sliding markerboard units required for this Project.

B. Fire Performance Characteristics: Provide tack boards with surface burning characteristics indicated below, as determined by testing assembled materials composed of facings and backings identical to those required in this section, in accordance with ASTM E 84, by a testing organization acceptable to authorities having jurisdiction.

1. Flame Spread: 25 or less.

2. Smoke Developed: 10 or less.

1.06 WARRANTY

A. Porcelain Enamel Markerboard Warranty: Furnish the manufacturer's written warranty, agreeing to replace porcelain enamel markerboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking, provided the manufacturer's instructions with regard to handling, installation, protection, and maintenance have been followed. Replacement is limited to material replacement only; labor for removal and reinstallation is not included.

1. Warranty Period: Lifetime of the building.

PART 2 PRODUCTS

2.01 MANUFACTURERS/PRODUCTS

A. Manufacturer of Marker Boards and Corkboards:

1. Design Standard: Claridge Products

2. Approved:
   a. PBS Supply.

   b. Lemco, Inc.

   c. Newline Products, Inc.

   d. Platinum Visual Product

e. Aarco Products, Inc.

B. Accessories:

1. Provide one (1) chalk tray with each marker board

2. Provide one (1) flag holder per room.

3. Provide one (1) - 2” cork map and display rail for each marker board.

4. Provide two (2) metal map hooks for each marker board.

5. Provide Two (2) end stops for each marker board.

2.02 MATERIALS

A. Porcelain Enamel Marker Boards: Provide balanced, high-pressure-laminated porcelain enamel chalkboards of 3-ply construction consisting of face sheet, core material, and backing.

1. Face Sheet: 0.024-inch enameling grade steel especially processed for temperatures used in coating porcelain on steel. Coat the exposed face and exposed edges with a 3-coat process consisting of primer, ground coat, and color cover coat, and the concealed face with a 2-coat process consisting of primer and ground coat. Fuse cover and ground coats to steel at the manufacturer's standard firing temperatures, but not less than 1200° F (649° C).

a. Design Standard for Markerboard: Claridge Products and Equipment, Inc. “LCS” porcelain enamel clad with standard surface intended for use with colored markers and magnetic aids.

b. Colors as selected by Architect.

2. Core: Provide the manufacturer's standard 3/8-inch-thick particleboard core material complying with the requirements of ANSI A208.1, Grade 1-M-1.

3. Backing Sheet: Provide the manufacturer's standard 0.015- inch-thick aluminum sheet backing.

4. Laminating Adhesive: Provide the manufacturer's standard moisture-resistant thermoplastic-type adhesive.

B. Tackboards (corkboards)
1. Claridge Fabricork Vinyl Bulleting Board
2. Size as indicated on drawings

3. Color: As selected
4. Pattern: Esquire Pattern
5. Wood Frame: Per manufacturer. Color as selected

2.03 ACCESSORIES

A. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062-inch-thick aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units wherever possible; keep joints to a minimum. Miter corners to a neat, hairline closure.

1. Marker Tray: Furnish the manufacturer's standard continuous, solid extrusion-type aluminum marker tray with ribbed section and smoothly curved exposed ends, for each markerboard.

a. Do not provide for units in the gymnasium and multi-purpose room.

2. Flag Holder: One (1) flag holder per space with display board.

3. Map Rail: Furnish map rail at the top of each unit, complete with the following accessories:

a. Display Rail: Provide continuous cork display rail approximately 2 inches wide, integral with the map rail.

b. End Stops: Provide one end stop at each end of the map rail.

c. Map Hooks: Provide two (2) map hooks for each 4 feet of map rail or fraction thereof.

4. Frames: Approximately 5/8” wide, clear anodized finish.

2.04 FABRICATION

A. Porcelain Enamel Chalkboards and Markerboards: Laminate facing sheet and backing sheet to core material under pressure with manufacturer's recommended flexible, adhesive.

B. Assembly: Provide factory-assembled markerboard and tackboard units, except where field-assembled units are required.

1. Make joints only where total length exceeds maximum manufactured length. Fabricate with the minimum number of joints, balanced around the center of the board, as acceptable to the Architect.

2. Provide the manufacturer's standard vertical joint system between abutting sections of markerboard.

3. Provide manufacturer's standard mullion trim at joints between markerboard and tackboard.

2.05 FINISHES

A. At porcelain enamel markerboards, color as selected by the Architect from manufacturer's standards.

PART 3 EXECUTION

3.01 INSTALLATION

A. Preparation: Take field measurements prior to fabrication where possible, to ensure proper fitting of the work. Allow for trimming and fitting wherever taking of field measurements before fabrication might delay work.

1. Coordinate location of support backing with visual display board locations.

B. Deliver factory-built markerboard and tackboard units completely assembled in one piece without joints, wherever possible. Where dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to the Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.

C. Install units in locations and at mounting heights indicated and in accordance with the manufacturer's instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for a complete installation.

D. Coordinate job-site assembled units with grounds, trim and accessories. Join all parts with a neat, precision fit.

3.02 ADJUST AND CLEAN

A. Verify that accessories required for each unit have been properly installed and that operating units function properly.

B. Clean units in accordance with the manufacturer's instructions. Break-in markerboards and chalkboards only as recommended by the manufacturer. Following break-in procedure, clean boards, ready for use by Owner.

END OF SECTION 10 11 00

SECTION 101400 - SIGNS

PART 1 GENERAL

1.1 SUMMARY

A. Interior Signage

1. Provide surface mounted panel signs.
2. Refer to signage schedule

B. Exterior Signage

1. Provide parking and directional 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 schedule indicated on the drawings.

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. Parking 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 and sign posts; one at the head of each handicap designated parking space.

2. Sign board shall be corrosion resistant metal, minimum size to meet Idaho State regulatory requirements. Provide permanent graphics on sign face showing "International Symbol of Access" and bearing the words "Reserved Parking, State Disabled Parking Permit Required" "Van Accessible" of colors and design acceptable to authorities and Architect.

3. Provide galvanized steel pipe post for each sign and tamper resistant sign board mounting fasteners. Provide finish top cap to prevent water intrusion.

C. Metal Letters: Provide (6) 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.

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 102600 - WALL SURFACE PROTECTION SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Provide stainless steel, surface mounted corner guards at all outside corners.

B. Provide materials, adhesives, accessories and tools for a complete installation.

1.2 SUBMITTALS

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

B. Product data for each wall surface protection system component and installation accessory required, including installation methods for each type of substrate. Provide written data on each required component including physical characteristics, such as durability, resistance to fading, and flame resistance.

1. After review and approval, submit to Architect.

C. Shop drawings showing locations, extent, and installation details of corner guards. Show methods of attachment to adjoining construction.

D. Samples for Verification Purposes: Submit the following samples, prepared from the same material to be used in the Work, for verification of color, pattern, and texture selected and for compliance with requirements indicated:

1. 12-inch long samples of corner guard required. Include examples of joinery, corners, and field splices.

2. After review and approval, submit to Architect.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has previously installed wall surface protection systems similar in material, design, and extent to the systems indicated for this project.

B. Manufacturer Qualifications: Firm experienced in manufacturing wall surface protection system components that are similar to those required for this project and that have a record of successful in-service performance.

C. Fire Performance Characteristics: Provide wall surface protection system components that are identical to those tested in accordance with ASTM E 84 for the fire performance characteristics indicated below. Identify wall surface protection system components with appropriate markings form the testing and inspection organization.

1. Flame Spread: 25 or less.

2. Smoke Developed: 450 or less.

D. Impact Strength: Provide wall surface protection system components with a minimum impact resistance of 16 ft. lbs. per sq. ft. when tested in accordance with ASTM D 256 (Izod impact, ft. lbs. per inch notch).

E. Single Source Responsibility: Obtain each color, grade, finish, and type of wall surface protection system component from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

F. Design Criteria: The drawings indicate the size, profile and dimensional requirements of wall surface protection system components required and are based on the specific types and models indicated. Wall surface protection system components by other manufacturers may be considered provided deviations in dimensions and profiles are minor and do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, quality or grade, and fire hazard classification.

B. Store wall surface protection materials in original undamaged packages and containers inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within the storage area at not less than 70° F (21° C) during the period plastic materials are stored. Keep sheet material out of direct sunlight to avoid surface distortion.

2. Store rigid plastic corner guard covers in a vertical position for a minimum of 72 hours, or until the plastic material attains the minimum room temperature of 70° F (21° C).

1.5 PROJECT CONDITIONS

A. Environmental Conditions: Do not install wall surface protection system components until the space is enclosed and weatherproof and until the ambient temperature within the building is maintained at not less than 70° F (21° C) for not less than 72 hours prior to beginning of the installation. Do not install rigid plastic wall surface protection systems until that temperature has been attained and is stabilized.

1.6 MAINTENANCE

A. Maintenance Instructions: Provide the manufacturer's instructions for maintenance of installed work. Include recommended methods and frequency for maintaining optimum condition

under anticipated traffic and use conditions. Include precautions against cleaning materials and methods that may be detrimental to finishes and performance.

B. Replacement Materials: After completion of work, deliver not less than 2 percent of each type, color, and pattern of wall surface protection materials and components. Include accessory components as required. Replacement materials shall be from the same production run as materials installed. Package replacement materials with protective covering, identified with appropriate labels.

PART 2 PRODUCTS

2.1 MANUFACTURERS/PRODUCTS

A. Corner Guards:

1. Stainless steel units, 16 GA., #4 finish, 2-1/2" x 2-1/2", 1" x 1" wings with 1/8" radius. Break edges, full length, for tight fit against wall.

2. Mounting method: Full spread silicone sealant.

3. Length: Provide 4'-0" corner guards installed above base material

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions in which wall surface protection components and wall protection systems will be installed.

1. Complete all finishing operations, including painting, before beginning installation of wall surface protection system materials.

3.2 PREPARATION

A. General: Prior to installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. Install stainless steel corner guard units on all outside framed wall corners, including angled corners, as indicated.

1. Measure for length.

2. Coordinate installation with other trades.

3.4 CLEANING

A. General: Immediately upon completion of installation, clean wall protection materials and accessories in accordance with the manufacturer's directions prior to Substantial Completion.

1. Wipe down and remove fingerprints from stainless steel corner guards.

2. Remove and replace damaged materials prior to Substantial Completion.

B. Remove surplus materials, rubbish, and debris, resulting from installation upon completion of work and leave areas of installation in neat, clean condition.

END OF SECTION 102600

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: 60-B: C, 10 lb. nominal capacity. Provide as indicated on drawings.
3. Approved: Larsen’s Manufacturing Co.
4. 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.

7. Provide 2A 20 BC Fire Extinguisher at each FEC.

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 108000 - MISCELLANEOUS SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes but is not limited to:

1. Knox Box for Fire Department access.

2. Knox Box Installation.

1.2 QUALITY ASSURANCE

A. Uniformity: Provide products of same manufacturer.

B. Shelving products shall meet Shelving Manufacturer's Association specification for the design, testing, utilization, and application of industrial grade steel shelving.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions including all dimensions and rough in requirements for each type of specialty unit or system, including data indicating compliance with requirements.

1.4 DELIVERY AND STORAGE

A. Deliver products to project site in manufacturer's undamaged protective containers, after spaces to receive them have been fully enclosed.

PART 2 PRODUCTS

2.1 KNOX BOX FOR FIRE DEPARTMENT ACCESS

A. Fire Department Key Box:

1. Knox Box Model No. 3200 or as required by local jurisdiction.

PART 3 EXECUTION

3.1 INSTALLATION

A. General: Install all miscellaneous specialties as recommended by manufacturer.

B. Provide all accessories required for complete assembly installations, whether or not specifically indicated, and whether or not required accessories are manufacturer's standard supplied items.

3.2 CLEANING, RESTORING FINISHES

A. After completion of installation of each portion of work specified herein, remove protective coverings, if any, and clean all work as recommended by manufacturers.

END OF SECTION 108000

SECTION 122100 – WINDOW BLINDS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes but is not limited to:

1. Provide horizontal operating blind assembly and all accessories and equipment for a complete system.

2. Provide blinds at all exterior windows

1.2 SUBMITTALS

A. For Horizontal Blinds: submit product data and manufacturers installation instructions.

1. Samples for color for verification consisting of sections of exposed components with integral or applied finishes showing colors and materials.

1.3 QUALITY ASSURANCE

A. General: Provide units produced by one manufacturer for each type required, with complete standard assemblies including hardware accessory items, mounting brackets, and fastenings.

B. NFPA Flame-Test: passes NFPA 701. Materials tested shall be identical to products proposed for use.

PART 2 – PRODUCTS

2.1 HORIZONTAL LOUVER BLINDS

A. Manufacturers for 1” Horizontal Blinds:

1. Hunter Douglas

2. Kirsch

3. As approved by Architect

B. Product: CL82-1”

1. Slat size/type: 1”, aluminum alloy, 8 ga. heat treated and spring tempered bounce back construction.

2. Full tilting operation

C. Finish: Provide manufacturer's standard finish. Finish exposed accessories and hardware to match rail color.

1. Colors: As selected by Architect

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install blinds according to manufacturer's directions.

3.2 HORIZONTAL LOUVER BLIND SCHEDULE

A. Install horizontal blind units at all exterior classroom windows.

3.3 CLEANING

A. Remove protective coverings and devices and clean blinds. Replace any damaged or rejected units at no cost to the Owner.

END OF SECTION

DIVISION 21: FIRE SUPPRESSION

21 0500 COMMON REQUIREMENTS FOR FIRE SUPPRESSION
21 0548 VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT
21 0553 IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT
21 1300 WET PIPE FIRE SUPPRESSION SPRINKLERS

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 addition.
   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 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.

2.3 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.

2.4 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.

2.5 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.

2.6 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.

2.7 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.

2.8 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.

2.9 DRAIN VALVES

A. Compression Stop:
1. Bronze with hose thread nipple and cap.

B. Ball Valve:
1. Manufacturers:
a. Milwaukee Model BBSC with threaded ends
b. Nibco Model T-505 with threaded ends
c. Nibco Model G-505 with grooved ends
2. Brass with cap and chain, 3/4 inch (20 mm) hose thread.

2.10 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 0553

SECTION 21 1300 – WET PIPE FIRE SUPPRESSION SPRINKLERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. System design, installation, and certification.

C. Fire department connections.

1.2 RELATED REQUIREMENTS

A. Section 21 0500 - Common Requirements for Fire Suppression: Pipe, fittings, and valves.

B. Section 21 0548 - Vibration and Seismic Controls for Fire Suppression Piping and Equipment.

C. Section 21 0553 - Identification for Fire Suppression Piping and Equipment.

D. Section 26 0519 – Line Voltage Electrical Power Conductors and Cables: Electrical characteristics and wiring connections.

E. Section 26 6411 – Automatic Fire Alarm and Detection System.

1.3 REFERENCE STANDARDS

A. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.4 SUBMITTALS

A. See Section 01 3300 – for submittal procedures.

B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Shop Drawings:
1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
3. Submit shop drawings to authority having jurisdiction for approval. Submit proof of approval to Architect.

D. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

E. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.

F. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Sprinklers: Type and size matching those installed, in quantity required by referenced NFPA design and installation standard.
3. Sprinkler Wrenches: For each sprinkler type.

1.5 QUALITY ASSURANCE

A. Maintain one copy of referenced design and installation standard on site.

B. Conform to UL requirements.

C. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State of Idaho.

D. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

E. Equipment and Components: Provide products that bear UL label or marking.

F. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Sprinklers, Valves, and Equipment:
1. Tyco Fire Suppression & Building Products: www.tyco-fire.com.
2. Viking Corporation: www.vikinggroupinc.com.
3. Reliable: www.reliablehvac.com
4. Central: www.aecinfo.com
5. Substitutions: See Section 01 6000 - Product Requirements.

2.2 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for entire building.

B. Occupancy: Comply with NFPA 13 for hazard classification.

C. Water Supply: Determine volume and pressure from water flow test data.
1. Revise design with test data available prior to submittals.

D. Provide fire department connections where indicated.

E. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

2.3 SPRINKLERS

A. Suspended Ceiling Type: Semi-recessed pendant type with matching screw on escutcheon plate.
1. Finish: Enamel, color white.
2. Escutcheon Plate Finish: White.
3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

B. Concealed Ceiling Type: Fully recessed with surface cap.
1. Finish: Enamel, color white.
2. Surface Cap Finish: White.
3. Fusible Link: Fusible solder link type, temperate rated for specific area hazard.

C. Exposed Area Type: Pendant upright type with guard.
1. Finish: Brass.
2. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

D. Sidewall Type: Semi-recessed horizontal sidewall type with matching screw on escutcheon plate.
1. Finish: Brass.

2. Escutcheon Plate Finish: Brass.
3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

E. Dry Sprinklers: Standard pendant type with matching screw on escutcheon plate.
1. Finish: Brass.
2. Escutcheon Plate Finish: Brass.
3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

F. Furnish and install special sprinkler heads on each side of all windows or doors with windows in the two hour fire rated walls as required by I.B.C. 715.
1. White enamel finish.
2. Liquid filled bulb link.
3. White escutcheon plates.

G. Guards: Finish to match sprinkler finish.

H. Spray Nozzles: Brass with solid cone discharge, 30 degrees of arc with blow-off dust cap.

2.4 SPRINKLER HEADS

A. Sprinkler head orifice sizes shall be in accordance with National Fire Protection Association.

B. Any change in spacing must be in straight rows with lights and walls.

C. Sprinkler heads shall be automatic and conventional (spray) type approved by a nationally recognized testing laboratory.

D. Each head shall have an orifice of nominal 1/2" diameter.

E. Sprinkler heads shall be pendant type where installed above a hung ceiling.

2.5 PROTECTIVE GUARDS

A. Heavy wire protective guard shall be provided for sprinkler heads located in heavy use areas where damage may result including, but not limited to:

B. Gyms, Wrestling rooms

C. Locker rooms

D. Multi-purpose rooms

E. Shops

F. Equipment rooms

2.6 PIPING SPECIALTIES

A. Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm and electric alarm, with pressure retard chamber and variable pressure trim ; with test and drain valve.

B. Electric Alarm: 24 volt D.C. electrically operated chrome plated gong with pressure alarm switch.

C. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.

D. Fire Department Connections:
1. Type: Flush mounted wall type with brass finish.
2. Outlets: Two way with thread size to suit fire department hardware; threaded dust cap and chain of matching material and finish.
3. Drain: 3/4 inch (19 mm) automatic drip, outside.
4. Label: "Sprinkler - Fire Department Connection".

E. Post indicator valves.

PART 3 - EXECUTION

3.1 INSPECTION

A. It is the responsibility of the Fire Sprinkler Contractor to inspect the job site prior to fabricating materials. The Fire Sprinkler Contractor shall coordinate the design with all plans and other contractors so that construction can be done without problems. The Fire Sprinkler Contractor shall call for a meeting with all trades to coordinate and sequence installation with the progress of other mechanical and structural systems and work out spaces for all of the work. By doing so, the project will proceed at the General Contractor's completion schedule.

3.2 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

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

C. Work to begin inside building, at base of flange to underground fire protection water main.

D. Install system in compliance with methods detailed in NFPA-13, including seismic requirements for Area 3.

E. Offset as needed for other trades. Avoid conflict in areas of tight construction. Do not obstruct access to air control boxes, access doors, lights or other ceiling mounted equipment.

F. Submit piping and equipment data sheets for review by the Architect prior to the start 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

22 0000 PLUMBING

22 0501 COMMON PLUMBING REQUIREMENTS
22 0502 DEMOLITION AND REPAIR
22 0503 PIPE, PIPE FITTINGS, PIPE HANGERS & VALVES
22 0548 VIBRATION AND SEISMIC CONTROL FOR PLUMBING AND EQUIPMENT
22 0553 IDENTIFICATION FOR PLUMBING PIPES AND EQUIPMENT
22 0710 POTABLE WATER PIPE INSULATION
22 0800 FIRE STOPPING

22 1000 PLUMBING PIPING AND VALVES

22 1007 PRESS TYPE PIPE FITTINGS
22 1114 NATURAL GAS SYSTEMS
22 1116 DOMESTIC WATER PIPING SYSTEMS (COPPER)
22 1116 DOMESTIC WATER PIPING SYSTEMS (PEX)
22 1313 SOIL, WASTE, & VENT PIPING SYSTEMS

22 3000 PLUMBING EQUIPMENT

22 3330 ELECTRIC STORAGE TYPE WATER HEATERS

22 4000 PLUMBING FIXTURES

22 4001 PLUMBING FIXTURES
22 4703 HANDICAP DRINKING WATER COOLING SYSTEM

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 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 0502 - DEMOLITION AND REPAIR

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. Under this section remove obsolete piping and mechanical equipment and relocate, reconnect or replace existing piping affected by demolition or new construction. Remove concealed piping abandoned due to demolition or new construction, or cap piping flush with existing surfaces.

1.3 DRAWINGS AND EXISTING CONDITIONS

A. All relocations, reconnections and removals are not necessarily indicated on the drawings. As such, the Contractor shall make adequate allowance in his proposal for this work as no extra charges will be allowed for these items.

PART 2 - NOT USED

PART 3 - EXECUTION

3.1 TEMPORARY CONNECTIONS

A. Where existing piping must remain in service to supply occupied areas during construction, provide temporary piping, connections, and equipment to maintain service to such areas. All shall be performed in a neat and safe manner to prevent injury to the building or its occupants.

3.2 EXISTING TO BE ABANDONED

A. All Required drilling, cutting, block-outs and demolition work required for the removal and/or installation of the mechanical system is the responsibility of this Contractor.

B. No joists, beams, girders, trusses or columns shall be cut by any Contractor without written permission from the Architect.

C. The patching, repair, and finishing to existing or new surfaces is the responsibility of this Contractor, unless specifically called for under sections of specifications covering these materials.

D. Disconnect all equipment that is to be removed or relocated. Relocate any existing equipment that obstructs new construction.

3.3 EXISTING TO REMAIN IN USE

A. Where affected by demolition or new construction, relocate, replace, extend, or repair piping and equipment to allow continued use of same. Use methods and materials as specified for new construction.

3.4 MATERIALS AND EQUIPMENT REMOVED

A. All obsolete materials, piping, and equipment shall become the property of the Contractor and be removed from the site promptly.

END OF SECTION 22 0502

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:
a. Milwaukee BA-100, bronze, screwed, 600# WOG ball valve with Teflon seats
b. Victaulic S/722.
2. 2" and smaller for heating hot water service:
a. Milwaukee BA-100, bronze, screwed, 600# WOG ball valve with Teflon seats
b. Victaulic S/722.
3. 2½" and larger - 3 piece full port, bronze, flanged 400# WOG with seats rated for temperature service.
4. Ball valves shall be used where ever possible.

B. Butterfly Valves:
1. 2" and Smaller:
a. Milwaukee BB2-100, bronze body, 350# WOG, stainless steel disc and stem, viton seal, and lever handle
b. Victaulic S/700, 300, 709.
2. 2 ½" and Larger:
a. 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
b. Victaulic
3. 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:
a. Milwaukee No. 359
b. Victaulic actuated butterfly valves

E. Check Valves:
1. Up to 2" inclusive: Milwaukee No. 509
2. 2 1/2" and larger:
a. Milwaukee No. F-2974
b. 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. Compressed Air Piping: 40-A-120 black steel pipe with black banded 300 lb. malleable iron fittings and coupling or Victaulic press-fit system.

B. Oxygen, Vacuum, Nitrous Oxide, and Medical Use Compressed Air: Piping shall be Type "K" copper tubing with wrought copper solder fittings. Solder with Silvaloy, Streamline 122, Phos-Copper, Sil-Fos, or approved equal silver solder. Pipe to be "pickled" and cleaned with caustic soda. Use flux and prepare joint in accordance with solder manufacturer's recommendations. Installation shall be in accordance with NFPA latest pamphlets. Testing and certification of piping for actual flow and use required.

2.3 PIPE HANGERS

A. Adjustable, malleable iron clevis type of a diameter adequate to support pipe size.

B. Approved Manufacturers:
1. B-Line Systems Fig. B3100
2. Grinnell No. 260
3. Kin-Line 455
4. Superstrut CL-710

2.4 INSULATING COUPLINGS

A. Suitable for at least 175 PSIG WP at 250 deg F.

B. Approved Manufacturers:
1. Central Plastics Co
2. Victaulic Co
3. Watts Regulator Co

2.5 EXPANSION JOINTS

A. Install at all building expansion joints and as shown on the drawings, flexible, or nipple/flexible coupling combinations for added expansion/deflection. Submit Manufacturer’s data.

B. Approved Manufacturers
1. Victaulic Style 155, 150

2. Grinnell - Gruv-Lok
3. Garlock Garlflex 8100
4. Vibration Mountings & Controls, Inc.

2.6 SLEEVES

A. Sleeves shall be standard weight galvanized iron pipe, Schedule 40 PVC, or 14 gauge galvanized sheet metal two sizes larger than pipe or insulation.

B. Steel or heavy steel metal of the telescoping type of a size to accommodate pipe and covering wherever it passes through floors, walls, or ceilings.

2.7 INTERMEDIATE ATTACHMENTS

A. Continuous threaded rod may be used wherever possible.

B. No chain, wire, or perforated strap shall be used.

2.8 FLOOR AND CEILING PLATES

A. Brass chrome plated

2.9 APPROVED MANUFACTURERS - Grinnell and Fee/Mason

A. Concrete Inserts: Grinnell Fig. 282

B. Pipe Hanger Flange: Grinnell Fig. 163

C. Vertical Pipe: Grinnell Fig. 261 or equal.

D. Cast Iron Pipe: Grinnell Fig. 260 clevis hanger or equal

E. Pipe Attachments for steel pipe with 1" or less of insulation:
1. Grinnell Fig. 108 ring
2. Grinnell Fig. 114 turnbuckle adjuster
3. Or equal

PART 3 - EXECUTION

3.1 INSTALLATION

A. Furnish and install complete system of piping, valved as indicated or as necessary to completely control entire apparatus. Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Contractor from responsibility for proper erection of systems of piping in every respect.

B. Properly support piping and make adequate provisions for expansion, contraction, slope, and anchorage.
1. Cut piping accurately for fabrication to measurements established at site and work into place without springing or forcing.
2. Do not use pipe hooks, chains, or perforated metal for pipe support.
3. Remove burr and cutting slag from pipes.
4. Make changes in direction with proper fittings.
5. Insulate hangers for copper pipe from piping by means of at least two layers of Scotch 33 plastic tape.

6. Support piping at 8 feet on center maximum for pipe 1-1/4 inches or larger and 6 feet on center maximum for pipe one inch or less. Provide support at each elbow. Install additional support as required.
7. Suspend piping from roof trusses or clamp to vertical walls using Unistrut and clamps (except underground pipe). Laying of piping on any building member is not allowed.

C. Arrange piping to not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings. Provide accessible, ground joint unions in piping at connections to equipment.

D. Make connections of dissimilar metals with insulating couplings.

E. Provide sleeves around pipes passing through floors, walls, partitions, or structural members.
1. Seal sleeves with plastic or other acceptable material.
2. Do not place sleeves around soil, waste, vent, or roof drain lines passing through concrete floors on grade.

F. Cap or plug open ends of pipes and equipment to keep dirt and other foreign materials out of system. Do not use plugs of rags, wool, cotton waste, or similar materials.

G. Install piping systems so they may be easily drained.

H. Grade soil and waste lines within building perimeter 1/4 inch fall per ft in direction of flow.

I. Insulate water piping buried within building perimeter.
1. Do not use reducing bushings, street elbows, or close nipples.
2. Bury water piping 6 inches minimum below bottom of slab and encase in 2 inches minimum of sand.
3. Do not install piping in shear walls.

J. Valves
a. Install all isolation shut-off valves in an accusable location.
b. Install isolation valves at all each branch line serving multiple plumbing fixtures.
c. Where valves are above hard ceilings, or in walls provide minimum 12 x 12 access door to service valves. Label door “Plumbing Valve Access.”
d. If valves above access doors are not within “arms reach,” install minimum 24 x 24 access door for access.
e. Access doors shall be equal to _____.

3.2 HORIZONTAL PIPING INSTALLATION

A. Locate hangers, supports, and anchors near or at changes in piping direction and concentrated loads.

B. Provide for vertical adjustment to maintain pitch required for proper drainage.

C. Allow for expansion and contraction of the piping.

3.3 PIPE SLEEVES AND INSERTS

A. Set sleeves before concrete is poured or floors finished.

B. Inserts for units should be placed in the concrete or masonry during construction to avoid cutting of finished work. When and if cutting becomes necessary, it must be done in accordance with the cutting and patching specifications.

3.4 FLOOR AND CEILING PLATES

A. Install on all pipes passing through floors, partitions, and ceilings.

3.5 UNIONS AND CONNECTIONS

A. Install malleable ground joint unions in hot and cold water piping throughout the system so that any portion can be taken down for repairs or inspections without injury to same or covering.

B. Running threads or long screws will not be permitted in jointing any pipe.

C. Provide dielectric waterways Style #47 between ferrous and non-ferrous metals.

3.6 FIRE STOPPING

A. Fire stop all penetrations of fire walls, fire barriers, fire petitions, and other fire rated walls and ceilings and floors as per IBC Section 711. See Specification 22 0800.

END OF SECTION 22 0503

SECTION 220548 – VIBRATION AND SEISMIC CONTROL FOR PLUMBING AND EQUIPMENT

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 engineering, labor, material, and equipment necessary for a complete anchorage and seismic restraint system and vibration isolation system as described in Contract Documents.
   1. The system design and installation shall be based on Seismic Zone III of the Uniform Building Code and other standards listed below.
   2. The work shall include all mechanical isolated and non- isolated equipment, ducts and piping systems which shall include:
      a. Water heaters and booster heaters.
      b. Expansion tanks.
      c. Air compressors.
      d. All piping 2-1/2" and larger except waste, vent and roof drainage piping.

1.3 REFERENCE STANDARDS

A. International Building Code, Current Edition

B. NFPA Bulletin 90A, Current Edition

C. UL Standard 181

D. Tri-Services Manual, Fagel Et Al

E. MACNA Guidelines for Seismic Restraints of Mechanical Systems

1.4 SEISMIC REQUIREMENTS & QUALIFICATIONS

A. The Mechanical Contractor shall be responsible for supplying and installing equipment, vibration isolators, flexible connections, rigid steel frames, anchors, inserts, hangers and attachments, supports, seismic snubbers and bracing to comply with the current code. All supports, hangers, bases, braces and anchorage for all non-isolated equipment, ductwork and piping shall be installed as detailed and specified in the contract documents. Specific requirements on equipment anchorage and restraints, locations and sizes shall be furnished to the contractor after shop drawings for mechanical equipment have been reviewed and approved. All supports, hangers, bases, anchorage and bracing for all isolated equipment shall be designed by a professional engineer employed by the restraint manufacturer, qualified with seismic experience in bracing for mechanical equipment. Shop drawings submitted for earthquake bracing and anchors shall bear the Engineer's signed professional seal.

B. The Contractor shall require all equipment suppliers to furnish equipment that meets the seismic code, with bases designed to receive seismic bracing and/or anchorage. All isolated mechanical equipment bracing to be used in the project shall be designed from the Equipment Shop Drawings certified correct by the equipment manufacturer for Seismic Zone III with direct anchorage capability.

1.5 SUBMITTALS

A. Submittal data prior to fabrication, shall include but not be limited to the following:
   1. Complete engineering calculations and shop drawings for all vibration and seismic requirements for all equipment to be isolated and restrained.

2. The professional stamp of the engineer who is responsible for the design of the Vibration and Seismic Restraint System for isolated equipment.
3. Details for all the isolators and seismic bracing with snubbers proposed for items in this specification and on the drawings.
4. Details for steel frames, concrete inertia bases, and anchors to be used in conjunction with the isolation of the items in this specification and drawings.
5. Clearly outlined procedures for installing and adjusting the isolators, seismic bracing anchors and snubbers.
6. The proposed location of pipe and duct restraints.

PART 2 - PRODUCTS

2.1 RESTRAINT EQUIPMENT

A. Manufacturer of restraint equipment for isolated equipment shall be the manufacturer of the vibration isolators furnished for the equipment. Design of restraints and anchors for isolated equipment shall also be by the manufacturer.

B. Approved Manufacturers and Suppliers:
1. Manufacturers and suppliers of restraint equipment and systems approved for use by the Contractor, for isolated and non-isolated systems, are Mason Industries. Inc., Korfund, Amber/Booth Company, Vibration Mountings & Control Co. or prior approved equal.

PART 3 - EXECUTION

3.1 SEISMIC REQUIREMENTS

A. All mechanical equipment, piping and ductwork shall be braced, snubbed or supported to withstand seismic disturbances and remain operational. Furnish all engineering, labor, materials and equipment to provide protection against seismic disturbances as specified herein.

B. Isolated Equipment:
1. All vibration isolated equipment shall be mounted on rigid steel frames or concrete bases as described in the vibration control specifications unless the equipment manufacturer certified direct attachment capability. Each spring mounted base shall have a minimum of four all-directional seismic snubbers that are double acting and located as close to the vibration isolators as possible to facilitate attachment both to the base and the structure. The snubbers shall consist of interlocking steel members restrained by shock absorbent rubber materials.
2. Elastomeric material shall be replaceable and a minimum of 3/4" thick. Snubbers shall be manufactured with an air gap between hard and resilient material of not less than 1/8" nor more than 1/4". Snubbers shall be installed with factory set clearances. Snubbers shall be equal to Mason Z-1011.
3. A one "g" minimum vertical and lateral level shall be used in the design of all snubbers restraining isolated equipment.

C. Piping:
1. All isolated and non-isolated piping 2-1/2" I.D. and larger shall be protected in all planes by restraints to accommodate thermal movement as well as restrain seismic motion. Locations shall be as scheduled and shall include but not be limited to:
a. At all drops to equipment and at flexible connections.
b. At all 45° or greater changes in direction of pipe.
c. At horizontal runs of pipe, not to exceed 30 feet O.C. spacing.
d. Piping shall be restrained by a cable restraining system using a minimum of two cables at all restraint points.
e. Shop drawings shall be submitted with the locations of all restraints shown on a floor plan and noting the size and type of restraint to be used.
f. Gas piping shall have additional restraints as scheduled.

D. Non Isolated Equipment:

1. The restraint systems for all non isolated equipment shall be designed according to Table 23J, sec. 2312 of the Uniform Building Code with an importance factor of 1.5, a site factor Z = 0.75 and a Cp = 0.3. Horizontal force factor for elements of structures. In addition, the vertical forces restraint requirement shall be computed as 1/2 the value of the horizontal forces. All equipment not anchored directly to floors shall be restrained by cables as designed and furnished by the Restraint Manufacturer.

3.2 VIBRATION ISOLATION REQUIREMENTS

A. All spring supports shall be designed to have an additional travel of 50 percent between the design height and the solid height.

B. Vertical pipe risers shall be isolated from the structure by means of vibration and noise isolating expansion hangers. The hangers shall have a minimum rated deflection of four times the anticipated pipe movement and shall be enclosed in a housing for fail-safe equipment.

C. Flexible members shall be incorporated in the piping adjacent to all reciprocating equipment.

D. Flexible connections shall be incorporated in the ductwork adjacent to all air-moving units.

END OF SECTION 22 0548

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 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 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 1007-- PRESS TYPE PIPE FITTINGS

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 01 apply to this Section.

1.2 SUMMARY

A. Copper Tubing and Fitting System for Hot and Cold Water Distribution Systems, Sprinkler and Standpipe Systems and Hydronic Piping Systems

1.3 DEFINITIONS

A. ASME: American Society of Mechanical Engineers

B. ASTM: American Society for Testing and Materials

C. EPDM: Ethylene-propylene-diene-monomer

D. IAPMO: International Association of Plumbing & Mechanical Officials

E. ICC: International Code Council

F. MSS: Manufacturers Standardization Society

G. AWWA: American Water Works Association

H. NSF: National Sanitation Foundation

I. UL: Underwriters Laboratory

J. NFPA: National Fire Protection Association

1.4 REFERENCES

A. ASME A13.1: Scheme for the Identification of Piping Systems

B. ASME B1.20.1: Pipe Threads, General Purpose (inch)

C. ASME B16.18: Cast Copper Alloy Solder Joint Pressure Fittings

D. ASME B16.22: Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings

E. ASME B16.26: Cast Copper Alloy Fittings for Flared Copper Tube

F. ASME B31.9: Building Services Piping

G. ASTM B75: Standard Specification for Seamless Copper Tube

H. ASTM B88: Standard Specification for Seamless Copper Water Tube

I. ASTM B813: Standard Specification for Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube

J. ASTM B828: Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings

K. AWWA C651: Standard for Disinfecting Water Mains

L. IAPMO: Uniform Mechanical Code

M. IAPMO: Uniform Plumbing Code

N. ICC: International Plumbing Code

O. ICC: International Mechanical Code

P. MSS-SP-58 Pipe Hangers and Supports Materials, Design and Manufacturer

Q. MSS-SP-69 Pipe Hangers and Supports Selection and Application

R. NFPA 13 Standard for the Installation of Sprinkler Systems

S. NFPA 13D Standard for the Installation of Sprinkler Systems in One/Two Family Dwellings and Mobile Homes

T. NFPA 13R Standard for the Installation of Sprinkler Systems for Residential Occupancies up to and including Four Stories in Height

U. NFPA 14 Standard for the Installation of Standpipe and Hose Systems

V. NSF 61 Drinking Water System Components – Health Effects

1.5 QUALITY ASSURANCE

A. Installer shall be a qualified installer, licensed within the jurisdiction, and familiar with the installation of ProPress copper press joint systems.

B. ProPress copper press fittings shall be installed using the proper tool, actuator, jaws and rings as instructed by the press fitting manufacturer.

C. The installation of copper tubing for hot and cold water distribution systems shall conform to the requirements of the ICC International Plumbing Code or IAPMO Uniform Plumbing Code.

D. The installation of copper tubing in sprinkler or standpipe systems shall conform to NFPA 13, 13D, 13R and 14.

E. The installation of copper tubing in Hydronic systems shall conform to the requirements of the ICC International Mechanical Code or the IAPMO Uniform Mechanical Code.

F. ASME Compliance: ASME B31.9 for building services piping valves.

1.6 DELIVERY, STORAGE AND HANDLING

A. Copper tubing shall be shipped to the job site on truck or in such a manner to protect the tubing. The tubing and fittings shall not be roughly handled during shipment. Tubing and fittings shall be unloaded with reasonable care.

B. Protect the stored product from moisture and dirt. Elevate above grade. When stored inside, do not exceed the structural capacity of the floor.

C. Protect fittings and piping specialties from moisture and dirt.

1.7 PROJECT CONDITIONS

A. Verify length of tubing required by field measurements.

1.8 WARRANTY

A. The tubing and fittings manufacturer shall warrant that the tubing and fittings are free from defects and conform to the designated standard. The warranty shall only be applicable to tubing and fittings installed in accordance with the manufacturer’s installation instructions.

B. The manufacturer of the fittings shall not be responsible for the improper use, handling or installation of the product.

PART 2 - PRODUCTS

2.1 MANUFACTURES

A. Press Fittings: Viega**,** Victaulic.

2.2 MATERIAL

A. Tubing Standard: Copper tubing shall conform to ASTM B 75 or ASTM B88.

B. Fitting Standard: Copper fittings shall conform to ASME B16.18, ASME B16.22 or ASME B16.26.

C. Press Fitting: Copper and copper alloy press fittings shall conform to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer.

D. Threaded Fittings: Pipe Threads shall conform to ASME B1.20.1.

E. Hanger Standard: Hangers and supports shall conform to MSS-SP-58.

2.3 SOURCE QUALITY CONTROL

A. All fittings in contact with drinking water shall be listed by a third party agency to NSF 61.

B. All fittings used in Fuel Gas Applications shall be listed by a third party agency as being acceptable for fuel gas piping systems.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The installing contractor shall examine the copper tubing and fittings for defects, sand holes or cracks. There shall be no defects of the tubing or fittings. Any damaged tubing or fittings shall be rejected.

B. The installing contractor shall insure that sealing elements are properly in place and free from damage. For Sizes 2-1/2" to 4", installer should insure that the stainless steel grip ring is in place.

3.2 PREPARATION

A. Copper tubing shall be cut with a wheeled tubing cutter or approved copper tubing cutting tool. The tubing shall be cut square to permit proper joining with the fittings.

B. Remove scale, slag, dirt and debris from inside and outside of tubing and fittings before assembly. The tubing end shall be wiped clean and dry. The burrs on the tubing shall be reamed with a deburring or reaming tool.

3.3 INSTALLATION GENERAL LOCATIONS

A. Plans indicate general location and arrangement of piping systems. Identified locations and arrangements are used to size tubing and calculate friction loss, expansion, pump sizing and other design considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings.

3.4 INSTALLATION

A. Pressure Rating: Install components having a pressure rating equal to or greater than the system operating pressure.

B. Install piping free of sags, bends and kinks.

C. Change in Direction: Install fittings for changes in direction and branch connections. Where approved, changes in direction may also be made by bending of Types K and L tube.

D. Solder Joints: Solder joints shall be made in accordance with ASTM B 828. The temperature of the joint during soldering shall not be raised above the maximum temperature limitation of the flux.

E. Threaded Joints: Threaded joints shall have pipe joint compound or teflon tape applied to the male threads only. Tighten joint with a wrench and backup wrench as required.

F. Flared Joints: Flared copper tube joints shall be made by the appropriate use of cast copper alloy fittings. Flared ends of copper tube shall be of the 45-degree flare type and shall only be made with a flaring tool designed specifically for that purpose.

G. Press connections: Copper and copper alloy press connections shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool(s) approved by the manufacturer.

H. Pipe Protection: Provide protection against abrasion where copper tubing is in contact with other building members by wrapping with an approved tape, pipe insulation or otherwise suitable method of isolation.

I. Penetration Protection: Provide allowance for thermal expansion and contraction of copper tubing passing through a wall, floor, ceiling or partition by wrapping with an approved tape or pipe insulation or by installing through an appropriately sized sleeve. Penetrations for fire resistant rated assemblies shall maintain the rating of the assembly.

J. Backfill Material: Backfill material shall not include any ashes, cinders, refuse, stones, boulders or other materials which can damage or break the tubing or promote corrosive action in any trench or excavation in which tubing is installed.

K. Horizontal Support: Install hangers for horizontal piping in accordance with MSS-SP-69 or the following maximum spacing and minimum rod sizes.

L. Vertical Support: Vertical copper tubing shall be supported at each floor.

M. Galvanic Corrosion: Hangers and supports shall be either copper or vinyl coated to prevent galvanic corrosion between the tubing and the supporting member.

N. Seismic Restraint: In seismic areas, copper tubing shall be installed to withstand all seismic forces.

O. Piping Identification: Copper tubing systems shall be identified in accordance with the requirements of ASME A13.1.

3.5 FIELD QUALITY CONTROL

A. Water Testing: The copper tubing system shall be water tested for joint tightness. The piping system shall be filled with water. The system shall be pressurized to the maximum pressure and length of time required by the code or standard. The system shall have no leaks at the rated pressure.

B. Air Testing: The copper tubing system shall be air tested for joint tightness. The piping system shall be pressurized with air to the maximum pressure of the system or to the code or standard required minimum for the required length of time. The system shall have no leaks at the rated pressure.

3.6 CLEANING (potable water systems)

A. Disinfection: The copper hot and cold water distribution system shall be disinfected prior to being placed in service. The system shall be disinfected in accordance with AWWA C651 or the following requirements:
   1. The piping system shall be flushed with potable water until discolored water does not appear at any of the outlets.
   2. The system shall be filled with a water chlorine solution containing at least 50 parts per million of chlorine. The system shall be valved off and allowed to stand for 24 hours or the system shall be filled with a water chlorine solution containing at least 200 parts per million of chlorine. The system shall be valved off and allowed to stand for 3 hours.
   3. Following the standing time, the system shall be flushed with water until the chlorine is purged from the system.

END OF SECTION 22 1007

SECTION 22 1114-- NATURAL GAS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, and Section 22 0501 apply to this Section.

1.2 SUMMARY

A. Furnish and install gas piping and fittings within building including connection to meter.

1.3 QUALITY ASSURANCE

A. Qualifications:
1. Welders shall be certified and bear evidence of certification 30 days prior to commencing work on project. If there is doubt as to proficiency of welder, Owner's Representative may require welder to take another test. This shall be done at no cost to Owner. Certification shall be by Pittsburgh Testing Laboratories or other approved authority.

PART 2 - PRODUCTS

2.1 PIPE

A. Meet requirements of ASTM A 53-89a, "Specification for Pipe, Steel, Black & Hot-Dipped Zinc-Coated Welded & Seamless".

B. Carbon steel, butt welded, Schedule 40 black steel pipe.

2.2 FITTINGS

A. Black Pipe:
1. Welded forged steel fittings meeting requirements of ASTM A 234-89a, "Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures", or standard weight malleable iron screwed.

2.3 VALVES

A. 125 psi bronze body ball valve, UL listed

B. Approved Manufacturers & Models:
1. ConBraCo - "Apollo" series 80-100
2. Jenkins - FIG-30-A
3. Jomar - Model T-204
4. McDonald - 3410
5. PGL Corp - "Red Cap" gas ball valve
6. Watts - Model B-6000-UL

2.4 PRESSURE REDUCING REGULATORS

A. Self- operated, spring loaded regulator with large diaphragm area.

B. Internal registration and relief.

C. Tamper-resistant adjustment with corrosion resistance brass for indoor or outdoor use.

D. ½″ to 1 ½ ″ Threaded NPT.

E. 2″ and Above Flanged.

F. Max Inlet Pressure 10 psi., Max Outlet Pressure 0.5 psi.

G. Temperature Capabilities - ~20 to 180° F.

H. Install with manual shut off cock.

I. Approved Manufactures and Models.
1. Emerson Y600 AR.
2. Maxitrol 3UP33.
3. Or Approved Equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Pipe installed underground, through air plenums, in walls, and pipes 2-1/2 inches and larger shall have welded fittings and joints. Other pipe may have screwed or welded fittings.

B. Wrap and lay underground pipe in accordance with local gas utility company regulations and specifications.

C. Install gas cocks on lines serving boilers, furnaces, duct heaters, and water heaters adjacent to boiler, furnace, or heater on outside of boiler, furnace, or heater cabinet and easily accessible.

D. Do not use flexible pipe connections to boilers, furnaces, duct heaters, or hot water heaters.

E. Install dirt leg with pipe cap, 6 inches long minimum, on each vertical gas drop to heating equipment.

F. Use fittings for changes of direction in pipe and for branch runouts.

G. Paint exterior exposed gas piping with gray paint to match gas meter.

END OF SECTION 22 1114

SECTION 22 1116 – DOMESTIC WATER PIPING SYSTEMS (COPPER –ALL SIZES)

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

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 1117 DOMESTIC WATER PIPING SYSTEMS (PEX-Sizes 1" AND SMALLER)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes ASTM F877 cross-linked polyethylene (PEX) tubing hot and cold water distribution systems, ASTM F876 cross-linked polyethylene (PEX) tube, ASTM F1807 fittings and ASTM F2159 fittings

1.2 REFERENCES

A. ASTM International
1. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM F876 Standard Specification for Cross-linked Polyethylene (PEX) Tubing.
3. ASTM F877 Standard Specification for Cross-linked Polyethylene (PEX) Plastic Hot and Cold Water Distribution Systems
4. ASTM F1807 Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing
5. ASTM F2159 Standard Specification for Plastic Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing

B. National Sanitation Foundation (NSF)
1. Standard 14 Plastics Piping System Components and Related Materials
2. Standard 61 Drinking Water System Components – Health Effects

C. International Code Council (ICC)
1. International Mechanical Code
2. International Plumbing Code

D. International Association of Plumbing Officials (IAPMO)
1. Uniform Plumbing Code
2. Uniform Mechanical Code

E. Plastic Pipe Institute (PPI)
1. Technical Report TR-3 Policies and Procedures for Developing Recommended Hydrostatic Design Stresses for Thermoplastic Pipe Materials.
2. Technical Report TR-4 Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Piping and Fitting Compounds

1.3 SYSTEM DESCRIPTION

A. Design Requirements
1. Standard Grade hydrostatic pressure ratings from the Plastic Pipe Institute in accordance with TR-3 and listed in TR-4. The following three standard-grade hydrostatic ratings are required;
a. 200 degrees F at 80 psi
b. 180 degrees F at 100 psi
c. 73 degrees F at 160 psi
2. Tubing tested in general accordance with ASTM E84 for a flame spread/smoke developed index of 25/50 or less for the following PEX tube sizes;
a. 3/8 inch
b. ½ inch
c. 5/8 inch
d. ¾ inch

e. 1 inch

B. Performance Requirements
1. To provide a PEX tubing hot and cold potable water distribution system, which is manufactured, fabricated and installed to comply with regulatory agencies and to maintain performance criteria stated by the PEX tubing manufacturer without defects, damage or failure
a. Comply with NSF Standard 14
b. Comply with NSF Standard 61
c. Show compliance with ASTM F877

1.4 SUBMITTALS

A. General
1. Upon request, submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section

B. Product Data
1. Upon request, submit manufacturer's product submittal data and installation instructions
2. Upon request, submit manufacturer's Professional Installation Limited Warranty

C. Shop Drawings
1. Upon request, provide installation drawings indicating tubing layout, manifold locations, plumbing fixtures supported and schedules with details required for installation of the system

D. Samples
1. Upon request, submit selection and verification samples of piping

E. Listing Certifications
1. Upon request, submit manufacturers third party listings

1.5 QUALITY ASSURANCE

A. Installer Qualifications
1. Utilize an installer having demonstrated experience on projects of similar size and complexity and possesses the skills and knowledge to install a PEX potable water distribution system
2. Installer will utilize skilled workers holding a trade qualification license or equivalent or apprentices under the supervision of a licensed tradesperson

B. Pre-installation Meetings
1. Verify project timeline requirements
2. Manufacturer's installation instruction
3. Manufacturer's warranty requirements

1.6 DELIVERY, STORAGE AND HANDLING

A. General
1. Comply with Division 1 Product Requirement Section

B. Delivery
1. Deliver materials in manufacture's original, unopened, undamaged containers with identification labels intact until ready for installation

C. Storage and Protection
1. Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer

2. Store PEX tubing indoors, in cartons or under cover to avoid dirt or foreign material from entering the tubing
3. Do not expose PEX tubing to direct sunlight for more than six months. If construction delays are encountered, cover the tubing that is exposed to direct sunlight

1.7 WARRANTY

A. Project Warranty
1. Refer to Conditions of the Contract for project warranty provisions

B. Manufacturer's Warranty
1. Shall cover the repair or replacement of properly installed tubing and fittings proven defective as well as incidental damages
2. Warranty period for PEX tubing and subsequent system shall be 25 year non-prorated warranty against failure due to defect in material or workmanship, beginning with the date of installation
3. It is the installer's responsibility to avoid mixing fittings manufactured by others as it will reduce the owner's warranty

PART 2 - PRODUCTS

2.1 PRODUCT MANUFACTURERS

A. Zurn

B. Uponor

C. Vanguard

D. Rehau

E. Viega

2.2 MATERIALS

A. Tubing
1. Cross-linked polyethylene (PEX).
2. Non-barrier type.
a. Shall have a pressure and temperature rating of 160 PSI at 73°F, 100 PSI at 180°F and 80 PSI at 200°F.
b. Tubing shall have a minimum of 6 months UV protection.
3. Manufactured in accordance with ASTM F876 and ASTM F877 and tested for compliance by an independent third-party agency.

B. Fittings
1. Manufactured in accordance with ASTM F1807 or ASTM F2159 and/or comply with ASTM F877 system standard as identified on the fitting

C. Manifold
1. Preassembled Manifold
2. Copper Manifold System
3. Multi Port Fittings
4. Copper Manifold Header

D. Valves
1. Shall be of the metal type, meeting the requirements of ASTM F877, identified as such with the appropriate mark on the product

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. A. Comply with manufacture's product data, including product technical bulletins, technical memo's, installation instructions and design drawings.

3.2 EXAMINATION

A. Site Verification of Conditions
   1. Verify that site conditions are acceptable for the installation of the PEX potable water system
   2. Do not proceed with installations of the PEX potable water system until unacceptable conditions are corrected

3.3 INSTALLATION

A. Install PEX tubing in accordance with tubing manufacturer's recommendations and as indicated in the PEX Plumbing Installation Guide

B. Do not install PEX tubing within 6 inches of gas appliance vents or within 12 inches of any recessed light fixtures

C. Do not solder within 18 inches of PEX tubing in the same waterline. Make sweat connections prior to making PEX connections

D. Ensure no glues, solvents, sealants or chemicals come in contact with the tubing without prior permission from the tubing manufacturer

E. Do not expose PEX tubing to direct sunlight for more than 6 months

F. Use grommets or sleeves at the penetration for PEX tubing passing through metal studs

G. Use a PEX manufacturer recommended fire stop sealant manufacturer

H. Protect PEX tubing with sleeves where abrasion may occur

I. Use nail plates where PEX tubing penetrates wall stud or joists and has the potential for being struck with a screw or nail

J. Allow slack of approximately 1/8 inch per foot of tube length to compensate for expansion and contraction

K. Minimum horizontal supports are to be installed not less than 32 inches between hangers in accordance with model plumbing codes.

L. Pressurize PEX tubing in accordance with applicable codes or in the absence of applicable codes, test pressure shall be at least equal to normal system working pressure, but not less than 40 PSI water or air and not greater than 225 PSI water, 125 PSI air

3.4 FIELD QUALITY CONTROL

A. Site Tests
   1. To ensure system integrity, pressure test the system before covering tubing in concrete and after other trades have worked in the vicinity of the tubing

2. Repair and replace any product that has been damaged according to manufacturer's recommendation

3.5 PROTECTION

A. Protect installed work from damage due to subsequent construction activity on the site

END OF SECTION 22 1117

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. 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 3330 – ELECTRIC STORAGE TYPE WATER HEATERS

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 water heater as specified in Contract Documents.

1.3 SUBMITTALS

A. Warranty:
   1. Submit copy of specified warranty.

1.4 WARRANTY

A. Three year non-prorated warranty on water heaters of 20 gallon capacity and larger.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Glass lined storage tank pressure tested and rated for 125 PSI working pressure.

B. 50 Gallon - (Regular Height)
   1. (2) 4.5 Kw non-simultaneous operation.
   2. 3 inches minimum glass fiber insulation.
   3. Complete with two stage thermostat, magnesium anode, electric sheath rod type heating element, high limit control, and ASME rated temperature-pressure relief valve.
   4. Heater shall be pre-wired and entire unit bear UL label.
   5. Maximum Height - 50 inches.
   6. Approved Manufacturers:
      a. A O Smith
      b. State Industries
      c. Ruud/ Rheem
      d. Bradford/White
      e. PVI

PART 3 - EXECUTION

3.1 INSTALLATION

A. Water heaters shall each have a temperature-pressure relief valve sized to match heat input and set to relieve at 120 psi.

B. Install temperature-pressure relief valve rated at MBH input of heater minimum on hot water heater and pipe discharge to directly above funnel of floor drain.

C. Thermal Expansion Absorbers.
   1. Bladder type for use with potable water systems.
   2. Acceptable Products:
      a. Therm-X Trol ST-5 by Amtrol
      b. Equal as approved by Architect before bidding.

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 3330

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, Guardian, Sloan Valve Co., or an approved equal. Specialties shall be Zurn, Josam, MiFab, J. R. Smith, Wade, or Watts.

F. Carrier and wall hydrant manufacturers shall be Smith, Zurn, Wade, Josam, or Watts.

G. Stainless steel sink manufacturers shall be Elkay or Just.

H. Drinking fountain manufacturers shall be Elkay, Halsey Taylor, Haws, Cordley, Sunroc, Murdock, or Oasis.

I. Pressure balance mixing valves shall be Powers, Lawler, Leonard, or Symmons.

J. Thermostatic mixing valves shall be Powers.

K. Provide GSR "Fuseseal" flame retardant acid resisting pipe and fittings where shown. Provide slip joint union connections on all traps and connections to equipment.

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. Make fixture floor connections with approved brand of cast iron floor flange, soldered or calked securely to waste pipe.

C. Make joints between fixtures and floor flanges tight with approved fixture setting compound or gaskets.

D. Caulk between fixtures and wall and floor with white butyl rubber non-absorbent caulking compound. Point edges.

E. 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.

F. Traps: Install "P" traps in branch lines from floor drains or where required. Traps installed in connection with threaded pipe shall be recess drainage pattern. Traps installed in connection with cast iron pipe shall be of the same quality and grade as the pipe. Traps installed in connection with fixtures shall have a seal of not less than 2" nor more than 4". Exposed traps shall be chrome plated cast brass or chrome plated 17 gauge tubular type. Provide trap primers as required by Code.

3.2 FIXTURE INSTALLATION

A. Provide stop valves and 18" minimum air chambers on all water connections to fixtures. Furnish and install wall carriers for wall mounted fixtures, wood backing, where necessary, to be installed by General Contractor at the direction of this Contractor. Provide exact locations, including proper mounting heights, obtained from details on drawings and from manufacturer's specifications. Provide hudee rims for countertop installations.

B. Interior exposed pipe, valves, and fixtures trim shall be chrome plated.

C. Complete installation of each fixture including trap and accessories with accessible stop or control valve in each hot and cold water branch supply line. Make fixture floor connections with approved brand of cast iron floor flange, soldered or caulked securely to waste pipe. Make joint between fixture and floor flange tight with approved fixture setting compound or gaskets.

D. Polish chrome finish at completion of project.

E. Caulk between fixtures and wall and floor with white butyl rubber non-absorbent caulking compound. Paint all edges.

F. Install fixtures and fittings as per local codes and manufacturer's instructions.

END OF SECTION 22 4001

SECTION 22 4703 – HANDICAP DRINKING WATER COOLING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 05 01 apply to this Section.

1.2 SUMMARY

A. Furnish and install handicap drinking water cooling system as described in Contract Documents.

PART 2 - PRODUCTS

2.1 HANDICAPPED FOUNTAIN

A. Vandal proof operating bar on front and both sides. 7-1/2 GPH of 50 deg F water with 90 deg F room temperature, 1/5 horsepower compressor motor, 120 V, 60 Hz, single phase. One piece stainless steel back splash and basin. Flexi-guard or chrome plated brass bubbler.

B. Approved Manufacturers:
1. Sunroc
2. Halsey Taylor
3. Haws
4. Elkay
5. Oasis
6. Murdock

2.2 HYDRATION STATION.

A. Touchless sensor activated, 1.5 GPM Quick Fill, with automatic 20 second shut-off timer. 120V, 60 HZ single phase.

B. Visual user interface display includes:
1. Innovative Green Ticker counting number of bottles saved from waste.
2. Filter moniter indicating when replacement is needed.

C. Water Sentry Plus Filler:
1. 3000 Gallon Capacity.
2. Quick ¼ turn for easy installation.
3. Polypropylene pre-filter mesh prevents coarse sediment from entering filter.
4. Made with activated carbon and patented ATS lead-removal media.
5. Final filter mesh prevents loose carbon from entering water.
6. ANSI/NSF Standard 42 and 53.

D. Approved Manufacturers:
1. Sunroc
2. Halsey Taylor
3. Haws
4. Elkay
5. Oasis

PART 3 - EXECUTION

3.1 INSTALLATION

A. Anchor bottom of fountain to wall.

B. Top surface to be 32 inches above floor unless required otherwise by local code.

C. Install 3/8 inch IPS union connection and Chicago No. 376 stop to building supply line.

D. Install 1-1/4 inch IPS slip cast brass "P" trap. Install trap so it is concealed.

END OF SECTION 22 4703

DIVISION 23: HEATING, VENTILATING, AND AIR-CONDITIONING

23 0000 HEATING, VENTILATING, AND AIR-CONDITIONING

23 0501 COMMON HVAC REQUIREMENTS
23 0502 DEMOLITION AND REPAIR
23 0548 SEISMIC AND VIBRATION CONTROL
23 0553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
23 0593 TESTING, ADJUSTING, AND BALANCING
23 0717 ROUND SUPPLY DUCT INSULATION
23 0718 DUCT LINING

23 3000 HVAC AIR DISTRIBUTION

23 3114 LOW-PRESSURE STEEL DUCTWORK
23 3346 FLEX DUCT
23 3400 EXHAUST FANS
23 3713 AIR OUTLETS & INLETS
23 4100 DISPOSABLE FILTERS

23 5000 CENTRAL HEATING EQUIPMENT

23 5416 SEPARATED COMBUSTION UNIT HEATERS
23 5723 WALL HEATER

23 6000 CENTRAL COOLING EQUIPMENT

23 7413 PACKAGED ROOFTOP AIR CONDITIONING UNITS

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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 heat pump, 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 0502 - DEMOLITION AND REPAIR

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. Under this section remove obsolete piping and mechanical equipment and relocate, reconnect or replace existing piping affected by demolition or new construction. Remove concealed piping abandoned due to demolition or new construction, or cap piping flush with existing surfaces.

1.3 DRAWINGS AND EXISTING CONDITIONS

A. All relocations, reconnections and removals are not necessarily indicated on the drawings. As such, the Contractor shall make adequate allowance in his proposal for this work as no extra charges will be allowed for these items.

PART 2 - NOT USED

PART 3 - EXECUTION

3.1 TEMPORARY CONNECTIONS

A. Where existing piping must remain in service to supply occupied areas during construction, provide temporary piping, connections, and equipment to maintain service to such areas. All shall be performed in a neat and safe manner to prevent injury to the building or its occupants.

3.2 EXISTING TO BE ABANDONED

A. All required drilling, cutting, block-outs and demolition work required for the removal and/or installation of the mechanical system is the responsibility of this Contractor.

B. No joists, beams, girders, trusses or columns shall be cut by any Contractor without written permission from the Architect.

C. The patching, repair, and finishing to existing or new surfaces is the responsibility of this Contractor, unless specifically called for under sections of specifications covering these materials.

D. Disconnect all equipment that is to be removed or relocated. Relocate any existing equipment that obstructs new construction.

3.3 EXISTING TO REMAIN IN USE

A. Where affected by demolition or new construction, relocate, replace, extend, or repair piping and equipment to allow continued use of same. Use methods and materials as specified for new construction.

3.4 MATERIALS AND EQUIPMENT REMOVED

A. All obsolete materials, piping, and equipment shall become the property of the Contractor and be removed from the site promptly.

END OF SECTION 23 0502

SECTION 23 0548 – SEISMIC AND VIBRATION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 05 01 apply to this Section.

1.2 SUMMARY

A. Furnish and install engineering, labor, material, and equipment necessary for a complete anchorage and seismic restraint system and vibration isolation system as described in Contract Documents.
   1. The system design and installation shall be based on Seismic Zone D or above of the International Building Code and other standards listed below.
   2. The work shall include all mechanical isolated and non- isolated equipment, ducts and piping systems which shall include:
      a. Rooftop Units.
      b. Utility and inline exhaust fans.
      c. Ceiling and roof fans.
      d. Round ductwork 24" round and larger.
      e. Rectangular ductwork 4 sq. ft. in cross-sectioned area and larger.

1.3 REFERENCE STANDARDS

A. International Building Code, Current Edition

B. NFPA Bulletin 90A, Current Edition

C. UL Standard 181

D. Tri-Services Manual, Fagel Et Al

E. MACNA Guidelines for Seismic Restraints of Mechanical Systems

1.4 SEISMIC REQUIREMENTS & QUALIFICATIONS

A. The Mechanical Contractor shall be responsible for supplying and installing equipment, vibration isolators, flexible connections, rigid steel frames, anchors, inserts, hangers and attachments, supports, seismic snubbers and bracing to comply with the current code. All supports, hangers, bases, braces and anchorage for all non-isolated equipment, ductwork and piping shall be installed as detailed and specified in the contract documents. Specific requirements on equipment anchorage and restraints, locations and sizes shall be furnished to the contractor after shop drawings for mechanical equipment have been reviewed and approved. All supports, hangers, bases, anchorage and bracing for all isolated equipment shall be designed by a professional engineer employed by the restraint manufacturer, qualified with seismic experience in bracing for mechanical equipment. Shop drawings submitted for earthquake bracing and anchors shall bear the Engineer's signed professional seal.

B. The Contractor shall require all equipment suppliers to furnish equipment that meets the seismic code, with bases designed to receive seismic bracing and/or anchorage. All isolated mechanical equipment bracing to be used in the project shall be designed from the Equipment Shop Drawings certified correct by the equipment manufacturer for Seismic Zone III with direct anchorage capability.

1.5 SUBMITTALS

A. Submittal data prior to fabrication, shall include but not be limited to the following:
   1. Complete engineering calculations and shop drawings for all vibration and seismic requirements for all equipment to be isolated and restrained.
   2. The professional stamp of the engineer who is responsible for the design of the Vibration and Seismic Restraint System for isolated equipment.
   3. Details for all the isolators and seismic bracing with snubbers proposed for items in this specification and on the drawings.

4. Details for steel frames, concrete inertia bases, and anchors to be used in conjunction with the isolation of the items in this specification and drawings.
5. Clearly outlined procedures for installing and adjusting the isolators, seismic bracing anchors and snubbers.
6. The proposed location of pipe and duct restraints.

PART 2 - PRODUCTS

2.1 RESTRAINT EQUIPMENT

A. Manufacturer of restraint equipment for isolated equipment shall be the manufacturer of the vibration isolators furnished for the equipment. Design of restraints and anchors for isolated equipment shall also be by the manufacturer.

B. Approved Manufacturers and Suppliers:
1. Manufacturers and suppliers of restraint equipment and systems approved for use by the Contractor, for isolated and non-isolated systems, are Mason Industries. Inc., Korfund, Amber/Booth Company, Vibration Mountings & Control Co. or prior approved equal.

2.2 INERTIA PADS

A. Reinforced concrete inertia bases, the steel members of which are designed and supplied by the isolator manufacturer. The concrete shall be poured into a welded steel frame, incorporating prelocated equipment anchor bolts, 1/2" diameter reinforcing bars on nominal 8" centers each way, and recessed isolator mounting brackets to reduce the mounting height of the equipment, but yet remain within the confines of the base. The thickness of the base shall be 6 inches, or as indicated on the drawings. Where inertia bases are used to mount pumps, the bases shall be wide enough to support piping elbows. Provide with 1 inch minimum deflection springs.

B. Approved Manufacturers:
1. Mason
2. Peabody
3. Vibration Mountings

PART 3 - EXECUTION

3.1 SEISMIC REQUIREMENTS

A. All mechanical equipment, piping and ductwork shall be braced, snubbed or supported to withstand seismic disturbances and remain operational. Furnish all engineering, labor, materials and equipment to provide protection against seismic disturbances as specified herein.

B. Isolated Equipment:
1. All vibration isolated equipment shall be mounted on rigid steel frames or concrete bases as described in the vibration control specifications unless the equipment manufacturer certified direct attachment capability. Each spring mounted base shall have a minimum of four all-directional seismic snubbers that are double acting and located as close to the vibration isolators as possible to facilitate attachment both to the base and the structure. The snubbers shall consist of interlocking steel members restrained by shock absorbent rubber materials.
2. Elastomeric material shall be replaceable and a minimum of 3/4" thick. Snubbers shall be manufactured with an air gap between hard and resilient material of not less than 1/8" nor more than 1/4". Snubbers shall be installed with factory set clearances. Snubbers shall be equal to Mason Z-1011.
3. A one "g" minimum vertical and lateral level shall be used in the design of all snubbers restraining isolated equipment.

C. Non Isolated Equipment:
1. The restraint systems for all non isolated equipment shall be designed according to Table 23J, sec. 2312 of the Uniform Building Code with an importance factor of 1.5, a site factor Z = 0.75 and a Cp = 0.3. Horizontal force factor for elements of structures. In addition, the vertical forces restraint requirement shall be computed as 1/2 the value of the horizontal forces. All equipment not anchored directly to floors shall be restrained by cables as designed and furnished by the Restraint Manufacturer.

D. Ductwork:
1. All isolated and non isolated rectangular ductwork 4 sq. feet in cross-sectional area and larger and all isolated and not isolated round ductwork 24" round and larger shall be protected in all planes by restraints to

accommodate thermal movement as well as restrain seismic motion. Locations shall be as determined by the Seismic Restraint Manufacturer and shall include but not be limited to:

a. All horizontal runs of ductwork, not to exceed 30 feet O.C. spacing.
b. At all 45° or greater changes in direction of ductwork.
c. At each end of duct runs and drops to equipment.
d. At each flexible connection.
e. Ducts shall be restrained by a cable restraining system using a minimum of two cables at all restraint points.
f. Shop drawings shall be submitted with the size and type of all restraints to be used. A floor plan shall be provided to show the locations of all restraints.

3.2 VIBRATION ISOLATION REQUIREMENTS

A. All mechanical equipment 1 horsepower and over, unless otherwise noted, shall be isolated from the structure by means of resilient vibration and noise isolators designed and supplied by the manufacturer supplying seismic design and equipment. All piping and ductwork shall be isolated from the structure. Isolation equipment, hangers, connections, and other isolating devices shall be designed and installed to prevent transmission of vibration to the structure from the mechanical equipment or any associated piping and ductwork. All isolation systems shall be designed and installed to provide isolation efficiency of 98 percent.

B. All spring supports shall be designed to have an additional travel of 50 percent between the design height and the solid height.

C. Flexible members shall be incorporated in the piping adjacent to all reciprocating equipment.

D. Flexible connections shall be incorporated in the ductwork adjacent to all air-moving units.

END OF SECTION 23 0548

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 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"

2.5 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. Painting:
1. Background Color - Provide by continuous painting of piping.

Symbol	Name	Color
NG	Natural Gas	Yellow
FS	Fire Sprinkler	Red
AIR	Air	Blue

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.

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.

   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.

   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.

   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:

d. All nameplate and specification data for all air handling equipment and motors.
e. Actual metered running amperage for each phase of each motor on all pumps and air handling equipment.
f. Actual metered voltage at air handling equipment (phase-to-phase for all phases).
g. Fan RPM for each piece of air handling equipment.
h. Total actual CFM being handled by each piece of air handling equipment.
i. 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.

B. 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.

C. 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.

A. PERFORMANCE TEST PROCEDURES:

1. "Properly installed" means that the hood shall be installed in an area where there is at least 5 feet clear space in front for observation of the airflow pattern entering the hood. This area shall be without cross drafts or other air currents exceeding 20 fpm that would affect the hood performance in the area in front and around the hood.

2. Fume hood face velocities shall be verified as follows: with exhaust fan on, the quantity of air being exhausted shall be determined by measuring the velocity of air entering the hood face and multiplying this velocity by the square feet of hood opening. The hood sash shall be in the fully raised position. The air velocity shall be determined by averaging at least nine velocity readings taken at the hood face. Readings shall be taken in the center of a grid made up of 3 sections across the middle of the hood face and 3 sections each across the bottom and top of the hood face. Reading shall not vary more than ± 10 fpm from the average face velocity.

3. When the selected face velocity has been established, the following tests shall be made:
   a. Make a complete traverse of the hood face with a cotton swab dipped in titanium tetrachloride to demonstrate a positive flow of air is maintained into the hood over the entire hood face. No reverse air flows or dead air space shall be permitted.
   b. Paint a strip of titanium tetrachloride along each end and across the working surface of the hood, in a line parallel with the hood face and 6" back into the hood to demonstrate that no back flows of air exist at these points. The flow of smoke shall be directly to the rear of the hood without swirling turbulence or reverse flows.
   c. A smoke bomb (one-half minute size, as available from E. Vernon Hill Company, San Francisco, California) shall be discharged within the hood area to show the exhaust capability of the hood and its design efficiency. No reverse air flows will be permitted. Place lighted bomb in the hood area and move it to various places, meanwhile checking end panels and working surface to verify that no reverse air flows exist at any point. Lower the sash to closed position to verify that a sufficient air volume is flowing through the hood working area to carry away fumes from a massive fume source. Immediately after the smoke bomb stops discharging smoke, the hood area shall be purged of smoke.

4. Lower sash to a point 6 inches above work surface. Velocity, as measured at three points across the reduced face opening, shall be at least two times but less than three times the design face velocity when the sash was fully raised.

5. With the sash still at the lowered position, the exhaust air volume (indicated as a function of the average velocity determined in the duct with the pitot tube) shall be essentially the same as when the sash was fully raised. Now lower sash to fully closed position and measure exhaust flow. Total exhaust flow shall be essentially as measured previously with the different sash opening positions.

6. Check sash operation by raising and lowering sash. Sash shall glide smoothly and freely, and hold at any height without creeping, assuring proper counterbalance. No metal-to-metal contact shall be allowed between the sash and the sash tract.

3.2 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.

3.3 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.

3.4 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.

3.5 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.

C. END OF SECTION 23 0593

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. Exhaust air
4. Elbows, fittings, and diffuser drops greater than 12 inches in length.
5. Casings
6. 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

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 and 2-inches to each edge 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.

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.

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 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).
   2. Ducts 48 inches & larger:
      a. Ductmate/35, Nexus, or WDCI (Heavy) (SMACNA "J" Type connection).
   3. Approved Manufacturers:
      a. Ductmate Industries Inc, 10760 Bay Meadows Drive, Sandy, UT 84092 (801) 571-5308
      b. Nexus, Exanno Corp, P O Box 729, Buffalo, NY 14206 (716) 849-0545
      c. Ward Industries Inc, 1661 Lebanon Church Road, Pittsburg, PA 15236 (800) 466-9374
      d. 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
6. Pottorff

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
11. Pottorff

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
6. Pottorff

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 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. 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

A. 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 6'-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 0100 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 WALL 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 wall curb.

F. Approved Manufacturers:
1. Fans:
a. Penn
b. Centri-Master

c. Cook
d. Greenheck G, GB
e. Twin City

PART 3 - EXECUTION

3.1 INSTALLATION

A. Anchor fan units securely to structure or curb.

END OF SECTION 23 3400

SECTION 23 3713 - AIR OUTLETS & INLETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 23 0100 apply to this Section.

1.2 SUMMARY

A. Furnish and install wall supply registers, transfer grilles, return air grilles, soffit grilles, ceiling diffusers, louvers connected to ductwork, and registers as described in Contract Documents.

PART 2 - PRODUCTS

2.1 GRILLES & REGISTERS

A. Approved Manufacturers:
1. Price
2. Anemostat
3. Krueger
4. Titus
5. Tuttle & Bailey

2.2 SPIN-IN FITTINGS

A. Low pressure round take-offs to diffusers shall be made with spin-in fittings. They shall incorporate a manual balancing damper. The damper shall be spring loaded and a positive locking wing nut shall secure the damper position.

B. Approved Manufacturers:
1. Sheet metal fittings: Genflex DB-1DEL, Hercules

2.3 LOUVERS

A. Extruded aluminum, with blades welded or screwed into frames and 1/2 inch mesh 16 gauge aluminum bird screen.

B. Frames shall have mitered corners.

C. Louvers shall be recessed, flanged, stationary, or removable as noted on Drawings.

D. Approved Manufacturers:
1. Airolite
2. American Warming
3. Arrow
4. Industrial Louvers
5. Ruskin
6. Vent Products
7. Pottorff

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 4100 – DISPOSABLE FILTERS

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 filters used in mechanical equipment.

PART 2 - PRODUCTS

2.1 ROOFTOP UNIT FILTERS

A. 2 inch thick, medium efficiency, disposable type pre-formed pleated design, having at least 4.5 sq ft of filtering media per sq ft of face area.

B. Media shall be reinforced non-woven cotton fabric, treated with adhesive similar to "Vyclad B" and continuously laminated to supporting steel wire grid conforming to configuration of pleats.

C. Media pack shall be sealed in a chipboard frame or beverage board.

D. Filters shall have rated average efficiency of 25 to 30% on ASHRAE Test Standard 52-76 and be capable of operating with variable face velocities up to 500 FPM without impairing efficiency.

E. Initial resistance shall not exceed 0.30 inches w.g. at 500 FPM or 0.14 inch w.g. at 300 FPM. Filter shall be listed Class 2 by UL.

F. Approved Manufacturers:
1. Type 30/30 by Farr Co
2. Mark 80 by Serv-Aire
3. HC Type 40 by Envopleat
4. DP2-40 by Air Guard

END OF SECTION 23 4100

SECTION 23 5416 – SEPERATED COMBUSTION UNIT HEATERS

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 separated combustion unit heaters as described in Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Provide high-efficiency, separated combustion, gas fired unit heaters as manufactured by Reznor. They are to be designed for a fuel use improvement of 25% and engineered for use in building areas with negative pressure and/or extremely dirty or mildly corrosive atmospheres. The use of a factory-installed power venter to draw combustion air from outside is to prevent dirt, lint, dust, or other contaminants present in the heated space from entering the unit. The combustion air supply pipe and flue exhaust pipe shall be run parallel to a factory-supplied horizontal vent terminal assembly. The vent terminal assembly shall be arranged to provide preheating of the combustion supply air and to allow a single wall penetration.

B. The SC series shall be provided with a 24-volt control transformer, gas control system with a regulated combination redundant gas valve and an intermittent spark pilot with electronic flame supervision and timed lockout. The SC is to include all limit and safety controls, including a combustion air pressure differential switch to verify proper vent flow before allowing operation of the gas valve.

C. Each unit shall be equipped for use with natural gas and 120/1 volt power supply. The heat exchanger shall be the Reznor Themrocore design 409 stainless steel and include flared ports burner air shutters and a stainless steel insert. The units shall be designed for 83% thermal efficiency.

D. These units are to be propeller fan, open drip-proof fan motor with internal overloads, and safety fan guard. Horizontal louvers shall be provided for directing air flow. The unit must be arranged for ceiling suspension with threaded hanger connections and provided with hanger kits. The cabinet shall be constructed of zinc grip steel and finished with baked-on enamel.

E. All separated-combustion unit heaters must be design-certified by the American Gas Association and bear the A.G.A. label.

END OF SECTION 23 5416

SECTION 23 5723 - WALL HEATERS

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 wall heaters as described in Contract Documents.

1.3 QUALITY ASSURANCE

A. Units shall be UL listed and comply with NEC.

PART 2 - PRODUCTS

2.1 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 AWH-4000 or equal by
2. Berko
3. Thermador
4. Markel

END OF SECTION 23 5723

SECTION 23 7413 - PACKAGED ROOFTOP AIR CONDITIONING UNITS

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 REFERENCES

A. NFPA 90 A & B - Installation of Air Conditioning and Ventilation Systems and Installation of Warm Air Heating and Air Conditioning Systems.

B. ANSI/ASHRAE 15 - Safety Code for Mechanical Refrigeration.

C. ARI 360 - Commercial and Industrial Unitary Air Conditioning Equipment testing and rating standard.

D. ARI 340 - Commercial and Industrial Unitary Heat pump Equipment.

E. ANSI/ASHRAE/IESNA 90.1-1999 - Energy Standard for New Buildings Except Low-Rise Residential Buildings.

F. ANSI Z21.47/UL1995 - Unitary Air Conditioning Standard for safety requirements.

G. California Energy Commission Administrative Code - Title 20/24 - Establishes the minimum efficiency requirements for HVAC equipment installed in new buildings in the State of California.

H. ARI 210/240 - Unitary Air-Conditioning Equipment and Air- Source Heat Pump Equipment.

I. ARI 270 - Sound Rating of Outdoor Unitary Equipment.

J. ARI 370 - Sound Rating of Large Outdoor Refrigerating and Air Conditioning Equipment.

K. ANSI/NFPA 70-1995 - National Electric Code.

1.3 SUBMITTALS

A. Submit unit performance data including: capacity, nominal and operating performance.

1.4 DELIVERY, STORAGE and HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

1.5 WARRANTY

A. Provide parts warranty for one year from start-up or 18 months from shipment, whichever occurs first.

B. Provide five year extended warranty for compressors.

C. Provide five year heat exchanger limited warranty.

1.6 REGULATORY REQUIREMENTS

A. Unit shall conform to ANSI Z21.47/UL1995 for construction of packaged air conditioner.
   1. In the event the unit is not UL approved, the manufacturer must, at his expense, provide for a field inspection by a UL representative to verify conformance to UL standards. If necessary, contractor shall perform modifications to the unit to comply with UL, as directed by the UL representative, at no additional expense to the Owner.

PART 2 - PRODUCTS

2.1 SUMMARY

A. The contractor shall furnish and install package rooftop unit(s) as shown and scheduled on the contract documents. The unit(s) shall be installed in accordance with this specification and perform at the specified conditions as scheduled.

B. APPROVED MANUFACTURERS
1. Trane
2. Carrier
3. Lennox
4. Substitutions: As indicated under the general and/or supplemental conditions of these specifications. Mechanical contractor shall be responsible for electrical and mechanical changes to the structure when using a product other than the specified product. As built drawing changes are the responsibility of the mechanical contractor.

2.2 GENERAL UNIT DESCRIPTION

A. Unit(s) furnished and installed shall be packaged rooftop (s) as scheduled on contract documents and these specifications. Cooling capacity ratings shall be based on ARI Standard. Unit(s) shall consist of insulated weather-tight casing with compressor(s), air-cooled condenser coil, condenser fans, evaporator coil, return-air filters, supply motors and unit controls.

B. Unit(s) shall be 100% factory run tested and fully charged.

C. Units shall be dedicated downflow airflow as manufactured.

2.3 UNIT CASING

A. Cabinet: Galvanized steel, phosphatized, and finished with an air-dry paint coating with removable access panels. Structural members shall be 16 gauge with access doors and removable panels of minimum 20 gauge.

B. Units cabinet surface shall be tested 1000 hours in salt spray test in compliance with ASTM B117.

C. Cabinet top cover shall be one piece construction or where seams exits, it shall be double-hemmed and gasket-sealed.

D. Access Panels: Water- and air-tight panels with handles shall provide access to filters, heating section, return air fan section, supply air fan section, evaporator coil section, and unit control section.

E. Downflow unit's base pans shall have a raised 1 1/8 inch high lip around the supply and return openings for water integrity.

F. Insulation: Provide 1/2 inch thick coated fiberglass insulation on all exterior panels in contact with the return and conditioned air stream.

G. Provide openings either on side of unit or thru the base for power, control and gas connections.

2.4 FANS AND MOTORS

A. Provide evaporator fan section with forward curved, double width, double inlet, centrifugal type fan.

B. Provide self-aligning, grease lubricated, ball or sleeve bearings with permanent lubrication fittings.

C. Provide units 5 tons and above with belt driven, supply fans with adjustable motor sheaves.

D. Outdoor and Indoor Fan shall be permanently lubricated and have internal thermal overload protection.

E. Outdoor fans shall be direct drive, statically and dynamically balanced, draw through in the vertical discharge position.

F. Provide shafts constructed of solid hot rolled steel, ground and polished, with key-way, and protectively coated with

lubricating oil.

2.5 FILTER SECTION

A. Provide Merv 11 pleated filters.

2.6 CONDENSER SECTION

A. Provide vertical discharge, direct drive fans with aluminum blades. Fans shall be statically balanced. Motors shall be permanently lubricated, with integral thermal overload protection in a weather tight casing.

2.7 REFRIGERATION SYSTEM

A. Compressor(s): Provide direct drive, hermetic type, scroll compressor with centrifugal type oil pump. Motor shall be suction gas cooled and have internal spring isolation. Compressors shall include crankcase heaters, internal pressure relief, temperature and current sensitive overloads.

B. Units shall have cooling capabilities down to 0 degree F as standard for field-installed low ambient accessory, the manufacturer shall provide a factory-authorized service technician that will assure proper installation and operation.

C. Provide each unit with refrigerant circuit(s) factory-supplied completely piped with liquid line filter-drier, suction and liquid line pressure ports.

2.8 OUTDOOR AIR SECTION

A. Provide 100% return air.

B. Provide economizer with.

C. Provide adjustable minimum position control located in the economizer section of the unit.

D. Provide spring return motor for outside air damper closure during unit shutdown or power interruption.

2.9 OPERATING CONTROLS

A. Provide factory-wired roof top units with 24 volt control circuit with control transformers, contactor pressure lugs or terminal block for power wiring. Contractor to provide new disconnect device. Units shall have single point power connections. Field wiring of zone controls to be NEC Class II.

B. Provide microprocessor unit-mounted control which when used with an electronic zone sensor provides proportional integral room control. This UCM shall perform all unit functions by making all heating, cooling and ventilating decisions through resident software logic.

C. Provide factory-installed indoor evaporator defrost control to prevent compressor slugging by interrupting compressor operation.

D. Provide an anti-cycle timing and minimum on/off between stages timing in the microprocessor.

E. Economizer Preferred Cooling - Compressor operation is integrated with economizer cycle to allow mechanical cooling when economizer is not adequate to satisfy zone requirements. Compressors are enabled if space temperature is recovering to cooling setpoint at a rate of less than 0.2 degrees per minute. Compressor low ambient lockout overrides this function.

2.10 STAGING CONTROLS

A. Provide NEC Class II, electronic, adjustable zone control to maintain zone temperature setting, with new DDC controls. See specification Section 23 0933.

2.11 UNIT SOUND RATING NUMBER

A. SHALL BE MAXIMUM 80db BASED ON ARI 270 AND ARI 370.

2.12 OPTIONS REQUIRED

A. Condenser hail guard.

B. Internal condensate drain shall have water level monitoring device installed inside the primary drain pan and shall shut down unit in the event that the primary drain becomes restricted.

C. Convenient outlet.

D. Unit electrical service disconnect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Contractor shall verify that exiting curb is ready to receive work and opening dimensions with fit new unit.

B. Contractor shall verify that proper power supply is available.

3.2 INSTALLATION

A. Contractor shall install in accordance with manufacturer's instructions.

B. Mount units on existing built roof mounting curb or new curb as specified providing watertight enclosure to protect ductwork and utility services.

END OF SECTION 23 741

END OF DIVISION 23

DIVISION 26 - ELECTRICAL

26 0000 ELECTRICAL

26 0501 COMMON ELECTRICAL REQUIREMENTS
26 0502 DEMOLITION REQUIREMENTS
26 0503 EQUIPMENT WIRING SYSTEMS
26 0519 LINE-VOLTAGE CONDUCTORS AND CABLES
26 0526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
26 0533 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS
26 0553 ELECTRICAL IDENTIFICATION

26 2000 LOW (LINE) VOLTAGE DISTRIBUTION

26 2417 PANELBOARDS
26 2726 WIRING DEVICES
26 2816 ENCLOSED SWITCHES AND CIRCUIT BREAKERS

26 5000 LIGHTING

26 5100 INTERIOR & EXTERIOR LIGHTING

26 6000 AUXILIARY SYSTEMS

26 6100 AUXILIARY SYSTEMS
26 6210 DATA CABLING SYSTEMS

END OF TABLE OF CONTENTS

SECTION 26 0501 - COMMON ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. General electrical system requirements and procedures.
   2. Perform excavating and backfilling work required by work of this Division as described in Contract Documents.
   3. Make electrical connections to equipment provided under other Sections.
   4. Furnish and install Penetration Firestop Systems at electrical system penetrations as described in Contract Documents.

B. Related Sections:
   1. Division 07: Quality of Penetration Firestop Systems to be used on Project and submittal requirements.

1.2 SUBMITTALS

A. Product Data:
   1. Provide following information for each item of equipment:
      a) Catalog Sheets.
      b) Assembly details or dimension drawings.
      c) Installation instructions.
      d) Manufacturer's name and catalog number.
      e) Name of local supplier.
   2. Furnish such information for following equipment:
      a) Section 26 2417: Panelboards
      b) Section 26 2726: Wiring devices.
      c) Section 26 2816: Enclosed switches and circuit breakers.
      d) Section 26 5100: Interior & Exterior lighting fixtures.
   3. Do not purchase equipment before approval of product data.
   4. Submit in electronically in PDF format, Submittals shall be divided into Specification Sections and shall be electronically organized. Submittals shall specifically indicate items that are to be used, Generic submittals will be rejected.

B. Quality Assurance / Control:
   1. Report of site tests, before Substantial Completion.

1.3 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
   1. NEC and local ordinances and regulations shall govern unless more stringent requirements are specified.
   2. Material and equipment provided shall meet standards of NEMA or UL, or ULC, CSA, or EEMAC and bear their label wherever standards have been established and label service is available.

B. Materials and equipment provided under following Sections shall be by same Manufacturer:
1. Sections 26 2416, 26 2816, and 26 2913: Panelboards, Enclosed Switches And Circuit Breakers, and Enclosed Controllers.

C. Contractor shall obtain all permits and arrange all inspections required by local codes and ordinances applicable to this Division.

1.4 OWNER'S INSTRUCTIONS

A. Provide competent instructor for time required to adequately train maintenance personnel in operation and maintenance of electrical equipment and systems. Factory representatives shall assist this instruction as necessary. Schedule instruction period at time of final inspection.

1.5 OPERATION AND MAINTENANCE MANUALS

A. Prepare and submit (4) four complete copies of the O & M Manuals—manuals to contain information listed below. Place each manual in a tabbed three-ring binder upon completion of the project.
   1. Operation and Maintenance manual must contain the following items:
      a) Copies of reviewed shop drawings.
      b) Letter of 1-year guarantee of workmanship.
      c) Copy of voltage and ammeter readings.
      d) Copy of letter verifying owner's receipt of spare parts.

1.6 GUARANTEE

A. The following guarantee is a part of this specification and shall be binding on the part of the Contractor:

"The Contractor guarantees that this installation is free from mechanical defects. He agrees to replace or repair, to the satisfaction of the Owner's Representative, any part of this installation which may fail or be determined unacceptable within a period of one (1) year after final acceptance."

1.7 RECORD DRAWINGS

A. During the course of construction, the Electrical Contractor shall maintain a set of drawings upon which all deviations from the original layout are recorded. These marked-up prints shall be turned over to the Architect/Engineer at the conclusion of the work.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

A. All relocations, reconnections, and removals are not necessarily indicated on Drawings. All such work shall be included without additional cost to Owner.

B. Confirm dimensions, ratings, and specifications of equipment to be installed and coordinate these with site dimensions and with other Sections.

3.2 INSTALLATION

A. General:

1. Locations of electrical equipment shown on Drawings are approximate only. Field verify actual locations for proper installation.
2. Coordinate electrical equipment locations and conduit runs with those providing equipment to be served before installation or rough-in.
   a. Notify Architect of conflicts before beginning work.
   b. Coordinate locations of power and lighting outlets in mechanical rooms and other areas with mechanical equipment, piping, ductwork, cabinets, etc, so they will be readily accessible and functional.
3. Work related to other trades which is required under this Division, such as cutting and patching, trenching, and backfilling, shall be performed according to standards specified in applicable Sections.

B. Install Penetration Firestop System appropriate for penetration at electrical system penetrations through walls, ceilings, and top plates of walls.

3.3 FIELD QUALITY CONTROL

A. Site Tests: Test systems and demonstrate equipment as working and operating properly. Notify Architect before test. Rectify defects at no additional cost to Owner.

B. Measure current for each phase of each motor under actual final load operation, i.e. after air balance is completed for fan units, etc. Record this information along with full-load nameplates current rating and size of thermal overload unit installed for each motor.

END OF SECTION

SECTION 26 0502 - ELECTRICAL DEMOLITION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

B. Includes But Not Limited To
   1. Demolition involving electrical system as described in Contract Documents.

C. Related Sections
   1. Section 260501 – Common Electrical Requirements
   2. New and replacement work specified in appropriate specification Section.

PART 3 - EXECUTION

3.1 EXAMINATION

A. All relocations, reconnections, and removals are not necessarily indicated on Drawings. All such work shall be included without additional cost to Owner.

3.2 PREPARATION

A. Disconnect equipment that is to be removed or relocated. Carefully remove, disassemble, or dismantle as required, and store in approved location on site, existing items to be reused in completed work.

B. Were affected by demolition or new construction, relocate, extend, or repair raceways, conductors, outlets, and apparatus to allow continued use of electrical system. Use methods and materials as specified for new construction.

3.3 PERFORMANCE

A. Perform drilling, cutting, block-offs, and demolition work required for removal of necessary portions of electrical system. Do not cut joists, beams, girders, trusses, or columns without prior written permission from Architect.

B. Remove concealed wiring abandoned due to demolition or new construction. Remove circuits, conduits, and conductors that are not to be re-used back to next active fixture, device, or junction box.

C. Patch, repair, and finish surfaces affected by electrical demolition work, unless work is specifically called for under other Sections of the specifications.

3.4 CLEANING

A. Remove obsolete raceways, conductors, apparatus, and lighting fixtures promptly from site and dispose of legally.

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 conductors 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 cabinet of transformers to conduit and ground wires, if installed. Bond transformer secondary neutral conductor to cabinet.

M. Ground each separately derived system neutral to nearest ground per NEC and local inspector.

N. Provide and install a #6 ground conductor from main service ground to telephone board. Terminate ground at board on a grounding bar.

O. 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.

END OF SECTION

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. Bury underground raceway installed outside building 24 inches deep minimum.
    b. Bury underground conduit in planting areas 18 inches deep minimum. It is permissible to install conduit directly below concrete sidewalks, however, conduit must be buried 18 inches deep at point of exit from planting areas.
14. Conduit And Raceway Support:
    a. Securely support raceway with approved straps, clamps, or hangers, spaced as required.
    b. Do not support from mechanical ducts or duct supports without Architect's written approval. Securely mount raceway supports, boxes, and cabinets in an approved manner by:
       1) Expansion shields in concrete or solid masonry.
       2) Toggle bolts on hollow masonry units.
       3) Wood screws on wood.
       4) Metal screws on metal.
15. Prohibited Procedures:

a. Use of wooden plugs inserted in concrete or masonry units for mounting raceway, supports, boxes, cabinets, or other equipment.
b. Installation of raceway that has been crushed or deformed.
c. Use of torches for bending PVC.
d. Spray applied PVC cement.
e. Boring holes in truss members.
f. Notching of structural members.
g. Supporting raceway from ceiling system support wires.

C. Boxes:
1. Boxes shall be accessible and installed with approved cover.
2. Do not locate device boxes that are on opposite sides of framed walls in the same stud space. In other wall construction, do not install boxes back to back.
3. Locate boxes so pipes, ducts, or other items do not obstruct outlets.
4. Install outlets flush with finished surface and level and plumb.
5. Support switch boxes larger than two-gang with side brackets and steel bar hangers in framed walls.
6. At time of substantial completion, install blank plates on uncovered outlet boxes that are for future use.
7. Install air / vapor barrier back boxes behind outlet boxes that penetrate vapor barrier.
8. Location:
a. Install boxes at door locations on latch side of door, unless explicitly shown otherwise on Drawings. Verify door swings shown on electrical drawings with architectural drawings, and report discrepancies to Architect before rough-in. Distance of switch boxes from jamb shall be within 6 inches of door jamb.
b. Arrange boxes for ceiling light fixtures symmetrically with respect to room dimensions and structural features.
c. Properly center boxes located in walls with respect to doors, panels, furring, trim and consistent with architectural details. Where two or more outlets occur, space them uniformly and in straight lines with each other, if possible.
d. Center ceramic tile boxes in tile.

END OF SECTION

SECTION 26 0553 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Nameplates and labels.

B. Wire and cable markers.

1.02 RELATED WORK

A. This Section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total requirements for electrical identification.

1. Section 26 0501 - Basic Electrical Requirements

B. In the event of conflict regarding electrical identification requirements between this Section and any other section, the provisions of this Section shall govern.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Nameplates: Engraved three-layer laminated plastic, minimum 3/16 inch high white letters on a black background.

B. Nameplates (Emergency Equipment): Engraved three-layer laminated plastic, minimum 3/16 inch high white letters on a red background.

C. Wire and Cable Markers: Split sleeve or tubing type. Cloth or wraparound adhesive types not approved.

D. Conductor-color Tape: Colored vinyl electrical tape.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Degrease and clean surfaces to receive nameplates.

B. Install nameplates and labels parallel to equipment lines.

C. Secure nameplates to equipment fronts. Secure nameplate to outside face of panelboard doors.

D. Embossed tape will not be permitted for any application.

E. Electrical Contractor shall write the circuit number to which each device is connected on the inside of the box (clearly visible when device is removed) and on the backside of each coverplate. Use a permanent black marker.

3.02 WIRE IDENTIFICATION

A. Conductors for power circuits to be identified per the following schedule.

	System Voltage	
Conductor	480Y/277V	208Y/120V
Phase A	Brown	Black
Phase B	Orange	Red
Phase C	Yellow	Blue
Neutral	Grey	White
Grounding	Green	Green
Isolated Ground	Green with yellow stripe	Green with yellow stripe
Switchleg (lighting)	Purple	Pink
0-10V Dimming	Purple/Pink	Purple/Pink

3.03 NAME PLATE ENGRAVING SCHEDULE

A. Provide nameplates of minimum letter height as scheduled below.

B. Panelboards, Switchboards and Motor Control Centers:
1. 1st Line - Equpment Name: 1/4 inch Lettering.
2. 2nd Line - Voltage Rating: 3/16 inch Lettering
3. 3rd Line - Feed Source: 3/16 inch Lettering
4. 4th Line - Available Fault Current: 3/16 inch Lettering
5. Nameplate Examples:

PANEL: HA
480Y/277V
FEED FROM: MSB-2
FAULT CURRENT: 18,560 AMPS

SWBD: MSB
480Y/277V
FEED FROM: UTIL.
FAULT CURRENT: 35,680 AMPS

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

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: 22,000 amperes rms symmetrical for 240 volt Dist. panelboards; 42,000 amperes rms symmetrical for 480 volt Dist. panelboards, or 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: 10,000 amperes rms symmetrical for 240 volt panelboards; 14,000 amperes rms symmetrical for 480 volt panelboards, or 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: Grey or 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: Grey or As selected by Owner/Architect. Receptacles on Emergency circuit shall be Red in color. (Standarad colors shall include brown, gray, ivory, black and white for all devices.)

F. Weatherproof Receptacles: GFI, UL weather-resistant listed Receptacle mounted in a cast steel box with gasketed, weatherproof device plate and In-Use Cover.

G. Specific-use Receptacle Configuration: NEMA WD 1 or WD 5; type as indicated on Drawings, brown nylon face.

H. GFCI Receptacles: Duplex convenience receptacle with integral ground fault current interrupter. NEMA Type 5-20R.
1. *Color: As selected by Owner/Architect. Receptacles on Emergency circuit shall be Red in color. (Standarad colors shall include brown, gray, ivory, black and white for all devices.)
2. Feed-through type for downstream device protection.
3. All receptacles indicated to be installed in a toilet room, bathroom, roof top, and outdoors or within 6 feet of a sink, basin, tub or floor sink shall be GFCI protected

2.03 SPECIFIC PURPOSE RECEPTACLES

A. NEMA WD 1 or WD 5; type as indicated on Drawings.

B. Isolated Ground Type: Straight blade type 5-20R as indicated on the Drawings. Grey nylon face.

C. Twist lock type. NEMA configuration as shown on the Drawings.

2.04 WALL PLATES

A. Material:
   1. Finished Spaces: Stainless Steel.
   2. Unfinished Spaces: Galvanized Steel

B. All isolated ground receptacle covers shall bear the engraved phrase “ISOLATED GROUND”.

C. Engraved Plates: Same plate as specified herein. Provide with engraved characters 1/8 inch high characters (all letters in upper case) with filler of black color.

D. Weatherproof Cover Plate: Gasketed cast metal with hinged gasketed device covers.

2.05 CORDS AND CAPS

A. Acceptable Manufacturers:
   1. Hubbell.
   2. Leviton.
   3. Pass and Seymour.
   4. Cooper

B. Straight-blade Attachment Plug: NEMA WD 1.

C. Locking-blade Attachment Plug: NEMA WD 5.

D. Attachment Plug Configuration: Match receptacle configuration at outlet provided for equipment.

E. Cord Construction: Oil-resistant thermoset insulated Type SO multiconductor flexible cord with identified equipment grounding conductor, suitable for hard usage in damp locations.

F. Cord Size: Suitable for connected load of equipment and rating of branch circuit overcurrent protection.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install wall switches 48 inches AFF, OFF position down.

B. Install convenience receptacles 18 inches AFF, 4 inches above backsplash, or as noted, in a vertical position with grounding pole down.

C. Install specific-use receptacles at heights shown on Contract Drawings.

D. Install convenience receptacles in 4 square box in a vertical position with the ground pole down.

END OF SECTION

SECTION 26 2816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Fusible Disconnect switches.
B. Nonfusible Disconnect switches.
C. Enclosures.

1.02 RELATED WORK

A. This Section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total requirements for disconnect switches.
   1. Section 26 0501 - Basic Electrical Requirements.
   2. Section 26 0526 - Grounding.

B. In the event of conflict regarding individually enclosed low-voltage protective device requirements between this Section and any other section, the provisions of this Section shall govern.

1.03 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessor, and component indicated. Include dimensioned elevations, sections, weights, and manufacturer's technical data on features, performance, electrical characteristics, ratings, accessories and finishes.

1.04 QUALITY ASSURANCE

A. Source Limitations: Optain enclosed switches and circuit breakers, overcurrent protective devices, components and accessories within same product category from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Compenents, Devices and Accessories: Listed and labeled as defined in NFPA 70 by a qualified testing agency and marked for intended location and application.

D. Comply with NFPA 70.

1.05 COORDINATION

A. Coodinate layout and installation of switches, circuit breakers and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.06 SPARE PARTS

A. Provide fuses for switches, as required of classes, types and ratings needed to fulfill electrical requirements for services indicated. Provide spare fuses amounting to one spare fuse for each 10 installed but not less than three of any one type and size.

PART 2 - PRODUCTS

2.01 FUSIBLE SWITCHES

A. Manufacturer: Subjects to compliance with requirements, provide products of one of the following (for each type of switch):
   1. Square D Company
   2. General Electric (GE)
   3. Cutler-Hammer (Eaton)

B. Type HD, Heavy Duty, Single Throw, 240 or 600 VAC, 1200A and smaller: UL98 and NEMA KS 1, horsepower rated with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept two padlocks and interlocked with cover in closed position.

C. Accessories:
   1. Equipment Ground Kit: Internally mounted and labeled for copper or aluminum conductors.
   2. Neutral Kit (where required): Internally mounted, insulated; capable fo being grounded and bonded; labeled for copper and aluminum neutral conductors.
   3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
   4. Lugs: Mechanical type, suitable for number, size and conductor material.

2.02 NONFUSIBLE SWITCHES

A. Manufacturer: Subjects to compliance with requirements, provide products of one of the following (for each type of switch):
   1. Square D Company
   2. General Electric (GE)
   3. Cutler-Hammer (Eaton)

B. Type HD, Heavy Duty, Single Throw, 240 or 600 VAC, 1200A and smaller: UL98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks and interlocked with cover in closed position.

C. Accessories:
   1. Equipment Ground Kit: Internally mounted and labeled for copper or aluminum conductors.
   2. Lugs: Mechanical type, suitable for number, size and conductor material.

2.03 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

A. Manufacturer: Subjects to compliance with requirements, provide products of one of the following (for each type of switch):
   1. Square D Company
   2. General Electric (GE)
   3. Cutler-Hammer (Eaton)

B. Molded-Case Circuit Breaker: NEMA AB 1 with interrupting capacity to meet available fault cureents.
   1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantanuous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frams sizes 250A and larger.

C. Molded-Case Circuit Breaker Features and Accessories:
   1. Standard frame sizes, trip ratings and number of poles.

2. Lugs: Mechanical style with compression lug kits suitable for number, size, trip ratings and conductor material.
3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning and refrigerating equipment.

2.04 ENCLOSURES

A. NEMA AB 1 AND NEMA KS 1 to meed environmental conditions of installed location.
1. Indoor Locations: NEMA 250, Type 1
2. Outdoor Locations: NEMA 250, Type 3R
3. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine elements and surfaces to recieve enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

3.02 INSTALLATION

A. Comply with applicable portions of NECA 1, NEMA PB 1.1 and NEMA PB 2.1 for installations of enclosed switches and circuit breakers.

B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. (Maximum Height: 78" to top of enclosure AFF). Anchor floor-mounting switches to concrete base.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels and brackets and temporary blocking of mobing parts from enclosures and components.

3.03 IDENTIFICATION

A. Enclosure Nameplates: Label each enclosure with engrabed nameplate as specified in Section 26 0553 Electrical Identification.

3.04 FIELD QUALITY CONTROL

A. Provide the following acceptance testing:
1. Inspect mechanical and electrical connections.
2. Verify switch and relay type and labeling verification.
3. Inspect proper installation of type, size, quantity and arrangement of mounting or anchorage devices complying with manufactuer's certification.

3.05 ADJUSTING

A. Set field-adjustable switches and circuit breaker trip ranges.

3.06 CLEANING

A. On completion of installation vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.

B. Inspect exposed surfaces and repair damaged finishes.

END OF SECTION

SECTION 26 5100 – INTERIOR & EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SUMMARY

A. SECTION INCLUDES

1. Interior luminaires and accessories
2. Emergency lighting & Exit Signs
3. Exterior lighting

B. DEFINITIONS:

1. Luminaire: A luminaire is a complete lighting unit including light source(s) and parts required to distribute the light, position and protect the light source(s), and connect the light source(s) to the power supply.
2. Average Life: The time after which 50 percent will have failed and 50 percent will have survived under specified operating and starting condition.

1.2 SUBMITTALS

A. Submit the following in accordance with project submittal procedures:

1. Interior Fixture Catalog Data: Submit catalog data describing luminaires, lamps, and ballasts. Include data substantiating that materials comply with specified requirements. Arrange data for luminaires in the order of fixture designation.
2. Exterior Fixture Catalog Data: Submit catalog data describing poles, luminaires, lamps, ballasts, and pole and luminaire finishes. Include data substantiating that materials comply with specified requirements. Arrange data for luminaires in the order of luminaire designation.
3. Performance Curves/Data:
   a. Submit certified photometric data for each type of luminaire.
   b. Submit supply-air, return-air, heat-removal, and sound performance data for air handling luminaires.
4. Drawings: Submit shop drawings for luminaries.

1.3 QUALITY ASSURANCE

A. Interior Lighting

1. Comply with the *National Electrical Code* (NEC) and the *International Building Code (IBC)* for installation requirements.
2. Provide luminaires listed and labeled by a nationally recognized testing laboratory (NRTL)
3. Use manufacturers that are experienced in manufacturing luminaires, lamps and ballasts similar to those indicated for this Project and have a record of successful in-service performance.

4. Coordinate luminaires, mounting hardware and trim with the ceiling system.

B. Emergency Lighting

1. Comply with ANSI/NFPA 70 - National Electrical Code (NEC), NFPA 101 - Life Safety Code, and the International Building Code (IBC) for components and installation.

2. Emergency lighting units and exit signs shall be NRTL-listed and labeled for their indicated use, and location on this project, by a Nationally Recognized Testing Laboratory (NRTL) in accordance with UL 924–Emergency Lighting and Power Equipment.

3. Use manufacturers that are experienced in manufacturing emergency lighting units similar to those indicated for this Project and have a record of successful in-service performance.

C. Exterior Lighting

1. Comply with the following codes and standards:

a. National Electrical Code (NEC) for components and installation.

b. International Building Code

2. Provide luminaires listed and labeled by a nationally recognized testing laboratory (NRTL) for the application, installation condition, and the environments in which installed.

3. Use manufacturers that are experienced in manufacturing poles, luminaires, lamps and drivers similar to those indicated for this Project and have a record of successful in-service performance.

1.4 RECEIVING, STORING AND PROTECTING

A. Receive, store, and protect, and handle products according to the following NECA National Electrical Installation Standards:

1. NECA/IESNA 500, *Recommended Practice for Installing Indoor Commercial Lighting Systems* (ANSI).

1.5 WARRANTY

A. Submit a warranty, mutually executed by the LED luminaire manufacturer and the installer, agreeing to replace LED luminaires that fail in materials or workmanship within five years, beginning on the date of substantial completion of project.

B. Manufacturer shall replace any luminaires that fail to operate properly within 60 months of the substantial completion date of project . Lens yellowing or hazing will be considered a failure.

C. Manufacturer shall replace any luminaries that experience housing or finish failure within 5 years of the substantial completion date of project

PART 2 PRODUCTS

2.1 SEISMIC PERFORMANCE REQUIREMENTS

A. The luminaires shall remain in place without separation of any parts when subjected to the design basis earthquake per Section 01 8734, *Seismic Qualification of Nonstructural Components (IBC)*

2.2 INTERIOR LUMINAIRES

A. Furnish interior luminaires that comply with requirements specified below, indicated on the Drawings, and as required to meet conditions of installation.

B. Metal parts shall be free from burrs and sharp corners and edges.

C. Metal components shall be formed and supported to prevent sagging and warping.

D. Steel parts shall be finished with manufacturer's standard finish applied over a corrosion-resistant primer. Finish shall be free from runs, streaks, stains, holidays or defects.

E. Doors and frames shall be smooth operating and free from light leakage under operating conditions. Relamping shall be possible without the use of tools. Doors, frames, lenses and diffusers shall be designed to prevent accidental falling during relamping and when secured in the operating position.

F. Lenses, diffusers, covers and globes shall be 100 percent virgin acrylic unless specified otherwise on the Drawings. Lenses shall have 0.125 inches minimum thickness. Lenses for fluorescent troffers shall be injection molded.

G. Luminaires shall conform to UL 1598 - *Luminaires*. Provide product with damp location listing or wet location listing as required by installation location.

H. Light diffusers, other than those made of metal or glass, used in air-handling light fixtures shall be listed and marked “Fixture Light Diffusers for Air-Handling Fixtures.”

2.3 INTERIOR LED LUMINAIRES

A. For LED lighting in interior spaces, use NRTL-listed 120V or 277V luminaires with the performance characteristics listed below:

1. Minimum luminaire efficacy per IES LM-79, *Approved Method: Electrical and Photometric Measurement of Solid-State Lighting Products*:

   a. 90 lumens/watt for general lighting,

   b. 50 lumens/watt for accent and display lighting, down-lighting, and special purpose lighting.

2. Correlated color temperature (CCT) per IES LM-79 and ANSI/NEMA/ANSLG C78.377, *Specification for the Chromaticity of Solid-State Lighting (SSL) Products*:

   a. As indicated in the fixture schedule

3. LED Design life (L70): Not less than 50,000 hours per IES LM-80, *Approved Method: Measuring Lumen Maintenance of LED Light Sources*.

4. Driver System Design Life: Not less than the LED design life; note that the driver system includes all associated components, not just the driver integrated circuit. Driver system design life is defined as when 2 percent of the systems would have failed.

5. Power factor: 0.90 or better.

6. Design ambient temperature: 35 °C (95 °F); note that this is the ambient temperature surrounding the luminaire, not the LED or driver heat-sink temperature.

7. EMI/RFI: Meet FCC 47 CFR Part 15.

8. Minimum dimming provisions or capability:

a. 0-10V dimming down to 1%.

B. For emergency battery packs shall be factory installed, unless noted otherwise.

C. Provide NRTL-listed luminaire disconnect assembly for each driver. Manufacturer: IDEAL “PowerPlug”, Thomas & Betts “Sta-Con.”

2.4 LUMINAIRE ACCESSORIES

A. Provide stud supports, mounting brackets, frames, plaster rings and other accessories required for luminaire installation.

B. Furnish hangers as specified below and as required by conditions of installation:

1. Stem hangers shall be made of 1/2-inch steel tubing with 45 degrees swivel ball hanger fitting and ceiling canopy. Finish the same as the luminaire.

2. Rod hangers shall be made of 1/4 inch threaded zinc-plated steel rod.

3. For Highbay LED fixtures provide, power cord and locking type plug. Provide a safety chain or cable for each luminaire that will attach to the building structure, and to the reflector/diffuser assembly.

C. Use NRTL-listed T-bar safety clips for lay-in luminaires.

D. Where indicated on the Drawings or where lamp breakage is detrimental, such as above food counters, provide open fluorescent luminaires with:

1. Self-locking sockets or lamp retainers, two per lamp, and

2. Clear polycarbonate protective lamp sleeves with end caps over each lamp. Sleeve shall have a light transmission of 95 percent and shall be rated for the thermal profile of the lamp and ballast.

2.5 EMERGENCY LIGHTING & EXIT SIGNS

A. Emergency LED driver

1. Battery packs shall be factory installed in fixtures whenever possible.

2. Non Factory installed battery packs shall be as follows:

a. NRTL-listed, self-diagnostic, fully automatic, battery pack in each luminaire indicated on the Drawings.

b. maintenance-free, sealed high-temperature nickel-cadmium or nickel-metal hydride battery with an expected service life of not less than 7 years.

c. Upon interruption of normal AC power, the internal controller shall automatically switch the emergency lighting load to the battery. The battery shall supply the driver with power to produce 1100 to 1400 lumens of emergency light output for a minimum of 90 minutes.

d. Shall have an LED charging indicator lamp and a push to test switch for installation on the luminaire at locations and positions that will be visible from the floor and operable without removing or opening luminaire lenses or covers.

e. Manufacturer: Bodine, IOTA, or approved equal.

B. LED Emergency Exit Sign

1. Furnish a NRTL-listed, self-diagnostic, fully automatic, LED illuminated emergency exit sign at each location indicated on the Drawings.

2. LED emergency exit sign shall be connectable for operation at either 120 or 277 volts and suitable for indoor dry locations with a temperature range of 32 to 104 degrees F.

3. Shall have stencil face letters, and universal mounting capability with all necessary components for each wall, ceiling, or end mounting application.

4. Shall be single face or double face with field-selectable chevron knockouts as indicated on the Drawings or as required for each location.

5. Shall have a maintenance-free battery, either nickel-cadmium or nickel-metal hydride. Battery shall be field-replaceable and shall have an expected service life of not less than 7 years.

6. Upon interruption of normal AC power, or brownout conditions exceeding a 20% drop from nominal voltage, the internal controller shall automatically switch the emergency exit sign lighting load to the battery. Emergency power will be provided for a minimum of 90 minutes. During emergency operation, the battery shall be protected from deep discharge by a low-voltage battery disconnect circuit.

7. Visibility of exit sign during normal or emergency operation shall be not less than that required in UL 924.

8. Exit sign shall provide exterior visual indication of AC power status, all self-diagnostic test cycles, and unit malfunctions including:

a. Battery fault

b. Charger fault

2.6 EXTERIOR LIGHTING

A. Finishes

1. Furnish luminaires, poles, and accessories with finishes as scheduled that are resistant to fading, chalking, and other changes due to aging and exposure to heat and ultraviolet light. Acceptable finishes for metals are:

a. Hot-dipped galvanized steel: ASTM A 123/A 123M.

b. Brushed natural aluminum

c. Anodized aluminum: AAMA 611, Anodized Architectural Aluminum, Class I.

d. Powder coated aluminum: Fluorocarbon polymer powder coating per AAMA 2605, Superior Performing Organic Coatings over chrome phosphate conversion coated aluminum.

e. Powder coated steel: Fluorocarbon polymer powder coating per AAMA 2605, Superior Performing Organic Coatings over zinc phosphate conversion coated shot-blasted steel.

2. Reject luminaires, poles, and accessories with finish having runs, streaks, stains, holidays and defects.

3. Replace luminaires, poles, and accessories showing evidence of yellowing, fading, chalking, and other changes indicating failure during warranty period.

4. Use stainless steel for exposed hardware.

B. Exterior Luminaires - General

1. Furnish exterior luminaires that comply with requirements specified in this Section and in the luminaire schedule on the Drawings.

2. Luminaires shall be NRTL-listed as conforming to UL 1598 - Luminaires.

3. Luminaire housing shall be primarily metal.

a. Metal parts shall be free from burrs and sharp corners and edges.

b. Sheet metal components shall be fabricated from corrosion-resistant aluminum, formed and supported to prevent sagging and warping.

c. Exposed fasteners: Stainless steel.

4. Doors and frames shall be smooth operating and free from light leakage under operating conditions.

a. Doors, frames, lenses and diffusers shall be designed to prevent accidental falling during and when secured in the operating position.

b. Door: Removable for cleaning or replacing lens.

5. Provide lenses, diffusers, covers and globes as scheduled on the Drawings fabricated from materials that are UV stabilized to be resistant to yellowing and other changes due to aging or exposure to heat and ultraviolet radiation.

6. Doors shall have resilient gaskets that are heat-resistant and aging-resistant to seal and cushion lens and refractor.

C. LED Luminaires

1. Conform to UL 1598 and to UL 8250 – Safety Standard for Light-Emitting Diode (LED) Light Sources for Use in Lighting Products.

2. Lead and mercury free.

3. Photometric characteristics: Established using IESNA LM-79-08, IESNA Approved Method for the Electrical and Photometric Measurement of Solid-State Lighting Products.

4. Ingress protection for optical assembly: IP65 or better in accordance with ANSI/IEC 60529 - Degrees of Protection Provided by Enclosures.

5. Color characteristics as follows in accordance with ANSI C78.377 – Specifications for the Chromaticity of Solid State Lighting Products:

   a. Color temperature (deg K): 4000

   b. Color rendering index: not less than 70

6. LED and driver cooling system: Passive and shall resist the buildup of debris.

7. LED luminaire output after 50,000 hours of operation: Not less than 70 percent of the initial lumen output when determined in accordance with IESNA LM-80-08 – IESNA approved Method for Measuring Lumen Maintenance of LED Lighting Sources.

8. LED luminaire electrical characteristics:

   a. Supply voltage: 120 V, 208 V, 240 V, 277 V, or 480 V as indicated on the Drawings. Provide step-down transformers if required to match driver input voltage rating.

   b. Total harmonic distortion (current): Not more than 20 percent

   c. Power factor: Not less than 90%

   d. RF interference: Meet FCC 47 CFR Part 15/18

   e. Driver input surge protection device: UL 1449 3rd Edition recognized component meeting IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits, Category C, High Exposure.

D. Poles and Accessories

1. Furnish poles and accessories that comply with requirements specified in this Section and the luminaire schedule on the Drawings.

2. Pole, base, and anchorage shall carry the luminaires, supports, and appurtenances at the indicated height above grade without deflection or whipping.

3. Mountings, fastenings and other appurtenances shall be fabricated from corrosion-resistant materials that are compatible with poles and luminaires and will not cause galvanic action at contact points. Mountings shall correctly position luminaires to provide scheduled light distribution.

4. A reinforced access handhole, minimum 2.5 x 5 inches, shall be located in the wall of each metal pole.

5. A welded 1/2-inch grounding lug shall be accessible through the handhole of each metal pole. Grounding connection shall be designed to prevent electrolysis when used with copper ground wire.

6. Metal poles shall have anchor type bases and galvanized steel anchor bolts, leveling nuts and bolt covers.

7. Where poles are indicated as “breakaway” type on the Drawings, each pole shall have a frangible aluminum transformer base that meets the requirements of AASHTO LTS-5.

8. Each non-breakaway metal pole shall have a metal base cover that covers the entire base plate and anchorage.

9. Protect painted, anodized, or brushed pole finishes during shipment and installation. Minimum protection shall consist of spirally wrapping each pole shaft with protective paper secured with tape, and shipping small parts in boxes.

10. Steel poles shall be fabricated from tubing having minimum 7-gage steel with minimum yield/strength of 48,000 psi.

    a. Poles shall be anchor bolt mounted type.

    b. Poles shall be one-piece construction up to 40 feet in length. Poles over 40 feet in length may be in two or more sections with overlapping joints.

    c. Poles shall be tapered, either round in cross section or polygonal. Poles shall have a continuous taper not less than 0.14 inch of diameter per foot of length.

    d. Poles shall be welded construction with no bolts, rivets, or other means of fastening except as specifically approved.

    e. Tops of shafts shall be fitted with a round or tapered cover.

    f. Pole markings shall be approximately 3 to 4 feet above grade and shall include manufacturer, year of manufacture, top and bottom diameters, and length.

    g. Provide poles with finish color indicated on the Drawings and conforming to FINISHES article of this Section. If pole is not galvanized, coat inside of pole with suitable rust-inhibiting finish.

    h. Base covers for steel poles shall be structural-quality, hot-rolled carbon-steel plate having a minimum yield of 36,000 psi. Finish shall be the same as the corresponding poles.

E. Lighting Control Equipment

1. Furnish lighting control relay panel with astronomical timeclock to control exterior lighting unless indicated otherwise on Drawings.

    a. Lighting Control Relay Panel shall be: Acuity Brands ARP Series with required # of relay's or pre-approved equal.

    b. Program on/off times of exterior lighting as directed by Owner.

2. Where photoelectric relays are mounted on luminaires use products that conform to UL 733, Plug-in, Locking Type Photocontrols for Use with Area Lighting with single-pole single-throw contacts arranged to fail in the "ON" position. For each luminaire provide a luminaire-mounted locking-type receptacle conforming to IEEE C136.10.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas, spaces, and surfaces to receive exterior luminaire (s) or poles for compliance with installation tolerances and other conditions affecting performance of the product. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Interior Lighting

1. Install interior lighting system in accordance with the NEC, manufacturer's installation instructions, approved shop drawings, and the following NECA National Electrical Installation Standards:

   a. NECA/IESNA 500, Recommended Practice for Installing Indoor Commercial Lighting Systems (ANSI)

2. Have the manufacturer’s installation instructions available at the Project site.

3. Mounting heights specified or indicated on the Drawings are to the bottom of the luminaire for ceiling-mounted fixtures and to the center of the luminaire for wall-mounted fixtures.

4. Where the ceiling forms the protective membrane of a fire-resistive assembly, install protective coverings over luminaires in accordance with NRTL requirements.

5. Install slack safety wires as described below for luminaires in or on suspended ceilings.

   a. Wire shall be minimum 12 gauge galvanized soft annealed steel wire conforming to ASTM A641.

   b. Attach wire to the building structure directly above the attachment point on the box or luminaire; make trapezes of framing channel material as required to span obstacles

   c. Secure wire(s) at each end with not less than three tight turns in 1-1/2 inches.

6. Install emergency luminaires in suspended ceilings as follows:

   a. Fasten the four corners of each luminaire to the suspended ceiling main channels or framing members.

   b. Use sheet metal screws or bolts to fasten luminaires above exit pathways.

   c. Use NRTL listed clips, sheet metal screws, or bolts or to fasten luminaires that are not above exit pathways.

   d. Install two independent slack safety wires per luminaire with dimensions not exceeding 2 ft x 4 ft. Install four independent slack safety wires per luminaire with dimensions exceeding 2 ft x 4 ft. Attach wires to the luminaire not more than 6 inches from the luminaire corners.

7. Support pendant-mounted or cable-supported luminaires directly from the structure above using a 9 gauge wire or an approved alternate support without using the ceiling suspension system for direct support.

   a. Install seismic restraints for pendant-mounted and cable-supported luminaires.

   b. Pendants, rods, cables, or chains 4 ft or longer shall be braced to prevent swaying using three cables at 120 degrees separation.

8. Connect luminaires in suspended ceilings using 6 ft. lengths of flexible wiring method arranged accommodate not lea than 4 inches of differential seismic movement in any direction. Refer to Section 26 0533 - Raceways and Boxes for Electrical Systems.

B. Emergency Lighting & Exit Signs

1. Install emergency lighting system in accordance with the NEC, NECA/IESNA 500, Recommended Practice for Installing Indoor Commercial Lighting Systems (ANSI), the manufacturer's instructions, and approved shop drawings. Have the manufacturer’s installation instructions available at the construction site.

2. Mount exit signs and unit emergency lights with bottom of fixture not less than 6'-8" or more than 12'-0" above finished floor.

3. Connect each emergency power system outlet box using a minimum 2 ft length of flexible wiring method to accommodate not less than 4 inches of differential seismic movement in any direction between the outlet box and the non-flexible raceway system. Refer to Section 26 0533 - Raceways and Boxes for Electrical Systems.

4. Install slack safety wires as described below for emergency luminaires and exit signs on suspended ceilings.

a. Wire shall be minimum 12 gage galvanized soft annealed steel wire conforming to ASTM A641.

b. Attach wire to the building structure directly above the attachment point on the box or luminaire; make trapezes of framing channel material as required to span obstacles

c. Secure wire(s) at each end with not less than three tight turns in 1-1/2 inches.

d. Use connection devices at the supporting structure, outlet box, and luminaire that are capable of carrying not less than 100 pounds.

5. Install branch circuits for emergency lighting and exit signs in accordance with Article 700 of the National Electrical Code.

6. Connect unit emergency lighting equipment to a branch circuit that serves the general lighting in the area and ahead of any local or remote switches.

C. Exterior Lighting

1. Install products in accordance with manufacturer's instructions, NECA/IESNA 501, and approved shop drawings.

2. Locations of luminaires and poles shown on the Drawings are diagrammatic. Coordinate luminaire locations with building finishes, building structure, paving and striping, utility piping, security fences, and existing trees.

3. Set poles and luminaires plumb, square, level and secure.

4. Install surface mounted luminaires directly to an outlet box which is supported from structure.

5. Install lamps in luminaires in accordance with manufacturer's instructions.

3.3 CONCRETE FOUNDATIONS

A. Construct concrete foundations with exterior 4000 psi concrete and reinforcing conforming to Section 03 3001, Reinforced Concrete.

B. Comply with details on the Drawings and manufacturer's recommendations for foundation dimensions, reinforcing, anchor bolts, nuts and washers.

C. Position power conduits and ground rod to terminate within the pole shaft area and one inch above the top of the foundation; refer to Section 26 0533, Raceways and Boxes for Electrical Systems.

D. Cure concrete foundations for 7 full curing days before erecting poles.

3.4 POLE ERECTION

A. Do not install poles without luminaires.

B. Use fabric web slings to raise and set poles.

C. Use leveling nuts or shims to make poles plumb. When leveling nuts are used, set the lower nuts not more than 1 inch from the concrete foundation.

D. Tighten anchor bolt nuts and other pole hardware to torque recommended by manufacturer.

E. After pole is leveled, pack non-shrink grout between anchor base and concrete foundation to provide a full bearing surface. Use a short piece of 1/2-inch diameter pipe to make a drain hole through grout; arrange to drain condensation from interior of pole.

F. Set embedded poles to depth indicated on the Drawings, but not less than 1/6 of pole length below finish grade.

1. Auger holes large enough to permit the use of tampers the full depth of the hole.

2. Backfill in 6-inch layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of the undisturbed earth.

3.5 GROUNDING

A. Install grounding for exterior lighting using materials and methods specified in Section 26 0526, Grounding and Bonding for Electrical Systems.

B. Connect ground lug of metal pole to ground rod using a 6 AWG copper conductor.

C. Connect ground lug of metal pole to circuit equipment grounding conductor.

3.6 FIELD QUALITY CONTROL

A. Make electrical connections, clean interiors and exteriors of luminaires, install lamps, energize and test luminaires, inspect interior lighting system, and deliver spare parts in accordance with manufacturer's instructions and the following NECA National Electrical Installation Standards:

1. NECA/IESNA 500, *Recommended Practice for Installing Indoor Commercial Lighting Systems* (ANSI)

B. Test electronic dimming drivers for full range dimming capability.

1. Check for visually detectable flicker over the full dimming range.

C. Provide factory certified programming and commissioning of the Lighting control systems, occupancy sensors and Daylight sensors.

D. Aim lamps on wall-mounted emergency lighting units to obtain the following illumination of exit pathway:

1. 1 ft-candle average

2. 0.1 ft-candle minimum

3. Maximum-to-minimum uniformity ratio not exceeding 40 to 1.

E. Test emergency lighting equipment in accordance with the manufacturer's instructions and NECA/IESNA 500.

F. Inspect each installed lighting unit for damage. Replace damaged luminaires, poles, and components.

G. Test installed luminaires for proper operation.

1. Replace or repair malfunctioning luminaires and components then re-test.

2. Repeat procedure until all luminaires operate properly.

H. Replace inoperative fixtures.

3.7 ADJUSTING AND CLEANING

A. Clean each luminaire inside and out, including plastics and glassware. Use methods and materials recommended by manufacturer.

B. Aim adjustable luminaires to provide required light intensities as indicated on the Drawings.

END OF SECTION

SECTION 26 6100 - AUXILIARY SYSTEMS

PART 1 - GENERAL

A. The Auxiliary Systems of this specification are sections that have numbers between 26 6100 – 26 6900. This specification will include the Auxiliary Sections that are relative to this project.

B. Each system mentioned herein is a complete system. Each network is a new system, an extension of an existing and/or a new system that incorporates an existing system into the new. Whatever the condition, the contractor shall provide all the equipment, materials, labor, etc. for a complete and operable network. Each system is specified to perform a definite function. The function and operation of a system is the final objective and whatever the requirement to accomplish that objective shall be included. If for any reason the specifications do not complete the network, the bidder and/or manufacturers representative shall call the deficiencies to the attention of the engineer by facsimile five (5) days prior to the bid date, so they can be included in the addendum. Failure to submit this information to the attention of the engineer does not relieve the bidder from supplying and installing the equipment needed for a complete and operable system.

C. Walk through the system when the project is complete and each auxiliary system has been tested and ready to be set into operation, the contractor, the owner's and manufacturer's representative shall test each component of each system for normal operation and report in writing to the architect and engineer that the system meets all the conditions and functions of the specifications for normal operation.
   1. Example: In the case of the Fire Detection and Alarm System, the people mentioned above plus the local Fire Marshall (or his representative) shall check out the Fire Alarm System. Each component (break glass station, heat detector, ionization detector, alarms, etc.) shall be tested individually to prove their function in the total system. Any and all defective components shall be repaired and/or replaced.
   2. Likewise each of the other auxiliary systems, one by one (sound, F.A., telephone, computer, etc.) shall be tested and written reports made on the results of the test.

D. Return visits: Six months after the system has been accepted by the owner, the factory representative shall return to the project and check-out the system to determine the condition of operation, answer any questions of the operator and/or administrator, make repairs, etc., to determine if the system is operating to its full potential.

E. The factory representative shall review with the operator and administrator on their use of the equipment making sure the equipment is used to the ultimate.

F. Each auxiliary system shall carry a one year warranty from the date of acceptance by the owner.

END OF SECTION

SECTION 266210 – DATA SYSTEM CABLING

PART 1 - GENERAL

1.1 See drawings for additional system requirements.

1.2 Basis of design is Ortronics, the following are approved alternate manufacturers:
a. Hubbell
b. Leviton

1.3 The following specification and its associated drawings are intended to provide a set of instructions and materials needed to furnish and install Telecommunications Cabling, within parameters set by industry standards.

A. The information is modular in nature.
1. Each facility will have one or more of each module discussed.
2. Specifically included in this specification are cables, connecting hardware requirements to provide a Category 6+ compliant link to each data port of the workstations.

B. Some of the information contained in the following is directed to the owner's architects, electrical, mechanical, and structural engineers. This information points toward ideal conditions and may vary by site depending on actual conditions.

1.4 CODES AND STANDARDS COMPLIANCE

A. All materials shall comply with the applicable sections of the following Codes for installation of telecommunications cabling:
1. International Building Code (IBC)
2. National Electrical Code (NEC/NFPA 70)
3. National Electrical Safety Code (NESC IEEE C 2)
4. Local Codes, amendments, and ordinances.

B. All materials and installation practices shall comply with the applicable sections of the following Telecommunications Industry Standards:
1. ANSI/TIA/EIA-568-C.1, Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements.
2. ANSI/TIA/EIA-568-C.2, Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted-Pair Cabling Components.
3. ANSI/TIA/EIA-568-C.3, Commercial Building Telecommunications Cabling Standard, Part 3: Optical Fiber Cabling Components Standard.
4. ANSI/TIA/EIA-569-A-2001 (Including 5 addendums), Commercial Building Standards for Telecommunications Pathways and Spaces
5. ANSI/EIA/TIA-570-1991, Residential and Light Commercial Telecommunications Wiring Standard
6. ANSI/TIA/EIA-606-1993, The Administration Standard for the Telecommunications infrastructure of Commercial Building
7. ANSI/TIA/EIA-607-1994, Commercial Building Grounding and Bonding Requirements for Telecommunications

C. Installers shall have read the above documents and shall be familiar with the requirements that pertain to this installation. The documents may be obtained from:
1. Global Engineering Documents, 15 Inverness Way East, Englewood, CO, 80112-5776, 800-854-7179, fax: 303-397-2740, http://global.his.com/
2. IEEE-Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, NY, 10017-2394, 800-678-IEEE, fax: 732-981-9667, http://standards.ieee.org/

D. This document does not replace any Code, local or otherwise. The contractor must be aware of local Codes that may impact this project.

1. The Telecommunications Contractor shall be an approved Ortronics CIP (Certified Installer Plus) OR approved Hubbell Premise Wiring CI (Certified Installer).
2. A copy of the certification documents shall be submitted with the quote.

3. The owner reserves the right to require the Contractor to remove from the project any such employee the Owner deems to be incompetent, careless or insubordinate.
4. All clean up activity related to work performed will be the responsibility of the Low Voltage Contractor and must be completed daily before leaving the site.

E. Pre-Installation Conference:
1. Schedule a conference a minimum of five calendar days prior to beginning work of this Section. Attendees should include Owner's Rep., Engineer, GC, EC and Cabling Sub.
2. Agenda: Clarify questions related to work to be performed; data rack layout, scheduling, coordination, etc.
3. Minutes of the meeting shall be kept by the EC and sent to all attendees.

F. Warranty
1. A 15 Year Product Warranty covering all components, equipment and workmanship shall be submitted in writing with system documentation. The warranty period shall begin on the system's first use by the owner. Warranty shall be vendor supplied. Contractor warranty alone is unacceptable
2. The project must be pre-registered with Manufacturer before installation has begun.

PART 2 - PRODUCTS

2.1 COMMUNICATIONS EQUIPMENT ROOMS

A. Equipment Racks:
1. Supply and install all additional patch panels in existing racks as required.

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.

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. Test results will be handed over at the end of the project and shall provide an electronic and printed record of these tests

C. 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 312213 – ROUGH GRADING

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 SECTION INCLUDES

A. Cutting, grading, filling, rough contouring, and compacting site for structures.

1.03 RELATED SECTIONS

A. Section 31 05 13 - Soils for Earthwork.

B. Section 31 10 00 - Site Clearing.

C. Section 31 23 16 – Excavation.

D. Section 31 23 17 – Trenching.

1.04 REFERENCES

A. The latest edition of the Standard Specification for Road, Bridge, and Municipal Construction.

B. ASTM International:

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3).

3. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.

4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft^3).

5. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

6. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head).

7. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

8. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.05 CLOSEOUT SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with ISPWC Standards and the Geotechnical Report.

PART 2 PRODUCTS

2.01 MATERIALS

A. Subsoil Fill: Type as specified in related sections.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

A. Call Local Utility Line Information service not less than three working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

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

C. Notify utility company to remove and relocate utilities.

D. Protect utilities indicated to remain from damage.

E. Protect plant life, lawns, rock outcropping and other features remaining.

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

3.03 TOPSOIL EXCAVATION

A. Excavate topsoil from marked areas, without mixing with foreign materials for use in finish grading.

B. Do not excavate wet topsoil.

C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion. Stockpile material on 36 mil Hypalon material and cover over with same material, until disposal.

D. Remove excess topsoil not intended for reuse from site.

3.04 SUBSOIL EXCAVATION

A. Excavate subsoil from marked areas.

B. Do not excavate wet subsoil or excavate and process wet material to obtain optimum moisture content.

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

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

E. Stockpile excavated material in area designated on site.

F. Benching Slopes: Horizontally bench existing slopes greater than 1: 4 to key placed fill material to slope to provide firm bearing.

G. Stability: Replace damaged or displaced subsoil as specified for fill.

3.05 FILLING

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

B. Place fill material in continuous layers and compact in accordance with Geotechnical Report.

C. Place material in continuous layers as set forth in Geotechnical Report.

D. Maintain optimum moisture content +/- 2% of fill materials to attain required compaction density.

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

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

3.06 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 0.10 foot from required elevation. An inspection by the Engineer shall be required prior to placing any aggregate base.

3.07 FIELD QUALITY CONTROL

A. The Contractor shall be responsible for all costs associated with compaction and compaction testing.

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

C. Perform in place compaction tests in accordance with the following:

1. Density Tests: ASTM D1556, ASTM D2167, or ASTM D2922. Compact to 95% of density at a frequency of 1 test per 5,000 square feet. Once copy of the test results shall be sent to the Owner, Engineer, and Architect.

2. Moisture Tests: ASTM D3017.

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

END OF SECTION 31 22 13

SECTION 312316 – EXCAVATION

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 SECTION INCLUDES

A. Excavating for foundation for new building.

B. Excavating for asphalt paving.

1.03 RELATED SECTIONS

A. Section 31 05 13 - Soils for Earthwork.

B. Section 31 22 13 - Rough Grading.

C. Section 31 23 17 – Trenching.

D. Document: Geotechnical Report.

1.04 REFERENCES

A. ASTM International:

1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/^{f3t}).

2. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.

3. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

B. Local utility standards when working within 24 inches of utility lines.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PREPARATION

A. Call Local Utility Line Information service not less than three working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

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

C. Notify utility company to remove and relocate utilities.

D. Protect utilities indicated to remain from damage.

E. Protect plant life, lawns, and other features remaining as portion of final landscaping.

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

3.02 SOIL DENSIFICATION - VIBRO-COMPACTION

A. Vibro-compact substrates below footing bearing surfaces for footings as indicated on Drawings before excavating site.

B. Tolerances:

1. Maximum Deviation from Center of Completed Compaction: 8 inches from indicated position.

2. Maximum Deviation from Vertical: 4 degrees during vibrator insertion.

3.03 EXCAVATION

A. Underpin adjacent structures which may be damaged by excavation work.

B. Excavate subsoil to accommodate segmental wall foundations and paving.

C. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with ISPWC Standard Specifications.

D. Slope or shore excavations per ISPWC.

E. Do not interfere with 45 degree bearing splay of foundations.

F. Grade top perimeter of excavation to prevent surface water from draining into excavation.

G. Trim excavation. Remove loose matter.

H. Remove lumped subsoil, boulders, and rock.

I. Notify Architect/Engineer of unexpected subsurface conditions.

J. Correct areas over excavated with structural fill specified in Geotech report.

K. Remove excess and unsuitable material from site.

L. Stockpile subsoil in area designated on site to depth not exceeding 8 feet and protect from erosion.

M. Repair or replace items indicated to remain damaged by excavation.

3.04 FIELD QUALITY CONTROL

A. Refer to Geotechnical Report.

B. Request visual inspection of bearing surfaces by inspection agency before installing subsequent work.

3.05 PROTECTION

A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

END OF SECTION

SECTION 312317 – TRENCHING

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 SECTION INCLUDES

A. Compacted fill from top of utility bedding to subgrade elevations.

B. Backfilling and compaction.

1.03 RELATED SECTIONS

A. Section 31 05 13 - Soils for Earthwork.

B. Section 31 22 13 - Rough Grading.

C. Section 31 23 16 – Excavation.

1.04 REFERENCES

A. The latest edition of the Standard Specifications for Road, Bridge, and Municipal Construction.

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

C. ASTM International:

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3).

3. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.

4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft^3).

5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

6. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

7. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.05 DEFINITIONS

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

1.06 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Subsoil Fill: Type as specified in Section 31 05 13.

B. Structural Fill: Type as specified in Section 31 05 13.

PART 3 EXECUTION

3.01 LINES AND GRADES

A. Lay pipes to lines and grades indicated on Drawings.

1. Architect/Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.02 PREPARATION

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

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

C. Protect plant life, lawns, and other features remaining as portion of final landscaping.

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

E. Maintain and protect above and below grade utilities indicated to remain.

F. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.03 TRENCHING

A. Excavate subsoil required for utilities to utility service.

B. Remove lumped subsoil, boulders, and rock.

C. Perform excavation within 24 inches of existing utility service in accordance with utility's requirements.

D. Do not advance open trench more than 50 feet ahead of installed pipe.

E. Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.

F. Excavate bottom of trenches maximum 2 feet wider than outside diameter of pipe.

G. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe.

H. Do not interfere with 45 degree bearing splay of foundations.

I. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. When side walls can not be sloped, provide sheeting and shoring to protect excavation as specified in this section.

J. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by Architect/Engineer until suitable material is encountered. notify Architect/Engineer, and request instructions.

K. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Subsoil Fill and compact to density equal to or greater than requirements for subsequent backfill material.

L. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

M. Correct areas over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Architect/Engineer.

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

O. Stockpile subsoil in area designated on site to depth not exceeding 8 feet and protect from erosion.

P. All trenches to be backfilled and compacted to at least 95 percent of maximum density as determined by ASTM D1557 (Modified Proctor).

3.04 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

B. Support trenches more than 4 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

C. Design sheeting and shoring to be removed at completion of excavation work.

D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

E. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.05 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen fill materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Place material in continuous layers per Geotechnical Report.

D. Employ placement method that does not disturb or damage foundation perimeter drainage, and utilities in trench.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Do not leave any trench open at end of working day.

G. Protect open trench to prevent danger to the public.

3.06 TOLERANCES

A. Top Surface of Backfilling: Plus or minus 1 inch from required elevations.

B. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.07 FIELD QUALITY CONTROL

A. The Contractor shall be responsible for all costs associated with compaction and compaction testing.

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

C. Perform in place compaction tests in accordance with the following:

1. Density Tests: ASTM D2922. Compact to 95% of density per ASTM D1557.

2. Moisture Tests: ASTM D3017.

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

E. Frequency of Tests: Every 75 feet.

3.08 PROTECTION OF FINISHED WORK

A. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

SECTION 321216 – ASPHALT PAVING

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. Extent of asphalt concrete paving work is as shown on drawings and specified herein.

B. Section Includes:

1. Hot Mix Asphalt paving, wearing, binder and base course.

2. Surface sealer.

3. Tack Coat

4. Lane marking paint (striping).

C. Related Sections:

1. Section 31 22 13 - Rough Grading.

1.03 REFERENCES

A. The latest edition of the Standard Specifications for Road, Bridge, and Municipal Construction.

B. Asphalt Institute:

1. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot- Mix Types.

2. AI MS-19 - Basic Asphalt Emulsion Manual.

B. ASTM International:

1. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.

2. ASTM D3381 - Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.

1.04 SUBMITTALS

A. Material Certificates: Provide copies of materials certificates signed by the material producer and contractor certifying that each material item complies with, or exceeds, the specified requirements.

B. Product Data: Provide copy of asphalt mix design for review meeting ISPWC specifications.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with ISPWC Standard Specifications.

1.06 QUALIFICATIONS

A. Installer: Company specializing in performing work of this section with minimum three years documented experience.

1.07 ENVIRONMENTAL REQUIREMENTS

A Do not place Hot mix Asphalt when ambient air or base surface temperature is less than 45 degrees F, or surface is wet or frozen.

C. Do not place Hot Mix Asphalt between October 1 and April 1, unless approved by the Architect and Engineer.

D. Apply tack coat when the ground temperature is above 50 degrees F and when the ambient temperature has not been below 35 degrees F for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

PART 2 PRODUCTS

2.01 MATERIALS

A. Base Course:

1. Standard Traffic: Six inches (6”) thick, or four inches (4”) ATB.

2. On Public Right-of-Way: Thickness as shown on drawings.

B. Asphalt Hot Mix:

1. Standard Traffic: Two and one half (2.5”) thick.

2. On Public Right-of-Way: Thickness as shown on drawings.

C. Lane Marking Paint: Chlorinated rubber-alkyd type, AASHTO M-248, FS-TT-P-115, Type III, 4" wide, color white.

1. Paint curb at disabled parking blue.

2.02 SOIL STERILIZATION

A. Commercial grade herbicide treatment for weed control, registered by the Environmental Protection Agency. Provide granular, liquid, or wettable powder form. Place under all areas to receive HMA.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify compacted sub-grade and sub-base is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 SUBBASE

A. Aggregate sub-base: Install as specified in ISPWC Standard Specifications. Provide compacted thickness(es) as indicated on the drawings.

B. Remove loose material from compacted subbase surface immediately prior to applying herbicide treatment or prime coat.

C. Proof roll prepared subbase surface to check for unstable areas and areas requiring additional compaction.

D. Notify Architect of unsatisfactory conditions. Do not begin paving work until deficient subbase areas have been corrected and are ready to receive paving.

E. Apply chemical weed control agent in strict compliance with manufacturer's recommended dosages and application instructions.

3.03 PLACING ASPHALT PAVEMENT - SINGLE COURSE

A. Per ISPWC Standard Specifications.

3.04 PATCHING

A. Wherever existing asphalt areas to receive new topping are damaged, uneven, irregular or unsound, whether such condition is a result of the work of the contract or previously existed, remove all loose material and compact sub-grade.

B. Before patching, all trench edges and joints shall be neatly trimmed with an approved cutter to a uniform line parallel to the trench line.

3.05 TACK COAT

A. Apply to contact surfaces of previously constructed asphalt or Portland cement concrete and surfaces abutting or projecting into areas to receive new asphalt pavement or topping. Distribute at rate of 0.05 to 0.15 gallons per square yard of surface.

B. Allow to dry until at proper condition to receive paving.

C. Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces and other improvements. Completely correct any damage resulting from asphalt paving operations.

3.06 TOLERANCES

A. Flatness: Maximum variation of ¼ inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within ¼ inch.

C. Variation from Indicated Elevation: Within ½ inch.

D. An inspection by the Engineer shall be required.

3.07 FIELD QUALITY CONTROL

A. The Owner will employ a testing agency to test in-place asphalt courses for compliance with requirements for thickness and surface smoothness and drainage. The contractor is to repair or remove and replace unacceptable paving as directed by the Engineer.

B. Surface Smoothness: Test finished surface of asphalt for smoothness using 10’ straightedge applied parallel with and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness. Check surface areas at intervals directed by Engineer.

1. Wearing Course Surface: Approximately 2% slope to drain unless detailed otherwise.

C. Perform a flood test as follows:

1. Flood asphalt concrete paved area with water by use of a tank truck by hose.

a. If a depression is found where water ponds to a depth exceeding 0.125” in 6 feet, fill or otherwise correct to provide proper drainage.

b. Feather and smooth edges of fill as required to result in visible joints between fill and original surfaces or otherwise correct to achieve same visible correct.

3.08 Traffic and Lane Markings

A. Sweep and clean surface to eliminate loose material and dust.

B. Striping and markings: Use chlorinated rubber based traffic lane-marking paint, factory-mixed, quick drying and non-bleeding.

1. Color: Directional arrows, stalls, no parking to use color white. ADA accessible parking symbols to be white.

C. Do not apply traffic and lane marking paint until layout and placement has been verified with Architect.

D. Apply paint with mechanical equipment to produce uniform straight edges. Apply in two coats at manufacturer's recommended rates.

E. Provide approved handicap parking symbols and other markings as indicated.

3.09 PROTECTION OF FINISHED WORK

A. Immediately after placement, protect pavement from mechanical injury for four hours or until surface temperature is less than 140 degrees F.

3.10 CLEAN-UP

A. During paving operations, take care to prevent staining and damaging adjacent materials and surfaces. Provide protection for adjoining materials and surfaces as necessary.

B. After completion, remove all excess materials. Clean surfaces of spills and stains. Correct any damage caused by operations.

END OF SECTION

SECTION 321313 – CONCRETE PAVING

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. Section Includes:

1. Concrete sidewalks.

2. Concrete integral curbs and gutters.

B. Related Sections:

1. Section 31 22 13 - Rough Grading: Preparation of site for paving.

2. Section 32 12 16 - Asphalt Paving: Asphalt.

1.03 REFERENCES

A. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.

2. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

3. ACI 305R – Guide to Hot Weather Concreting

B. ASTM International:

1. ASTM C33 - Standard Specification for Concrete Aggregates.

2. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.

3. ASTM C150 - Standard Specification for Portland Cement.

4. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.

5. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

6. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.

7. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

8. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

1.03 PERFORMANCE REQUIREMENTS

A. Curb, Gutter and Sidewalk Paving: Designed for commercial pedestrian and vehicle traffic and winter freeze/thaw conditions.

1.03 SUBMITTALS

A. Section 01001 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on joint filler, concrete mix design, concrete admixtures and sealer/hardener concrete curing compounds.

1.04 QUALITY ASSURANCE

C. Perform Work in accordance with American Public Works Association (APWA) and American Concrete Institute (ACI) standards.

D. Maintain one copy of the APWA Standard Specifications and referenced ACI Standards on site.

E. Obtain cementitious materials from same source throughout.

1.05 QUALIFICATIONS

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

B. Installer: Company specializing in performing work of this section with minimum 3 years documented experience.

1.06 ENVIRONMENTAL REQUIREMENTS

C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

D. Follow ACI 305R guidelines and Sections 3.05 through 3.11 of this specification during the summer months. Use ACI 305R placing procedures between June 1st and October 1st unless otherwise directed by the Engineer.

PART 2 PRODUCTS

2.01 FORM MATERIALS

A. Form Materials: Conform to ACI 301.

B. Joint Filler: ASTM D1751.

C. Coat forms with a non-staining form release agent that will not discolor or deface surface of concrete.

2.02 CONCRETE MATERIALS

A. Concrete Materials: As specified in Section 03 30 00.

B. Fine and Coarse Mix Aggregates: ASTM C33. Maximum size of ¾".

C. Water: Potable, low alkali, not detrimental to concrete. Do not add water to truck without authorization of Architect.

D. Air Entrainment: ASTM C260. 5-7%.

E. Slump: 4" maximum.

F. Expansion Joint Filler Material: Preformed strips of asphalt saturated fiberboard with plastic caps, complying with ASTM D1751, 3/8" thickness unless indicated otherwise.

G. Sealing Curing Compound: Comply with ASTM C303, unless other type acceptable to Architect, install per manufacturer's instructions.

1. Products: Subject to compliance with requirements, provide one of the following or approved equal:

A. Rust-Oleum Clear-Seal

B. Green Umbrella SoloCure

H. Bonding Compound: Polyvinyl acetate or acrylic base, re-wettable type suitable for intended use.

I. Cold Applied Joint Sealant: Silicone sealant for concrete, one-part, low modules, neutral silicone sealant, complying with ASTM C290 for Type S, Grade P, Class 215.

2.03 DETECTABLE WARNING SURFACE

A. All detectable warning surfaces for on-site sidewalks and perimeter sidewalks immediately adjacent to the project site shall be per ISPWC specifications.

2.04 SOURCE QUALITY CONTROL AND TESTS

A. Submit proposed concrete mix design to Architect for review prior to commencement of Work.

B. Tests on cement, aggregates, and mixes must be provided to ensure conformance with specified requirements.

C. Test samples in accordance with ACI 301.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support concrete paving and imposed loads.

B. Verify gradients and elevations of base course are correct.

C. Visual inspection by the Architect or Engineer is required.

3.02 PREPARATION

A. Moisten base course to minimize absorption of water from fresh concrete. Do not pond water on the base course.

B. Notify Architect a minimum of 24 hours prior to commencement of any and all concreting operations.

3.03 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient. Check completed formwork for grade and alignment to the following tolerances:

1. Cross section of all walks not to exceed 2% slope.

2. Top of forms not more than 1/8” in 10 feet.

3. Vertical face on longitudinal axis, not more than ¼” in 10’.

4. Top of curb shall slope to pavement side at 2% slope.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI 318 when the ambient air temperature is between 50° F and 80° F (See section C. below).

B. Place concrete in accordance with ACI 305 Hot Weather Concreting when the ambient air temperature is or will be above 80°F and there is a lack of a protected environment for concrete placement and finishing (such as an enclosed building).

C. Use ACI 305 placing procedures and procedures outlined in Sections 3.05 through 3.07 of this specification between June 1st and October 1st unless otherwise directed by the Engineer. Notify the assigned testing laboratory and Engineer a minimum of 24 hours prior to commencement of operations.

D. Place concrete in accordance with ACI 306 Cold Weather Concreting if there is a period when the average daily air temperature drops below 40°F for more than 3 successive days and stays below 50°F for more than one-half of any 24 hour period.” Notify testing laboratory and Engineer minimum 24 hours prior to commencement of operations.

E. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

F. Place concrete to joint pattern indicated on the Drawings.

3.05 DETAILED HOT WEATHER CONCRETE PLACEMENT REQUIREMENTS

A. The basic requirements for good results in hot weather concrete placing and curing are no different than in other weather. However, the potential for permanently damaging the surface of the concrete is greater during hot weather conditions. For this reason, the following specific concrete placement and curing requirements must be followed:

1. Concrete shall be handled and transported with a minimum of segregation and slump loss.

2. Concrete shall be placed where it is to remain.

3. Concrete shall be placed in layers shallow enough to assure vibration well into the layer below and that the elapsed time between layers shall be minimized to avoid cold joints.

4. Construction joints shall be made on sound, clean concrete (refer to ACI 224.3R)

5. Finishing operations and timing shall be guided only by the readiness of the concrete and nothing else.

6. Curing shall be conducted so that at no time during the prescribed period will the concrete lack ample moisture and temperature control to permit full development of its potential strength and durability. Details of placing, consolidation, and curing procedures are described in ACI 304R, 308R, and 309R.

B. Planning Hot Weather Placements

1. Before the start of the project, plans shall be made to minimize the exposure of the concrete to adverse conditions. Whenever possible on building sites, slab placement shall be scheduled after the roof structure and walls are in place to minimize drying winds and direct sunlight. A roof also reduces thermal shock from rapid temperature drops caused by wide day and night temperature differences or cool rain on concrete heated by the sun earlier in the day.

2. Under hot weather conditions, scheduling concrete placements at other-than-normal hours may be advisable. Pertinent considerations include ease of handling and placing, and minimizing the risk of plastic shrinkage and thermal cracking.

C. Preparing for Ambient Conditions

1. Personnel in charge of concrete construction shall be aware of the damaging combinations of high air temperature, direct sunlight, drying winds, and high concrete temperature. Local weather reports shall be monitored, and routine recordings of site conditions shall be made, including air temperature, sun exposure, relative humidity, and prevailing winds. These data, together with projected or actual concrete temperatures, enable supervisory personnel to determine and

prepare the required protective measures. Equipment shall also be available at the site to measure the evaporation rate.

2. The determination on the level of protective measures for this project is borne by the Owner and/or their authorized representative(s).

D. Expediting Concrete Placement

1. Preparations shall be made to transport, place, consolidate, and finish the concrete at the fastest possible rate. Concrete delivery to the job shall be scheduled so that it is placed promptly on arrival, particularly the first batch. Avoid ordering the concrete too early before the job is ready since slump control will be lost at this most critical time. Traffic arrangements at the site shall ensure easy access of delivery trucks to the unloading points over stable roadways. Site traffic shall be coordinated for a quick turnaround of concrete trucks. If possible, large or critical placements shall be scheduled during periods of low urban traffic loads to minimize time on the road.

E. Concrete Placing Equipment

1. Equipment for placing the concrete shall be of suitable design and have ample capacity to perform efficiently. All equipment shall have adequate power for the work and be in first-class operating condition. Breakdowns or delays that stop or slow the placement can seriously affect the quality and appearance of the work. Arrangements shall be made for readily available backup equipment. Concrete pumps, where used, shall be capable of pumping the specified class of concrete through the length of line and elevation at required rates per hour. Where placement is by crane and buckets, wide-mouth buckets with steep-angled walls shall be used to permit rapid and complete discharge of bucket contents. Adequate means of communication between bucket handlers and placing crew shall be provided to ensure that concrete is charged into buckets only when the placing crew is ready to use the concrete without delay.

2. Concrete shall not be allowed to rest exposed to the sun and high temperature before it is placed into the form. To minimize the heat gain of the concrete during placement, delivery units, conveyors, pumps, and pump lines shall be kept in the shade where possible. In addition, pump lines shall be painted white. Lines can also be cooled by being covered with damp burlap or kept wet with a soaker hose.

F. Concrete Consolidation Equipment

1. There shall be ample vibration equipment and workers to consolidate the concrete immediately as it is received in the form. Procedures and equipment are described in ACI 309R. Provisions shall be made for an ample number of standby vibrators—at least one standby for each three vibrators in use. Where a site is subject to occasional power outages, portable generators shall be available for uninterrupted vibrator operation. Apart from the unsightliness of poorly consolidated concrete, insufficient compaction in the form can seriously impair the durability and structural performance of reinforced concrete.

G. Preparations for Protecting and Curing the Concrete

1. Ample water shall be available at the project site for moistening the subgrade, as well as for fogging forms and reinforcement before concrete placement. For moist curing, use water with a temperature no more than 20°F (11°C) cooler than the concrete temperature to avoid thermal shock where applicable. Fog nozzles shall produce a fog blanket. They shall not be confused with common garden-hose nozzles, which generate an excessive washing spray. Pressure washers with a suitable nozzle attachment can be a practical means for fogging on smaller jobs. Materials and means shall be on hand for erecting temporary windbreaks and shades as needed to protect against drying winds and direct sunlight. Plastic sheeting or sprayable compounds for applying temporary moisture-retaining films shall be available to reduce evaporation from flatwork between finishing passes.

2. When concrete is placed under hot weather conditions and it is exposed to rapid temperature drops, thermal protection shall be provided to protect the concrete against thermal shrinkage cracking (refer to Section 3.11 D).

3. Curing materials shall be readily available at the project site to permit prompt protection of all exposed surfaces from premature drying upon completion of the placement (refer to Section 3.11).

H. Preparing Incidental Work

1. Due to faster setting and hardening of the concrete in hot weather, timing of various final operations, such as saw cutting joints and applying surface retarders, becomes more critical; therefore, these operations shall be planned in advance. Plans shall be made for the timely sawing of contraction joints in flat-work to minimize cracking due to excessive tensile stress. Typically, joints that are cut using the conventional wet or dry process are made within 4 to 12 hours after the slab has been finished; 4 hours in hot weather, to 12 hours in cold weather. For early entry dry-cut saws, the waiting period will typically vary from 1 hour in hot weather to 4 hours in cold weather (ACI 302.1R).

3.06 JOINTS

A. General: Construct expansion, weakened-plane (contraction) and construction joints true to line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.

B. Expansion Joints (EJ): Provide preformed strips of asphalt saturated fiberboard, ASTM D1751, ½" thick for expansion joints abutting concrete curbs, catch-basins, manholes, inlets, structures, walks and other fixed objects, unless otherwise indicated. Place expansion joints at 20 foot intervals and points of curvature on curb returns. Align curb, gutter, and sidewalk joints.

C. Place joint filler between paving components and other appurtenances. Recess top of filler 1/8 inch for sealant placement.

D. Provide trowelled or sawn joints as indicated. Saw cut contraction joints 3/16 inch wide at an optimum time after finishing. Cut 1/3 into depth of slab (Refer to the Construction Plans for details).

E. Construction (Cold) Joints: Place construction joints at end of placements and at locations where placement operations are stopped more than ½ hour, except where such placements terminate at expansion joints.

1. Where load transfer-slip dowel devices are used, install so that one end of each dowel bar is free to move.

3.07 FINISHING

A. General

1. Expeditious placement and finishing of concrete significantly reduces hot weather difficulties. Delays in placement increase slump loss and invite the use of additional water to offset those losses. Each operation in finishing shall be carried out promptly when the concrete is ready. The concrete shall not be placed faster than it can be properly consolidated and finished. When the placing rate is not coordinated with the available work force and equipment, the quality of the work will be marred by cold joints, poor consolidation, and uneven surface finishes. These deficiencies will not be acceptable to the Owner. Complete replacement of damaged or poor quality concrete will be required at no additional expense to the Owner.

B. Placing Formed Concrete

1. In hot weather, it is usually necessary to place concrete in shallower layers than those placed in moderate weather to ensure coverage of the lower layer while it will still respond readily to vibration. The interval between concrete batch placements becomes very short in hot weather. This interval can be extended by the proper use of set-retarding admixtures. All admixtures must be approved for use by the Owner prior to construction.

2. The determination on the level of concrete protective measures required for this project will be made by the Engineer. The Contractor shall not place any concrete until the Engineer has determined the level of protection that will be required for the work.

C. Placement of Flatwork

1. When concrete is deposited for flatwork on the ground, the subgrade shall be moist, but free of standing water and soft spots. When placing concrete slabs of any kind in hot weather, it may be necessary to keep the operation confined to a small area and to proceed on a front with a minimum amount of exposed surface to which concrete is added.

2. A fog nozzle shall be used to cool the air, to cool any forms and steel immediately ahead and to lessen rapid evaporation from the concrete surface before and after each finishing operation. Excessive fog application (which would wash the fresh concrete surface or cause surplus water to cling to reinforcement or stand on the concrete surface during floating and troweling) shall be avoided.

3. Other means of reducing moisture loss include spreading and removing impervious sheeting or applying a liquid penetrable sealer/hardener compound (refer to Section 3.11).

4. Finishing of flatwork shall begin after the surface sheen of the film has disappeared. Liquid penetrable sealer/hardener compounds shall not be used as finishing aids or worked into the surface, as concrete durability can be reduced. The product manufacturer shall be contacted for information on proper application and dosage. Sealing procedures may cause a slight increase in concrete temperature due to reduced evaporative cooling. Generally, the benefit from reduced moisture evaporation is more important than the increase of in-place concrete temperature.

D. Finish Requirements:

1. Sidewalk Paving Finish

a. Light broom, radius to ½ inch radius, and trowel joint edges.

2. Curbs and Gutters:

a. Machine formed, sack rubbed finish

E. Direction of Texturing:

1. Transverse to pavement direction.

F. Place sealer on exposed concrete surfaces immediately after finishing (see section 3.11)

3.08 JOINT SEALING

A. Separate pavement from vertical surfaces with ¼ inch thick joint filler.

B. Place joint filler in pavement pattern placement sequence shown on the Construction Plans. Set top surface to required elevations. Secure to resist movement by wet concrete.

C. Extend joint filler from bottom of pavement to within 1/8 inch of finished surface.

3.09 TOLERANCES

A. Maximum Variation of Surface Flatness: ¼ inch in 10 ft.

B. Maximum Variation From True Position: ½ inch.

3.10 FIELD QUALITY CONTROL

A. The assigned testing firm will take test cylinders and perform slump and air entrainment tests in accordance with ACI 301.

B. One additional test cylinder will be taken during cold weather and cured on site under same conditions as concrete it represents.

C. One slump test will be taken for each set of test cylinders taken.

D. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

E. Provide copies of all testing to the Owner, Architect, and Engineer within 3 days.

3.11 CURING AND PROTECTION

A. Use ACI 305 curing procedures between June 1st and October 1st unless otherwise directed by the Engineer. Notify the testing laboratory and the Engineer a minimum 24 hours prior to commencement of concrete operations.

B. Immediately following completion of finishing operations, efforts shall be made to protect the concrete from low humidity, drying winds, and extreme ambient temperature differential. Whenever possible, the concrete and surrounding formwork shall be kept in a uniform moisture and temperature condition to allow the concrete to develop its maximum potential strength and durability. High initial curing temperatures can negatively affect ultimate strength and durability to a greater degree than high placement temperatures of fresh concrete. Procedures for keeping exposed surfaces from drying shall begin promptly and continue without interruption. Failure to do so can result in excessive drying shrinkage and related cracking, which can impair the surface durability of the concrete. Damaged concrete surfaces that were caused by improper curing protection will not be acceptable to the Owner. Complete replacement of the damaged concrete will be required at no additional expense to the Owner.

C. Plastic Shrinkage Cracking Protection

1. A curing method that is approved by the Engineer shall be implemented immediately after finishing operations and continued for at least 7 days. If more than one curing method is used during this period, any changes in method shall be approved by the Owner.

2. Concrete surfaces shall not be allowed to become surface-dry at any point during the finishing and 7-day curing process. A variety of curing methods are described in ACI 308R, which addresses the concept of initial curing during the plastic stage of the concrete.

3. Initial curing techniques such as fog spray, can be used to ensure timely replacement of bleedwater and avoidance of plastic shrinkage cracking.

D. Thermal Shrinkage Cracking Protection

1. Concrete shall also be protected against thermal shrinkage cracking due to rapid temperature drops, particularly during the first 24 hours. Thermal shrinkage cracking is associated with a cooling rate of more than 5°F per hour, or more than 50°F in a 24-hour period for concrete with a least dimension less than 12 in. This

type of temperature change is not uncommon during the summer months in Southern Idaho. The Contractor shall pay particular attention to the potential for thermal shrinkage cracking.

2. Concrete exposed to rapid cooling develops lower tensile strain capacity and is more susceptible to other types of shrinkage cracking than concrete that cools at a slower rate (refer to ACI 207.4R). Hot weather patterns increase the potential for thermal cracking due to vast day and night temperature differences. Additionally, seasonal weather patterns often include passing cold fronts that produce rain, which can induce thermal shock to exposed concrete sections. Under these conditions, concrete shall be protected by placing an approved waterproof material over the exposed concrete, or by using other insulating methods and materials described in ACI 306R.

E. Curing Methods

1. Moist curing of flatwork: Moist curing is usually the best method for maximizing strength and durability and minimizing early-age drying shrinkage of concrete flatwork. Examples of moist curing methods are:

- Fog-spraying
- Ponding
- Covering exposed concrete surfaces with a plastic membrane or fabric kept continuously wet
- Covering exposed concrete surfaces with clean sand kept continuously wet
- Continuous sprinkling

These methods require a sufficient water supply and disposal of any runoff. Where sprinkling is used, care shall be taken that surface erosion does not occur. A common and practical method of moist curing is to cover the concrete with impervious sheeting or fabric mats kept continuously wet with a soaker hose or similar means. Other suitable coverings are described in ACI 308R.

Curing materials shall be kept in contact with the concrete surface at all times. Alternating cycles of wetting and drying are not acceptable and this practice will result in pattern cracking. Pattern cracking will not be acceptable. Complete replacement of the damaged concrete will be required at no additional expense to the Owner.

The temperature of water used for initial curing shall be as close as possible to that of the concrete to avoid thermal shock.

2. Liquid penetrable sealer/hardener curing of flatwork: Where job conditions are not favorable for moist curing, the most practical method of curing is liquid penetrable sealer/hardener compounds. The liquid penetrable sealer restricts the loss of moisture from the concrete, thereby allowing the development of strength, durability, and abrasion resistance of the surface. Membrane forming surface coatings such as acrylics, urethanes or epoxies are not acceptable since these compounds tend to cause "popping" of the concrete surface over time.

   Concrete surfaces exposed to direct sunlight shall be shaded during curing whenever possible. For use in hot weather conditions, a material shall be selected that ensures equal or greater moisture retention than required by ASTM C309, and limits the moisture loss in a 72-hour period to 6.4 lb/yd^3 or less when tested per ASTM C156. The liquid penetrable sealer shall also include a liquid hardener. Dry-shake hardeners are not acceptable.

   Application of an approved sealer/hardener material shall immediately follow the disappearance of surface water sheen after the final finishing pass. When a spray application is required or approved, the spray nozzle(s) shall be positioned sufficiently close to the surface to ensure the correct application rate and prevent wind-blown dispersion. Manual spray application shall be performed in two passes, with the second pass perpendicular to the first pass. Two coats of the liquid penetrable sealer/hardener curing compound will be required with the second coat being applied 24 hours after the first.

3. Concrete in formwork: Forms shall be covered and kept continuously moist during the early curing period. Formwork shall be loosened or removed at the earliest practical age without damage to the concrete, and provisions shall be made for an approved curing method to begin.

   Following formwork removal, tie holes and significant defects can be filled and repairs made by exposing the smallest practical section of concrete at one time to perform the work. All repairs shall be completed within the first few days following form stripping so to the repaired areas cure with the surrounding concrete.

   At the end of the curing period, the covering shall be left in place without wetting for several days (4 days is suggested) so that the concrete surface will dry slowly and be less prone to surface shrinkage cracking. Surface cracking due to drying can be minimized by applying a liquid penetrable sealer/hardener curing compound to the exposed surfaces at the end of the moist-curing period.

F. Freezing protection

1. Protect concrete footings from freezing for minimum 5 days.

3.12 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements. Concrete will be considered defective if thermal, plastic or pattern cracking develops due to improper curing and/or excessive dryness.

B. Repair or replacement of defective concrete will be determined by the Enigneer. Concrete that has cracked due to shrinkage, including spider-cracking, must be removed and replaced. Concrete that has popped due to the use of improper or substandard sealants must be removed and replaced.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of the Engineer.

3.13 SCHEDULES

A. Concrete Sidewalks: 3,000 psi 28 day air-entrained concrete, 4 inches thick, light broom finish.

B. Concrete Curb and Gutter: 4,000 psi air-entrained 28 day concrete, formed by curbing machine.

END OF SECTION